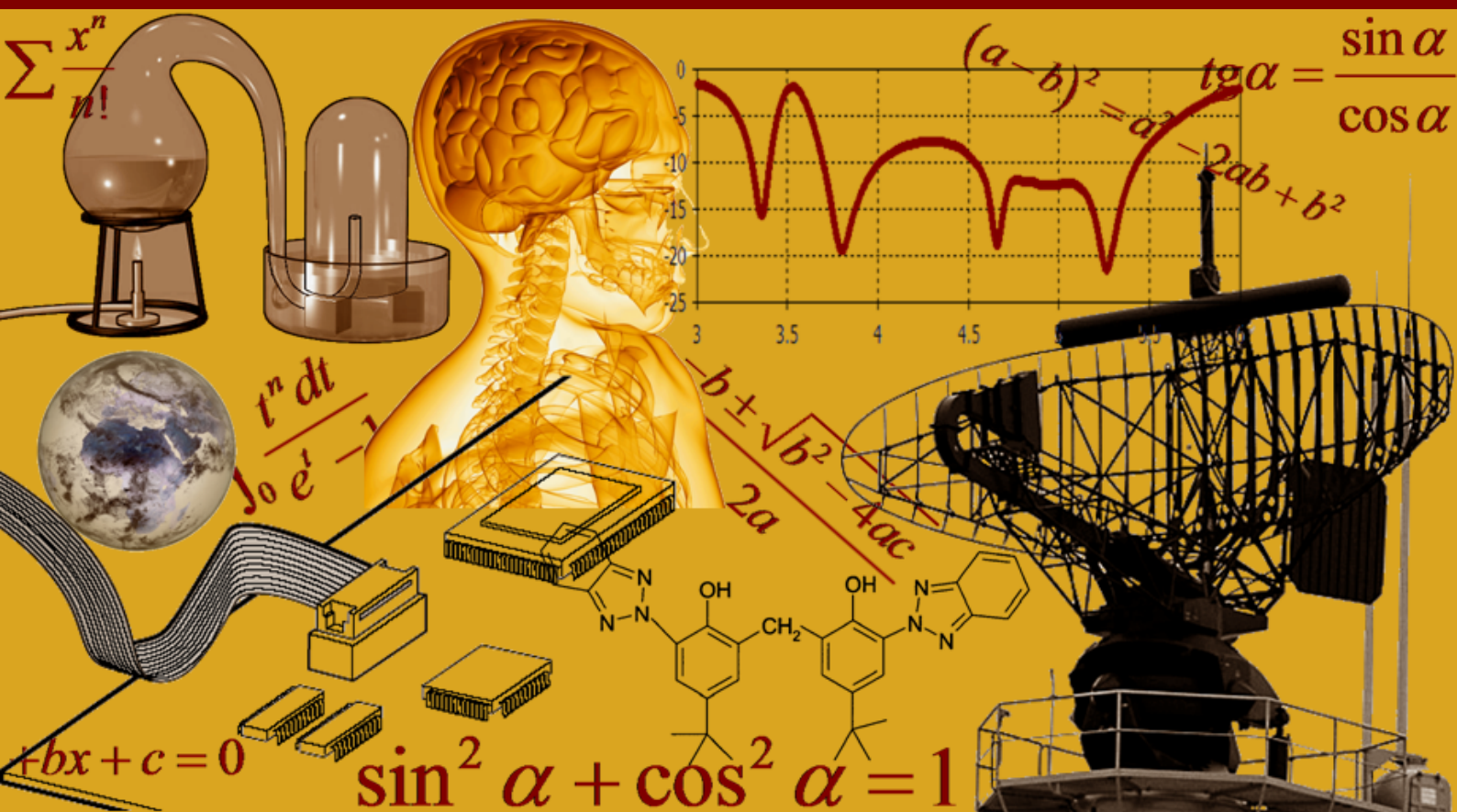


INTERNATIONAL JOURNAL OF INNOVATION AND SCIENTIFIC RESEARCH

Vol. 10 N. 2 October 2014



International Peer Reviewed Monthly Journal



International Journal of Innovation and Scientific Research

International Journal of Innovation and Scientific Research (ISSN: 2351-8014) is an open access, specialized, peer-reviewed, and interdisciplinary journal that focuses on research, development and application within the fields of innovation, engineering, science and technology. Published four times per year in English, French, Spanish and Arabic, it tries to give its contribution for enhancement of research studies.

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LEADING BY EXAMPLE: CAUSES AND TREATMENT BY AN EXPERIENCED LGBT COUNSELLOR

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ABSTRACT: LGBT stands for lesbian, gay, bisexual and transgender which had cause a serious issue nowadays. This research deals with the causes and cure or transformation from this sexual orientation to normal sexual orientation. In going about this, this research looks at the experience of an expert who has been in the field for about three decades and has witnessed it all. Through the analysis of his experienced with people of this sexual orientation, the research was able to point out some of the causes of this problem and proffered solution on how it could be curbed and how those with the orientation could be treated and transformed to the normal sexual orientation. This research uses a semi-structured in-depth interview that was completely guided by the topic of this research with detailed exploration on causes, attitude of LGBT people during and after the transformation and preferred technique for better transformation. The findings showed that the LGBT is a natural issue but can be controlled, while its antecedents or causes could be traced to the lack of enlightenment, lack of comfortability, compatibility and sexual abuse among the young ones. Moreover, the finding showed that counselling and follow-up techniques could solve the menace of LGBT in the larger societies.

KEYWORDS: LGBT, sexuality, solution, experienced counsellor, society, Malaysia

1 INTRODUCTION

Generally speaking, the issue of LGBT has been described as a major issue which has cut across the public of the universe including Malaysia, while some have described it as the generated issue from the concept of human rights, right to practice and live one's sexual orientation even if it is seen as unconventional by the larger society and the religion of the society. Irrespective of yearning for the right to sexual orientation of individual, some societies have opposed the unconventional sexuality, specifically between the same sexes and those who try to change their sexes, LGBT.

Thus, this research examines how an LGBT practitioner could be transformed to straight by exploring the experience of an LGBT counsellor spanning a period of about thirty years. The need for this study arises because researchers have conducted researches on occurrence, naturalness and nurture of homosexuality, lesbian, gay, bisexual and transgender and their frequencies in the society. However, there has been less research on the causes of homosexuality, lesbian, gay, bisexual and transgender orientation in the society and how this could be overcome by those who practice it. Therefore, this research is an attempt to fill the gap as it explores the causes of homosexuality and how it can be tamed through the process of transformation. The research uses the qualitative method approach through semi-structured in-depth interview for the collection of data.

1.1 LGBT: CAUSES AND TREATMENT BY AN EXPERIENCED COUNSELLOR

The research on gender appears to men's experiences and showing that it is a complex issue and sometimes focuses the women at the detriment of men (Faulkner, 2002). This implies that gender is considered in heterosexual terms alone, where

heterosexuality is tacitly regarded and accepted as the norm. In other words, women are often considered in relation to a typical family unit comprising one male and one female parent with one or more children. Moreover, gender and sexuality are seen as separate set of things that closely blended at many points with cultural logic that is combined with some components to form a fully articulated social identity (Ben et al., 2008). However, with the passage of time, some formations have been derived from identities through the sexual outlook which leads to the usage of terms such as Lesbianism, Gayism, bisexuality and transsexualism (LGBT) in identifying new sexual orientations.

Furthermore, the assumptions and norms associated with sexualities are closely attributed to the meaning given to it by contemporary culture and society. In the past, the family relationships of lesbian and gay parents and their children were not legally recognised in most countries of the world. But, presently, the lesbian, gay, bisexual and transgender (LGBT) relationships are now gaining recognition in some countries, while their matter is under active debate in relation to social and legal consideration in these nations (Charlotte, 2009). Recently, many crucial debate topics on the issue have undergone the scrutiny of sociobiologists in order to determine the cause(s) and origin of homosexuality and its related practices – LGBT. Indeed, the research by the American psychological association (APA) has recommended that LGBT be treated as a mental disorder and its practitioners, it said, are not fit to be in the society (APA Online, 2003).

In addition, some existing theories have tried to ascertain whether the occurrence of LGBT is natural or an ideology being propagated by certain people (Owoyemi & Ahmad Sani, 2013). However, there has been less research on the causes of LGBT in the society and how those who practice it could be transformed back to normal sexual orientation usually described as straight. This, therefore, is the task that this research intends to undertake through the experience of an expert counsellor who has been on the field for more than thirty years. Nonetheless, it is important to point out that both biological and social theorists have agreed that offspring of different species reared in different or same environment would produce different results and vice versa (Fujita, 2003). Thus, this research adopts the theory of “Born That Way” as the framework for its study of this issue in order to figure out the causes of LGBT and also outline the view of the expert counsellor on transforming LGBT practitioners back to straight.

2 METHODOLOGY

2.1 THEORETICAL FRAMEWORK

This part of the research is framed by the theoretical approach of “Born That Way” which was proposed by Le Vay in 1996. According to him, many factors are liable for the existence of homosexual orientation in the society. The theory postulates the causes of people practising homosexuality which developed into LGBT. Besides, the Born That Way theory postulates that temperament and environment are major causes of homosexuality (Julie, 2007). It stresses that temperament is integrated by the combination of genes, brain wiring and prenatal hormonal environment, depicted in equation (1) below. Indeed, environment as one of the causes of homosexuality practices is formed from the combination of parents, peers and experiences as shown in equation (2) below:

$$\text{Genes} + \text{Brain Wiring} + \text{Prenatal Hormonal Environment} = \text{Temperament} \quad (1)$$

$$\text{Parents} + \text{Peers} + \text{Experiences} = \text{Environment} \quad (2)$$

Therefore,

$$\text{Temperament} + \text{Environment} = \text{Homosexual Orientation} \quad (3)$$

By using born that way theory as shown in equations (1), (2) and (3), this research intends to examine the views of the expert respondent (Counsellor) who has been dealing with LGBT practitioners for over thirty years and transforming them back into straight.

2.2 STUDY PARTICIPANT

The ethical approval to conduct the interview with the expert participant was sent by the researchers, while the participant’s consent was obtained. The participant is a full time counselor that has been working on changing/transforming the life of LGBT practitioners into the normal life or straight. He is an elderly man of about 60 years of age with adequate verbal and written English.

Moreover, the participant was selected on the basis of his attributes and profession which could help in producing insights and understandings of the research objectives. The respondent who is a counsellor has been in the counselling practise for more than 30 years. He was discovered on the internet and latter contacted on the phone for the invitation,

while the objectives of the research was made clear to him. Conclusively, the respondent is an experienced counsellor in the field of transforming the life of LGBT as he was able to answer all the questions posed to him and shed more light on the causes of LGBT and how it could be reduced in the society through activities such as his own (counselling).

2.3 DATA COLLECTION AND ANALYSIS

A convenience sampling method is adapted in selecting the sample for this research which helps us in selecting the best person to produce the best answers to our research questions. Indeed, the main objective of this research is to find the causes and best technique for changing the life of LGBT people. Thus, convenient sampling is the best fit selection style to choose the participant for this research as it is view as an act of taking the available and useful sample to ease data gathering (Sherri, 2011; Creswell, 2012). Meanwhile, the participant was selected on the basis of his characteristics, which could help in producing insights and understandings of the research objectives.

Furthermore, this research uses a semi-structured in-depth interview that was completely guided by the topic of this research with detailed exploration on causes, attitude of LGBT people during and after the transformation and preferred technique for better transformation. The research adopts semi-structured in-depth interview due to the avenue it gives the respondents to give his or her opinion on the subject matter and allows them with freedom of perceptions (Sharlene and Patricia, 2010). Besides, audio recording was used during the interview with the respondent at his counseling center based on his permission and lasted between 45-55 minutes. The interview was conducted in two days due to the schedule given by the respondent (LGBT counselor) as the respondent is a very busy person who has many clients to attend to and always have invitations for seminars. The questions that were used for the interview were derived from the review of literatures that suit the LGBT domain. Interview mode of gathering data is an effective tool to collect data from group or individual respondents and provides the quick and detailed link to the root of the research (Creswell, 2003; 2012).

Data analysis was undertaken using the framework approach to manage the analysis of data gathered from the respondent through the semi-structured in-depth interview and describes the originality of data to the underlying theory. The interview transcripts were indexed and mapped on the basis of recurring themes by using content analysis style. The synthesized data were examined to identify the causes of practicing LGBT and the technique for transforming LGBT people. Moreover, the interview transcript was sent to the respondent (the Counselor) in order to ensure correctness of the data that was collected from the respondent. Besides, the data was validated since the beginning of the interview by ensuring that the research topic guides the discussion with the participant, while the data coding framework were thoroughly checked by the two members of the research group to achieve reliability of the study.

2.4 SAMPLE OF INTERVIEW SESSION WITH LGBT COUNSELOR

1. Question

What methods or ways do you use in changing the life of people engaging in the same opposite sex, specifically on counselling?

Answer (Counsellor)

I am counsellor and have my own clinic where many gays and transgender visit in order to change their life for better one. In changing the lives of gays, I developed statistics and trust for my clients in order to completely transform. My belief is that when they have trust in me and my organisation, it would help them in explaining everything about their lives. Indeed, everything about the characters of the gays needs to be told if they want to accept changes and at the same time should be honest to the counsellor.

Thus, in counselling, we try to develop a self esteem which changes the billy system in arity theory, however this is called "iman" in Islam. Furthermore, in using the counselling to change the lives of gay and transgender, there must be follow-up.

2. Question

Is the problem of LGBT a disease or natural as they used to say?

Answer (Counsellor)

The problem of LGBT is not a disease but is one of the tests from Allah which tells human on how to control the specialisation given to individual by Allah. That is why the sex emotion in LGBT world is given focus so as to help them on how to overcome these unique characteristics, even though they were born with it.

3. Question

There was a story of a woman with two children. She said each time she was with her husband, she does not have feeling of being together and eventually broke-up the marriage and bisexual. What is really causing this issue and is it natural?

Answer (Counsellor)

This is mainly caused by instinct with the woman. It is not natural but this may be cause if someone is exposed with sexual engagement before marriage which may prevent him or her from being honest with the spouse. The easiest way to solve this problem is for the affected person to inform his or her partner about his sex emotion.

4. Question

Does it mean that the affected people are not born with this menace?

Answer (Counsellor)

This can be view in two different ways:

1. The LGBT could be cause by the experience with sex abuse which may be difficult to leave after having a bisexual experience.
2. Some people were born deeply inside with sex emotion and once they could not control it, they would turn to transgender. This can be control by spending time with positive people and reading Alqurian always.

5. Question

Do you agree that there is conflict with what the LGBT are and what they feel?

Answer (Counsellor)

Yes. There is serious conflict in the two terms when it comes to the LGBT world.

6. Question

Do you believe in not preaching counselling to the LGBT people?

Answer (Counsellor)

I believe in preaching to the LGBT people and let them know the effect of the life they living and what would happen to them as the consequences. We counsel them to visit our LGBT friend that have contacted HIV and other diseases caused by the life they are living.

7. Question

What do you think we use to solve this problem in Islam?

Answer (Counsellor)

This could be solved by advising them to be moving with good people and read al-quran regular.

8. Question

How long have you been in this LGBT transformation and have you experience any of your converters moving back to LGBT?

Answer (Counsellor)

I have been doing this for the past 30 years and we make sure we are closer to the people that we have transformed from LGBT and give them monitoring.

3 RESULTS

Some numbers of factors and variables were identified as the causes of LGBT or the underlying factors for forming this sexual orientation and the best fit approach to transform the life of LGBT practitioners was made explicit as presented in Table 1.

Table 1: Factors and Variables for the Causes of LGBT Orientation and the Transformation Approach

Factors / Variables	Participant / Frequency
Causes of LGBT Orientation	
Intrinsic	
Lack of conquering inbuilt desire	√
Sex emotion	√
Infant sex experience	√
Individual characteristics	√
Environmental Factor	
Taking time with wrong one	√
Lack of mutual consideration	√
Distance from religion and religious literature	√
Approach for Transforming LGBT People	
Counseling	
Faith	√
Honest	√
Trust	√
Advise	√
Enlightenment	√
Monitoring	√

Table 1 shows the factors and variables that were derived from the data collected from the participant. It shows that the causes of LGBT are categorized into two forms; intrinsic and environmental factors. Intrinsic factor includes Lack of conquering inbuilt desire, sex emotion, infant sex experience and individual characteristics. The environmental factor comprises of taking time with wrong people, lack of mutual consideration and distancing oneself from religion and religious literature. Besides, it was derived from the discussion with the respondent that the best fit approach to transform the LGBT practitioner is to engage them in counseling which is integrated with faith, being honest with them, gaining their trust and confidence, advising them subtly, enlightenment about the harms of the practice and constantly monitoring their progress towards transforming themselves. Monitoring, the respondent points out is most important so as to guard against a reversion after they might have started the process of transformation. At this stage, he says, there is a need for them to change their circle of friends and move with people who will constantly motivate them especially in the practice of religion.

3.1 CONSISTENCY BETWEEN THE FACTORS

According to Xu (2003) and Huang (2007), the consistency or relationships among factors referred to the important information derived during the interview process. In the context of this research, the relationship between factors were extracted from the interview scripts and analyzed via content analysis process as depicted in Table 1.

Table 2: Linkage between the Factors

Factors Link	Frequency
INT → ENVF	√
INT → CNS	√
ENVF → CNS	√

Factors' abbreviation:

INT- Intrinsic

ENVF- Environmental Factor

CNS- Counseling

Table 2 shows the relationship between the factors in column 1 of Table 1 with their corresponding frequency. From the interview granted to the respondent, it was deduced that INT→ ENVF are valid factors due to the fact that both INT and ENVF demonstrate intrinsic and environmental factors that are responsible for the causes of homosexuality orientation and LGBT

in the society. Likewise, INT → CNS have relationship as shown in the factors link since intrinsic factor in individual can be controlled by the advice received during the counseling section to the individual or LGBT practitioner. Meanwhile, ENVF → CNS are found to be related to each other as counseling could be used to engage the LGBT practitioner and prevent him/her from spending their time with bad folks.

4 DISCUSSION

This research has explored the view of the respondent (LGBT Counselor) on LGBT transformation and the causes of LGBT orientation in the society. In the beginning of our interview with the respondent, we asked the respondent to identify himself. *The respondent made us understand that he is a counselor, specializing on the area of transforming the life of LGBT practitioners for more than 30 years.* Thereafter, the respondent was asked to give his view about the causes of LGBT or homosexual orientation in the society. His response was as follow:

"If we were to look at the cause of LGBT critically, we will find that it is intrinsic in human being which starts from the teen age and could be found on individual. The formation of LGBT orientation in individual does not come overnight; it can be categorized into two different factors; intrinsic factor and environmental factor. The intrinsic factor comprises of failure of individual to conquer his inbuilt sex emotion, infant sex emotion and individual characteristics."

Both the first and second factors highlighted by the respondent (the Counselor) as the antecedent catalysts for LGBT orientation in the individual are in line with the theory of "Born That Way" where Le Vay in 1996 pointed out that one of the causes of homosexual orientation is temperament, which comprises of genes, brain wiring and prenatal hormonal environment. Moreover, the second factor that causes LGBT is environmental factor that comprises of parents, peers and experiences. Indeed, attitude of man is found to be determined by both nature and nurture, showing that one cannot perform in the environment without possessing a gene while gene is solely depended on the environment in order to act.

In addition, sexual abuse during teen age could also lure people to LGBT orientation as this has the potential of destroying and causing gender identity confusion in human. Gender identity is the perception of an individual about his/her sense of masculinity or femininity. Gender identity occurs as a result of bond between a child and his or her parents and peer group at teen age. A child would determine his/her sex identity based on the affection he/she receives from one of the parents and friends. In order words, the relationships that teen forms with other boys or girls foster his/her sense of masculinity and femininity, thus, making him/her to discover more about other boys or girls and himself/herself as a boy or a girl. In the end, many years of bond with people of the same or different sex would help a teen age person to be able to identify his/her gender and to differentiate which gender is the same or different from his/her own. Sexual abuse, therefore, especially if it is same sex, can potentially lead to gender confusion and wrong desire in teens (Frank W. Putnam, 1990: p. 117 - 121).

Furthermore, the respondent was asked of the approach he uses to transform LGBT practitioners; his answers were as follows:

"In my organization, the approach that is being used to transform the life of LGBT practitioner is "Counseling Technique". The counseling technique entails some steps that need to be fulfilled in order to achieve complete transformation of LGBT practitioner. There must be faith which needs to be built by the LGBT practitioner that God can change his or her status for better one. Besides, honesty should also be built by the LGBT people in telling the counselor the truth whatever the questions that they asked from them, so as to know their gravity of practicing the LGBT orientation. Moreover, the LGBT practitioner sometimes does not expect total trust in counselor since they think that their secrets will be disclosed to others. But this is not the case and it is important that the people that are involved should disclose all their affairs past and present to the person that is expected to transform their life, while the counselor too should know that the process would be continued if their secrets are guaranteed. This is what we practice in our organization and this is the reason why we have been successful so far."

"Conclusively, we do ensure that religious oriented advises are given to the people we want to transform their lives for better. We make use of the team of experts in dawah (sermon) that are good at using Al-Quran and Islamic literatures to ensure that LGBT practitioners are improved spiritually. This is because the intrinsic nature that is embedded in them could be addressed spiritually together with physical treatment. Pursuing this further, our organization does ensure that LGBT practitioners are well enlightened about the associated problems with LGBT orientation and practices. Thus, we also engaged in monitoring and follow-up of the people we have transformed from LGBT practices to normal and meaningful life."

Lastly, our study found that the combination of intrinsic or temperament and environmental factors are the major causes of LGBT orientation in the society as postulated by "Born That Way" theory, while counseling which is faith based is ascertained as the best approach to transform the life of an LGBT practitioner.

5 CONCLUSION

In this research, we learn that both environmental and intrinsic factors are found to be the causes of LGBT orientation and practice in the individual and society, thus, there is a serious need to focus on them if the menace is to be curbed in the society.

Indeed, religion is a vital mechanism for controlling this sexual orientation. Since religion is plainly against this sexual orientation, it could be used as a form of therapy for the prevention of the practices and help the person to become more spiritual and move closer to God.

Therefore, counselling which is faith based (that is, which utilizes the teachings of religion) is recommended as the best approach to transform the life of LGBT practitioners since it is tested and trusted as seen in the experience of the expert respondent who has been in the field for more than thirty years.

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Modeling of Bilayer Graphene Based Field Effect Transistors for Digital Electronics

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ABSTRACT: Graphene is a wonder material with ultra-fast conductivity due to its zero bandgap structure with outstanding electronic properties. Monolayer graphene based transistors are suitable for analogue electronics as off-state is not required in analogue and radio frequency applications. But to make the bilayer graphene based transistors suitable for digital applications, a bandgap is required for the existence of an off-state. Also, to achieve a higher performance as compared to the rival silicon-CMOS technology, a high I_{ON}/I_{OFF} ratio is required. The latest research on bilayer graphene is still in a theoretical and analytical phase, so we present an analytical modeling of a bilayer graphene based field effect transistor (BLGFET) for digital applications. The proposed BLGFET operates on the principle of a Klein tunneling and Klein paradox. This principle is used to develop a model of BLGFET for digital electronics with an excellent I_{ON}/I_{OFF} ratio (greater than 10^6). Bilayer graphene (BLG) has two types depending on the geometry i.e. AA-stacked and AB-stacked. Both types of BLG undergo Klein tunneling and Klein paradox but at different angles. So the expressions for transmission probabilities and the I_{ON}/I_{OFF} ratios for both types of BLGs are derived and their corresponding results are plotted using MATLAB.

KEYWORDS: Bilayer Graphene Field Effect Transistors, Bandgap, I_{ON}/I_{OFF} ratio, AB-stacked BLG and AA-stacked BLG.

1 INTRODUCTION

In digital electronics, both logic states (on-state and off-state) are necessary for a transistor to be used in logic circuits. But graphene has a zero bandgap, which means it always operates in on-state which corresponds to a very low I_{ON}/I_{OFF} ratio. Monolayer graphene based field effect transistors (MLGGFETs) have the largest I_{ON}/I_{OFF} ratio of 10 [1], which is not enough for digital applications. Several alternate techniques have been proposed based on creation of bandgap such as; by using graphene nanoribbons (GNRs) narrower than 5 nm, which showed the I_{ON}/I_{OFF} ratios up to 10^5 [2]. But the GNFETs have a very low performance due to the line-edge disorder [3], [4].

Bilayer graphene (BLG) can be used in digital circuits because it has an ability to induce a bandgap necessary of achieving off-state. In BLG, both the layers of graphene are arranged in a way that carbon atoms in top layer exist above the rings of hexagon of bottom layer. In this symmetry, BLG just like single layer graphene (SLG) has a zero bandgap. By applying an electric field on the gate, this symmetry is broken as the atoms of the top layer have the higher potential than the atoms of the bottom layer. This creates a bandgap which is tunable by variation of gate voltage of BLG based GFETs.

In BLG, charge carriers exhibit a tunneling behavior which is also generally known as Klein paradox [5]. According to this behavior specifically for Graphene, the carriers striking the BLG at some angles undergo a total reflection and at other angles undergo a total transmission due to tunneling effect. Then the probability of tunneling for charge carriers can be calculated which is subsequently used for finding the I_{ON}/I_{OFF} ratio. This provides a solution for the lack of bandgap in graphene. In [6], a double gated BLG based GFET was used and a bandgap of 250 meV was induced and I_{ON}/I_{OFF} ratio $>10^3$ was achieved. But a double-gated topology causes a high complexity in circuit modeling and computation of parameters. So we present a single gated bilayer graphene based field effect transistor (BLGFET) for digital applications.

2 DESIGN STRUCTURE OF THE PROPOSED BLGFET

The BLGFET model is proposed for digital applications as shown in Fig. 1. BLG undergo a Klein paradox, according to which the carriers striking the BLG at some angles undergo a total reflection and at other angles undergo a perfect transmission due to tunneling effect. BLG has two types depending on the geometry: one is the AB-stacked in which both the layers of graphene are arranged in a way that carbon atoms in top layer exist above the rings of hexagon of bottom layer. The other type is AA-stacked in which the top layer is stacked exactly above the bottom layer having the perfect alignment of the carbon atoms and hexagonal rings as shown in Fig. 2 [7], [8]. The carriers striking at normal incidence are perfectly reflected in AB-stacked BLG and are totally transmitted in AA-stacked BLG. This tunneling paradox for carriers in both types of BLGs can be used to develop a BLGFET for digital electronics applications with an excellent I_{ON}/I_{OFF} ratio.

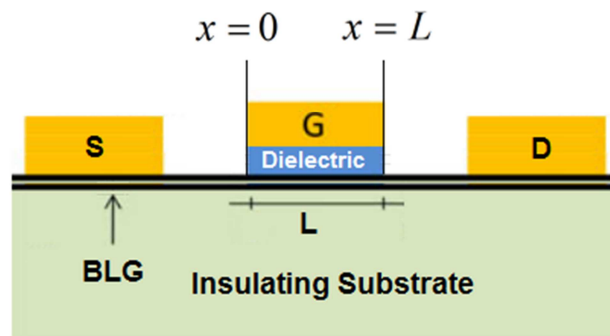


Fig. 1. The proposed BLGFET model for digital electronics applications

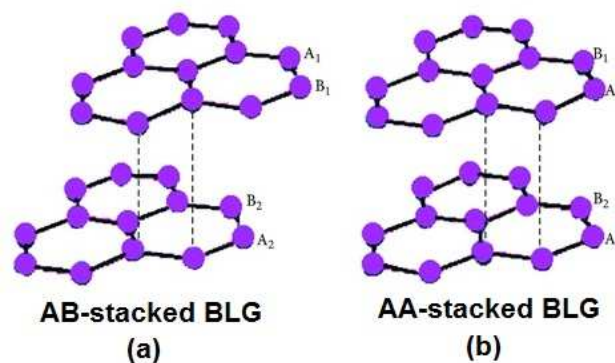


Fig. 2. a) Structure of AB-stacked bilayer graphene, b) Structure of AA-stacked bilayer graphene

3 MODELING OF THE PROPOSED GFET FOR DIGITAL ELECTRONICS

3.1 AB-STACKED BLG TUNNELING THROUGH AN N-P-N JUNCTION

Using the Klien tunneling concept of AB-stacked BLG in [9], the Hamiltonian of AB-stacked BLG is Dirac-like and is expressed as:

$$H = -\frac{\hbar^2}{2m} \begin{pmatrix} 0 & (k_x - ik_y)^2 \\ (k_x + ik_y)^2 & 0 \end{pmatrix} \quad (1)$$

Where 'm' is the effective mass of the charge carriers, 'h' is the planks constant and $(k_x - ik_y)$ is the wave vector of BLG. The corresponding eigen-states for this Hamiltonian are formulated as [10]:

$$\psi_A = (a_i e^{ik_x x} + b_i e^{-ik_x x} + c_i e^{K_x x} + d_i e^{-K_x x}) \cdot e^{ik_y y} \quad (2)$$

$$\psi_B = s_i \begin{pmatrix} a_i e^{ik_x x + 2i\phi_i} + b_i e^{-(ik_x x + 2i\phi_i)} \\ + c_i h_i e^{k_x x} + \frac{d_i}{h_i} e^{-k_x x} \end{pmatrix} \cdot e^{ik_y y} \quad (3)$$

For each eigenstate, by applying the boundary conditions (at $x = 0$ and $x = L$) as shown in Fig. 1, and then taking their derivative gives the following equations:

$$\begin{aligned} \psi_A^1(x=0) &= \psi_A^2(x=0), & \psi_A^2(x=L) &= \psi_A^3(x=L) \\ \frac{d}{dx} \psi_A^1(x=0) &= \frac{d}{dx} \psi_A^2(x=0), & \frac{d}{dx} \psi_A^2(x=L) &= \frac{d}{dx} \psi_A^3(x=L) \\ \psi_B^1(x=0) &= \psi_B^2(x=0), & \psi_B^2(x=L) &= \psi_B^3(x=L) \end{aligned}$$

The expression for transmission probability is given as:

$$T(\theta) = |A_3|^2 \quad (4)$$

Where A_3 is the amplitude of the transmitted wave (carrier) between the gate and drain region and θ is the incident angle of carriers. Between on and off states, the current modulation is given by: $1/T(\theta_{\max})$. Subsequently, the I_{ON}/I_{OFF} ratio can be expressed as:

$$\frac{I_{ON}}{I_{OFF}} = \frac{1}{T(\theta_{\max})} \quad (5)$$

Hence, by setting the target I_{ON}/I_{OFF} ratio of 10^6 , $\theta_{\max}$ can be calculated as 1.2° . This shows that the GFET is at off-state as long as the carriers strike the n-p-n junction at an angle less than 1.2° .

3.2 AA-STACKED BLG TUNNELING THROUGH AN N-P-N JUNCTION

Using the Klien tunneling concept of AA-stacked BLG from [AA], the Hamiltonian of AA-stacked BLG is expressed as [11]:

$$\bar{H} = \begin{pmatrix} 0 & 0 & \gamma & f(k) \\ 0 & 0 & \bar{f}(k) & \gamma \\ \gamma & f(k) & 0 & 0 \\ \bar{f}(k) & \gamma & 0 & 0 \end{pmatrix} \quad (6)$$

Where, $\gamma \approx 0.2\text{eV}$ which is the interlayer energy and $f(k) = \hbar v_F k e^{-i\theta}$, where θ is the angle of wave vector and $v_F = \sqrt{3}ta / 2\hbar \approx 10^6$ m/s is the Fermi velocity. The eigenstates for this Hamiltonian are formulated as:

$$\psi_{\eta_1, \eta_2}(\theta) = e^{ik \cdot r} \begin{pmatrix} \eta_1 e^{-i\theta} \\ \eta_1 \eta_2 \\ \eta_2 e^{-i\theta} \\ 1 \end{pmatrix} \quad (7)$$

By applying the n-p-n junction based boundary conditions:

$$\begin{aligned} \psi_i(x=0) + \psi_r(x=0) &= \psi_a(x=0) + \psi_b(x=0) \text{ and} \\ \psi_a(x=L) + \psi_b(x=L) &= \psi_t(x=L) \end{aligned}$$

The transmission probability ($T_\mu(\theta)$) is expressed as [11]:

$$T_\mu(\theta) = \frac{\cos^2 \phi \cos^2 \theta}{\cos^2 \phi \cos^2 \theta \cos^2(n\pi) + \sin^2(2(n\pi)[1 - \mu \sin \phi \sin \theta])} \quad (8)$$

Where θ is the incident angle of charge carriers, ϕ is the angle of transmitted wave and $\mu = +1$ represents the transmission at a same-chirality and $\mu = -1$ represents the transmission at flipped-chirality. Hence, by setting the target I_{ON}/I_{OFF} ratio of 10^6 , θ_{min} can be calculated as 69.5° . This shows that the GFET is at off-state as long as the carriers strike the n-p-n junction at an angle greater than 69.5° .

4 MODELING RESULTS

Matlab software was used to implement the equations (4) and (8). In AB-stacked BLG, for an incident angle (θ) = 1.2° , one out of 10^6 carriers undergo transmission by Klein tunneling. So if $\theta < 1.2^\circ$, then the AB-stacked BLGFET is at off-state otherwise it is at on-state. So the corresponding I_{ON}/I_{OFF} -ratio of AB-stacked BLBFET is greater than 10^6 as shown in Fig. 3.

Similarly in AA-stacked BLG, for an incident angle (θ) = 69.5° , one out of 10^6 carriers undergo transmission by Klein tunneling. So if $\theta > 69.5^\circ$, then the AA-stacked BLGFET is at off-state otherwise it is at on-state. So the corresponding I_{ON}/I_{OFF} -ratio of AA-stacked BLBFET is greater than 10^6 as shown in Fig. 4.

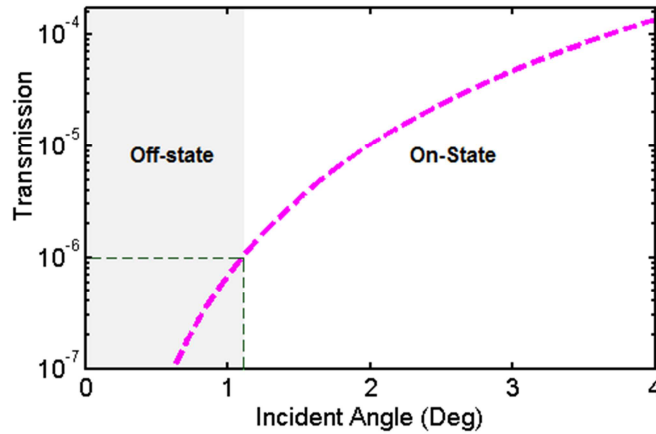


Fig. 3. Transmission probability for an n-p-n junction of AB-stacked BLGFET

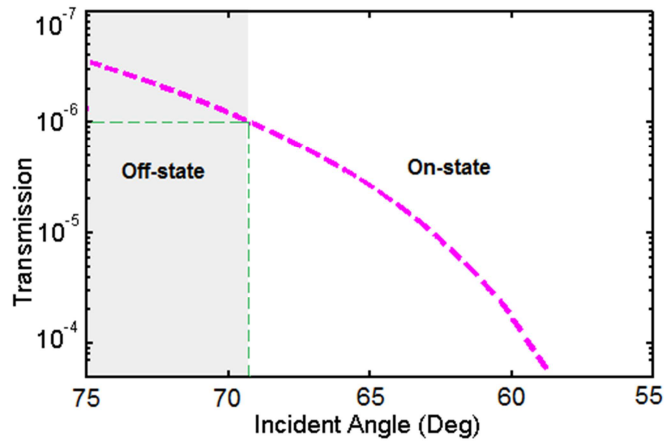


Fig. 4. Transmission probability for an n-p-n junction of AA-stacked BLGFET

5 CONCLUSION

We have presented an analytical model for a top-gated bilayer graphene based field effect transistor. The proposed model is suitable for digital electronics applications as it has a high I_{ON}/I_{OFF} ratio i.e. greater than 10^6 . It is shown and verified that both the AA-stacked and AB-stacked BLGFETs undergo Klein tunneling which is dependent on the incident angle of the charge carriers. We have exploited this unique Klein Paradox behavior of BLG to develop the proposed model which can enable the use of GFETs without the requirement of a bandgap. Although bandgap can be created by the process of chemical doping in BLG as shown in [12], but this increases the complexity and manufacturing cost of the BLGFETs.

In our proposed model, the gate of BLGFET is used to control transmission of charge carriers across the p-n junction. This gate-controlled operation is similar to the silicon FETs with a difference that; in BLGFETs, tunneling effect is controlled by the charge carrier's incident angle.

ACKNOWLEDGMENT

This work is done as a part of MSc Electrical Engineering thesis undertaken by 'Yasir Sabir' at University of Engineering & Technology, Taxila. The authors thank 'National University of Sciences & Technology, Islamabad' for providing access to its digital library. The authors would also like to acknowledge and thank 'Shaheen Foundation, PAF' and 'Sabancı University Nanotechnology Research and Application Center' for providing the software access.

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Various Image Enhancement Techniques - A Critical Review

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ABSTRACT: Image Enhancement is very essential and important technique used in image processing. The role of image enhancement is to improve the content visibility of an image. Images in different fields like medical, satellite images, aerial images and even real life pictures suffer from poor contrast and high noise. It is important to only enhance the contrast and reduce the noise to increase image quality. The enhancement technique differs according to various aspects and they can be broadly classified into two categories: Spatial Domain and Frequency domain based techniques. This paper presents a review of image enhancement processing techniques in spatial domain. Also we have categorized processing methods based representative techniques of Image enhancement. Thus this paper helps to evaluate various image enhancement techniques

KEYWORDS: Histogram Equalization, Frequency based domain enhancement, Spatial based domain enhancement, Image Enhancement.

1 INTRODUCTION

Image enhancement is the method to increase the visibility of higher frequency and lower frequency details of an image. The aim is to improve the visual details of the image, or to provide a “better” transform representation for appropriate usage in image processing, such as analysis, detection, segmentation and recognition. It also helps to detect background information that is essential to understand object behavior without human visual and perception. Due to presence of low contrast, we cannot clearly fetch objects from the dark background. Most color based methods will fail on this matter if the color of the objects and that of the background are similar. The survey is done on techniques that classifies it into two broad categories: Spatial based domain image enhancement and Frequency based domain image enhancement. Spatial based domain image enhancement operates directly on picture elements. The main advantage of spatial based domain technique is that they are relatively simple to implement and have lower complexity. On the other hand, Frequency based domain image enhancement is a term used to describe the analysis of mathematical functions or signals with respect to frequency and operate directly on the transform coefficients of the image, such as Fourier transform, Discrete wavelet transform (DWT), and Discrete cosine transform (DCT). This techniques works on the principle of manipulating the transform coefficients. The advantages of frequency based image enhancement comprise of low complexity of computations, ease of visibility and manipulating the frequency composition of the image and the easy applicability of special transformed domain properties.

The basic limitations are that, it cannot enhance all parts of image at once and also finds difficult to automate the image enhancement procedure. Image enhancement techniques like spatial domain methods can again be classified into two broad categories: Point Processing operation and Spatial filter operations. Traditional methods of image

enhancement are to enhance the low quality image itself. It did not embed any high quality background information. The reason is that in the dark image, some areas are so dark that all the information is already lost in those regions. Even high illumination is unable to bring back lost information. Frequency domain methods can again be classified into three categories: Image Smoothing, Image Sharpening and Periodic Noise reducing.

2 PREVIOUS WORK

Image enhancement process consists of a collection of techniques that seek to improve the visual appearance of an image or to convert the image to a form better suited for analysis by a human or machine. The principal objective of image enhancement is to modify attributes of an image to make it more suitable for a given task and a specific observer. During this process, one or more attributes of the image are modified. Digital Image enhancement techniques provide a multitude of choices for improving the visual quality of images. Appropriate choice of such techniques is greatly influenced by the imaging modality, task at hand and viewing conditions.

A familiar example of enhancement is in which when we increase the contrast of an image and filters it to remove the noise "it looks better". It is important to keep in mind that enhancement is a very subjective area of image processing. Improvement in quality of these degraded images can be achieved by using application of enhancement techniques. The work done by various researchers for Image Enhancement are discussed here, Madhu[1] suggested that the Adaptive histogram equalization produced a better result, but the image is not free from washed out appearance. The sharpness is poor and the background information as well as the plane is still fogged and poor in contrast. Alpha rooting is able to render the entire image in a dark tone.

Agaian [2] suggested that the common non transform-based enhancement technique is global histogram equalization, which attempts to alter the spatial histogram of an image to closely match a uniform distribution. Histogram equalization poorly equalizes every local detail as it works at same level on whole image. Equalization often over enhance the image, resulting in loss of visibility. Tang [3] suggested global histogram equalization, which adjusts the intensity histogram to particular distribution only. Global histogram equalization states that image properties may not be appropriately applied in a local context. In fact, its modification treat all regions of the image equally and, thus produce poor image detail preservation.

3 SPATIAL DOMAIN METHODS

Spatial domain techniques directly deal with the image pixels. The pixel values are manipulated to achieve desired enhancement. Spatial domain techniques like the logarithmic transforms, power law transforms, histogram equalization are based on the direct manipulation of the pixels in the image. Spatial techniques are particularly useful for directly altering the gray level values of individual pixels and hence the overall contrast of the entire image. But they usually enhance the whole image in a uniform manner which in many cases produces undesirable results. It is not possible to selectively enhance edges or other required information effectively. Techniques like histogram equalization are effective in many images.

The approaches can be classified into two categories:

1. Point Processing Operation (Intensity Transformation Function)
2. Spatial Filter Operations.

Point processing operations (Intensity transformation function) is the simplest spatial domain operation as operations are performed on single pixel only. Pixel values of the processed image depend on pixel values of original image. It can be given by the expression $g(x, y) = T[f(x, y)]$, where T is gray level transformation in point processing. The Point processing approaches can be classified into four categories as Image Negatives in which gray level values of the pixels in an image are inverted to get its negative image. Consider a 8 bit digital image of size $M \times N$, then each pixel value from original image is subtracted from 255 as $g(x, y) = 255 - f(x, y)$ for $0 \leq x < M$ and $0 \leq y < N$. In a normalized gray scale, $s = 1.0 - r$.

Negative images are useful for enhancing white or gray details embedded in dark regions of an image. Fig.1 shows an example of an image negative.

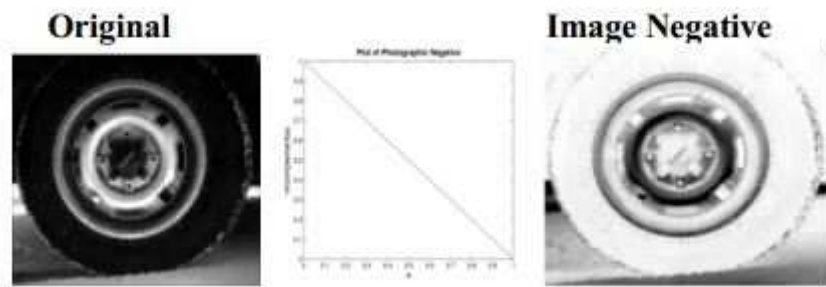


Fig. 1. Original image and its negative image

Image thresholding can be achieved as in a normalized gray scale as pixel values of threshold image are either 0's or 1's, $g(x, y)$ which is also called binary image. These images are used in image segmentation to isolate an image of interest from back ground. Moon image can be isolated from black ground in binary image as shown in Fig 2.

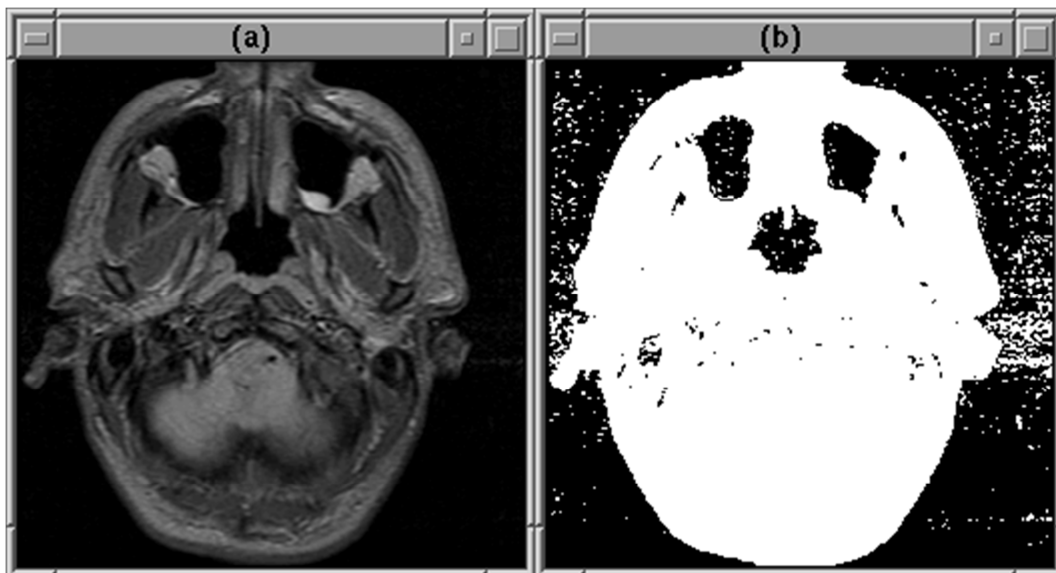


Fig 2. Original Image and its threshold Image

Log transformation is the one which maps a narrow range of low gray levels into a wider range of gray levels i.e. expand values of bright pixels and compress values of dark pixels. If C is the scaling factor, then log transformation can be achieved as $s = C \log(1 + |r|)$. Logarithmic image of a cameraman reveal more detail as shown in Fig.3



Fig. 3 DFT of Cameraman image and its logarithmic plot

Inverse logarithmic transformations map a wide range of gray level values into a narrow range of gray level values i.e. expand values of dark pixels and compresses values of bright pixels. Log and inverse log operations are particularly used when gray level values of an image have extremely large range and small range respectively. Logarithmic Transformations can be used to brighten the intensities of an image (like the Gamma Transformation, where gamma < 1). More often, it is used to increase the detail (or contrast) of lower intensity values. They are especially useful for bringing out detail in Fourier transforms.

In Power Law (Gamma) transformation the relation between pixel values of $f(x, y)$ and $g(x, y)$ in this transformation is given by $s = c r^\gamma$, where c and γ are positive constants. If $\gamma < 1$ power law transformation maps a narrow range of dark pixel values into a wider range and wider ranges of bright pixel values to a narrow range. Family of possible transformations on varying γ with $c=1$ is shown in Fig.4.

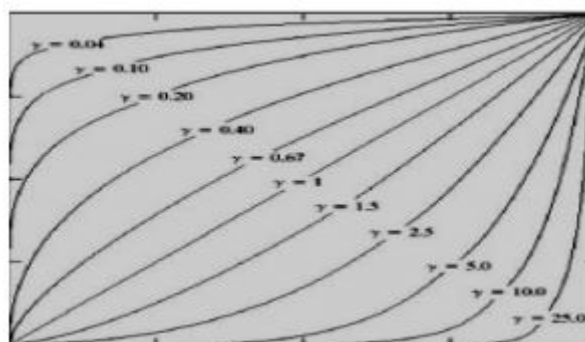


Fig 4. γ^{th} power and γ^{th} root curves for $c=1$.

Based on setting of (r_1, s_1) and (r_2, s_2) , different types linear transformations can be achieved.

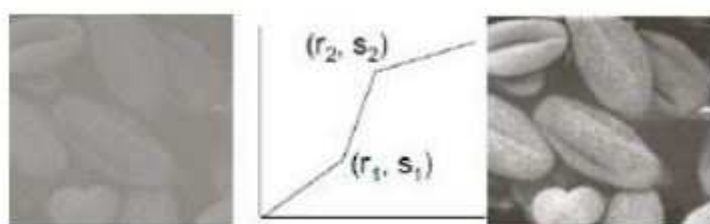


Fig. 5 Original image and its stretched image

There are three types of Piecewise linear transformations:

1. Contrast Stretching
2. Intensity level slicing
3. Bit plane slicing

Contrast Stretching is one of image enhancement techniques involves processing an image to make it look better to human viewers. It is usually used for post processing by modifying contrast or dynamic range or both in an image. The aim of contrast enhancement process is to adjust the local contrast in different regions of the image so that the details in dark or bright regions are brought out and revealed to the human viewers. Contrast enhancement is usually applied to input images to obtain a superior visual representation of the image by transforming original pixel values using a transform function of the form as $g(x, y) = T[r(x, y)]$ where $g(x, y)$ and $r(x, y)$ are the output and the input pixel values at image position. This process improves the contrast by stretching the range of gray level values to span a desired range of gray level values. This transformation is also called as image intensity transformation or normalization. Let a, b be the minimum and maximum pixel values of $f(x, y)$ and c, d be the minimum and maximum pixel values of $g(x, y)$. Normalization can be achieved by scaling each pixel in original image value as $s = (r - c) / (d - c) * (b - a) + a$. The existing techniques of contrast enhancement techniques can be again sub divided into two groups: direct and indirect methods. Direct methods define a contrast measure and try to improve it. Indirect methods on the other hand, improve the contrast through exploiting the underutilized regions or the dynamic range without defining a specific contrast term.

Contrast Enhancement can be divided into 2 main categories: Histogram Equalization (HE) and Tone Mapping. Histogram Equalization is commonly used method which attempts to alter the spatial histogram of an image to closely match a uniform distribution. The main objective of this method is to achieve a uniform distributed histogram by using the cumulative density function of the input image.[4] Histogram Equalization HE suffers from retaining local detail due to its global treatment of the image small-scale details that are often associated with the small bins of the histogram are eliminated. Also it is not suitable in some applications such as consumer electronic products, where brightness preservation is necessary to avoid artifacts. The equalization result is usually an undesired loss of visual data of quality and of intensity scale.

In this method, the shape of the histogram is specified manually and then a transformation function is constructed based in this histogram input image at gray levels. Image histogram is partitioned based on local minima and specific gray level ranges that are assigned to each partition. After partitioning, HE is applied on each partition. Tone Mapping is another approach of contrast enhancement techniques. In this method if we want to output high dynamic range (HDR) image on paper or on a display. This technique is used in image processing and computer graphics to map a set of colors to another, often approximate the appearance of high dynamic range images in media with a more limited dynamic range. Tone mapping is done in the luminance channel only and in logarithmic scale. It is used to convert floating point radiance map into 8-bit representation for rendering applications.

The two main aims of tone mapping algorithm: Preserving image details and providing enough absolute brightness information in low dynamic range tone mapped image. Intensity Level or Gray level Slicing is another technique of Piecewise linear transformation in which gray or Intensity level slicing high lights certain range of gray levels in the original image. These transformations permit segmentation of certain gray level regions from the rest of the image.[5] This technique is useful when different features of an image are contained in different gray levels. Bit plane Slicing is another form of Piecewise transformation is used for total image appearance by specific bits which used for pixel gray levels and determines the adequacy of number of bits used to quantize each pixel in image compression. Spatial Filter Operations are performed on a pixel and its immediate neighbors; this is also called as neighborhood operations.

Spatial filters are classified into two categories: Linear and Nonlinear spatial filters. Linear spatial filter process involves convolving a mask with an image i.e. passing a weighted mask over the entire image. Mask is also referred as window, template, or kernel [6]. Nonlinear spatial filter are those filters in which enhanced image is not linearly related to pixels in the neighborhood of original image.

4 FREQUENCY DOMAIN TECHNIQUES

Frequency domain techniques are based on the manipulation of the orthogonal transform of the image rather than the image itself. Frequency domain techniques are suited for processing the image according to the frequency content. The principle behind the frequency domain methods of image enhancement consists of computing a 2-D discrete unitary transform of the image, for instance the 2-D DFT, manipulating the transform coefficients by an operator M , and then performing the inverse transform.

Table 1. A Brief Survey of Histogram Enhancement Techniques

Author	Year	Operating Domain	Model	Processing techniques	Application
Agaian SS[7]	2007	Spatial domain	HE based Logarithmic transform LTHS	Log reduction zonal magnitude technique; Logarithmic transform histogram shifting	Traffic monitoring; Security Surveillance
Hao Hu[8]	2010	Spatial domain	Content adaptive video processing model	Content classification and adaptive processing	Computer vision
Tarik Arici[9]	2009	Spatial domain	HE based modification	Histogram modification framework, content adaptive algorithm	LCD display device; Low quality video
Sangkeun Lee[10]	2007	Spatial domain	Dynamic range compression	Discrete Cosine transform(DCT); Retinex theory	Image/video compressing
Viet Anhnguyen[11]	2009	Spatial domain Transform domain	Cauchy distribution model; AC transform coefficient	Video reconstructed from multiple compressed copies of video content	Compression video
R.C. Gonzalez[12]	2008	Spatial domain	HE	Global Histogram Equalization	Image/ Video Security Surveillance
Xuan Dong[13]	2010	Spatial domain	Image Inverting Model	Inverting the input low lighting video; dehaze algorithm	Traffic monitoring; Medical imaging
Shan Du[14]	2010	Spatial domain	ARHE model	Adaptive Region based Method	Face Recognition
A.A Wadud M[15]	2007	Spatial domain	Dynamic Histogram equalization	Dynamic Histogram Equalization technique	Medical Image, Low quality video
Boudraa A.O[16]	2008	Spatial domain	2DTKEO model	2D Teager- Kaiser Energy Operator	Medical image; Satellite image
David Menotti[17]	2007	Spatial domain	MHE model	Multi histogram equalization methods	Image processing
Sara Hashem[18]	2010	Spatial domain	Improve HE	Genetic algorithms	Compute high dynamic range image processing
George D[19]	2009	Spatial domain	Improve HS and HE	Histogram based image enhancement	Image processing

The orthogonal transform of the image has two components magnitude and phase. The magnitude consists of the frequency content of the image. The phase is used to restore the image back to the spatial domain. The usual orthogonal transforms are discrete cosine transform, discrete Fourier transform, Hartley Transform etc. The transform domain enables operation on the frequency content of the image, and therefore high frequency content such as edges and other subtle information can easily be enhanced. Frequency domain which operate on the Fourier transform of an image.

- Edges and sharp transitions (e.g. Noise) in an image contribute significantly to high frequency content of Fourier transform.
- Low frequency contents in the Fourier transform are responsible to the general appearance of the image over smooth areas.

The concept of filtering is easier to visualize in the frequency domain. Therefore, enhancement of image $f(x, y)$ can be done in the frequency domain based on DFT. This is particularly useful in convolution if the spatial extent of the point spread sequence $h(x, y)$ is large then convolution theory.

$$g(x, y) = h(x, y) * f(x, y) \quad \text{Where } g(x, y) \text{ is enhanced image.}$$

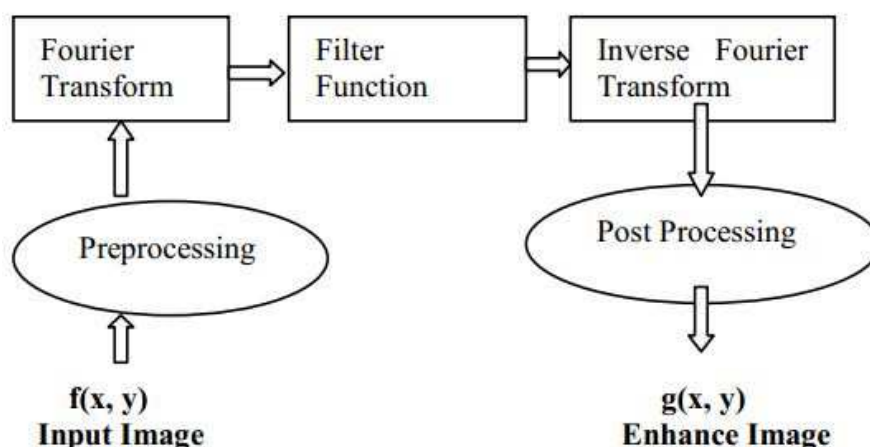


Fig. 6. The basic steps of image enhancement.

5 APPLICATIONS

Image enhancement is used for enhancing a quality of images. The applications of image enhancement are Aerial imaging, CCTV Footage, Satellite imaging, Medical imaging, Digital camera application, remote sensing and many more. The better result for Image enhancement has also used in real time enhancement of neuro evolution of augmenting. IE techniques when applied to pictures and videos help the visually impaired in reading small print, using computers and television, and face recognition. Color contrast enhancement, sharpening and brightening are just some of the techniques used to make the images vivid. In the field of education, enhancement algorithms are used to clarify the contents of scanned documents. Medical imaging uses this for reducing noise and sharpening details to improve the visual perception of the image. This makes algorithms, a necessary aiding tool for reviewing anatomic areas in MRI, ultrasound and x-rays to name a few. In forensics enhancement algorithms are used for identification and evidence gathering. Images obtained from fingerprint detection, security videos analysis and crime scene investigations are enhanced to help in identification of culprits and protection of victims.

6 CONCLUSION

Image enhancement algorithms offer a wide variety of approaches for modifying images to achieve visually acceptable images. The choice of such techniques is a function of the specific task, image content, observer characteristics, and viewing conditions. The review of Image enhancement techniques in Spatial domain have been successfully accomplished and is one of the most important and difficult component of digital image processing and the results for each method are also discussed. Based on the type of image and type of noise with which it is corrupted, a slight change in individual method or combination of any methods further improves visual quality. In this survey, we focus on survey the existing techniques of image enhancement, which can be classified into two broad categories as spatial domain enhancement and Frequency domain based enhancement. We show the existing technique of image enhancement and discuss the advantages and disadvantages of these algorithms. Although we did not discuss the computational cost of enhancement algorithms it may play a critical role in choosing an algorithm for real-time applications.

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Impact de l'état dépressif sur la performance sportive chez les jeunes adolescents scolarisés

[Impact of depression on athletic performance in young adolescents attending school]

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ABSTRACT: This work aims to study the impact of depression on athletic performance in a sample of 180 young adolescents attending school. To reach this objective, we used the MINI test (Mini International Neuropsychiatric Interview) for the assessment of depression. Moreover, we chose gymnastics as sport discipline to assess the performance. The results showed relatively high depressive statuses with 29% having a mild depressive episode, 14% with an average depressive episode and 8% with severe depressive episode. The studied adolescents displayed a low athletic performance. Furthermore, girls showed lower performance and higher depression than boys. In terms of age, the adolescents who are between 13 and 14 years old displayed higher performance and lower depression compared to older ones. The correlation analysis showed that depression has a negative effect on performance.

In conclusion, it should be noted that the sports performance depends on the depression status that a better management of mental health of adolescents could improve significantly their sports performance.

KEYWORDS: depression status, adolescents, athletic performance, MINI test.

RESUME: L'objectif de notre travail est d'étudier l'impact de l'état dépressif sur la performance sportive auprès d'un échantillon de 180 jeunes adolescent(e)s scolarisés. Pour atteindre cet objectif, nous avons utilisé le test MINI pour l'évaluation de l'état dépressif. Par ailleurs, nous avons choisi la gymnastique au sol comme discipline sportive pour évaluer la performance. Les résultats ont montré des états dépressifs assez élevés avec 29% présentant un épisode dépressif léger, 14% présentant un épisode dépressif moyen et 8% présentant un épisode dépressif sévère d'après le test MINI (Mini International Neuropsychiatric Interview) et une faible performance sportive. Les filles sont moins performantes et plus dépressives que les garçons. En terme d'âge, les adolescents âgés entre 13 et 14 ans s'avèrent plus performants et moins dépressifs par rapport aux adolescents plus âgés. Les analyses corrélationnelles ont montré que la manifestation d'un tel état dépressif agit négativement sur la performance sportive. En conclusion, il se dégage à partir de ce travail que la performance sportive dépend de leur état dépressif, ce qui implique qu'une prise en charge consciente de la santé mentale des adolescents pourrait améliorer considérablement leur performance sportive.

MOTS-CLEFS: état dépressif, adolescents, performance sportive, test MINI.

1 INTRODUCTION

Les sportifs doivent posséder des qualités physiques et techniques mais doivent aussi être très forts mentalement (Vallerand et Losier., 1999).

Les symptômes dépressifs augmentent de façon remarquable de l'enfance à l'adolescence, tant chez les garçons que chez les filles. Petersen et al.,(1993) soulignent que c'est entre 13 et 15 ans que l'on remarque une hausse dans le taux de dépression et que le sommet se situe vers 17 et 18 ans. Plusieurs études ont également identifié une différence de genre dans les taux de la dépression. Cette différence au niveau des filles, veut que celles-ci soient plus déprimées que les garçons et ce, dans un ratio de deux pour un (Nolen-Hoeksema et Girgus., 1994).

Dans cette optique, nous avons essayé par la présente étude d'évaluer l'impact de l'état dépressif sur la performance sportive chez un groupe d'adolescents marocain scolarisés.

2 SUJETS ET MÉTHODES

2.1 LIEU ET DURÉE DE L'ÉTUDE

L'étude a été effectuée au lycée collégial de DAR ELGUEDDARI, se situant dans la province de Sidi Kacem de la région Gharb-Chrarda-Beni Hssen au centre du MAROC. Avec une population de 15853 habitants, Dar Elgueddari est une région dont les activités sont majoritairement agricoles et dont les infrastructures destinées à la pratique sportive sont pauvres.

L'enquête a duré 3 mois s'étalant du 25 février au 25 mai 2013.

2.2 SUJETS DE L'ÉTUDE

La présente étude a été effectuée sur un échantillon de 180 élèves, choisis au hasard et présentant tous une bonne aptitude physique qui leur permet la pratique sportive. L'échantillon est réparti de la façon suivante :

Tableau 1 : Répartition des adolescents selon l'âge et le sexe

	13-14 ans	14-15 ans	15-16 ans	Total
Garçons	30	30	30	90
Filles	30	30	30	90
Total	60	60	60	180

2.3 MÉTHODES

Etat dépressif : l'état dépressif a été évalué par le test MINI (Mini International Neuropsychiatric Interview), il est composé de 10 items dont les réponses sont soit oui ou non. Une étude de validation du (MINI) en langue arabe dialectale marocaine a été réalisée auprès de 5498 personnes marocaines des deux sexes, âgées de 15 ans et plus, l'étude a démontré de bonnes propriétés psychométriques (Ministère de la santé au maroc., 2007). La cotation a été faite selon la CIM10, on parle d'un épisode dépressif léger quand il y a présence de deux ou trois des symptômes cités dans le test, d'un épisode dépressif moyen quand il y a au moins quatre des symptômes cités et d'un épisode dépressif sévère quand il y a plusieurs symptômes dépressifs mentionnés dans le test, concernant typiquement une perte de l'estime de soi et des idées de dévalorisation ou de culpabilité, sont marqués et pénibles. Les idées et les gestes suicidaires sont fréquents, et plusieurs symptômes « somatiques » sont habituellement présents.

Performance sportive : nous avons choisi une discipline sportive individuelle qui est la gymnastique au sol pour évaluer la performance. Pour ce faire, les sujets ont subi 9 séances d'apprentissage durant lesquelles l'élève apprend techniquement comment réaliser les éléments gymniques avec les aides et les parades. Ayant tous les mêmes chances de réalisation de cet exercice, les élèves devraient effectuer individuellement un enchaînement gymnique en public. L'évaluation a été basée sur trois critères : la difficulté (nombre et catégories des éléments gymniques exécutés) notée sur 5 points, l'exécution (qualité de l'enchaînement gymnique) notée sur 5 points et l'impression générale (tenue, respect du temps, attitude...) notée sur 5 points.

3 RESULTATS

3.1 ÉTAT DÉPRESSIF

La répartition des cas selon leur état dépressif est représentée dans la figure 1. Les adolescents n'ont présenté aucun symptôme de dépression dans 49% des cas. L'épisode dépressif léger vient en deuxième position avec 52 cas, soit 29%, suivi de l'épisode dépressif moyen avec 26 cas, soit 14% et de l'épisode dépressif sévère avec 14 cas (8%).

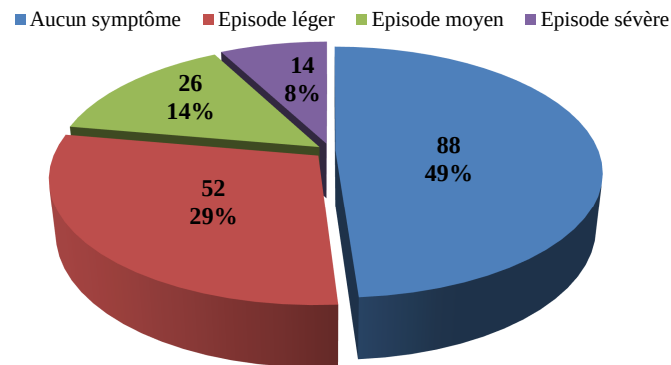


Figure 1 : Répartition selon le niveau de sévérité de l'état dépressif

Selon le sexe

Chez les garçons, 60% ne présentent aucun symptôme dépressif, 27% présentent un épisode dépressif léger et 11% un épisode dépressif moyen.

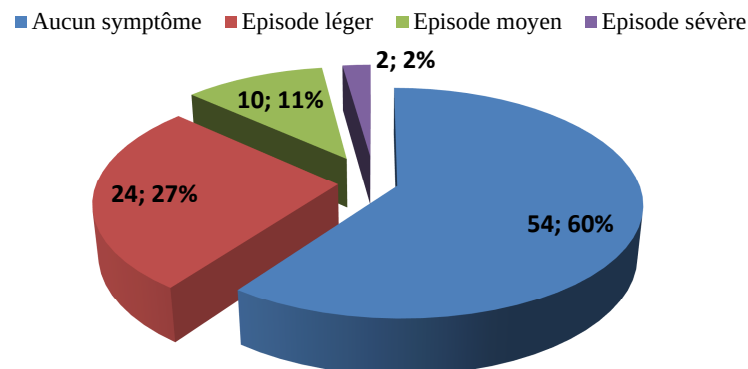


Figure2: Répartition selon le niveau de sévérité de l'état dépressif chez les garçons

Chez les filles, 38% ne présentent aucun symptôme dépressif, 31% présentent un épisode dépressif léger, 18% un épisode dépressif moyen et 13% présentent un épisode dépressif sévère.

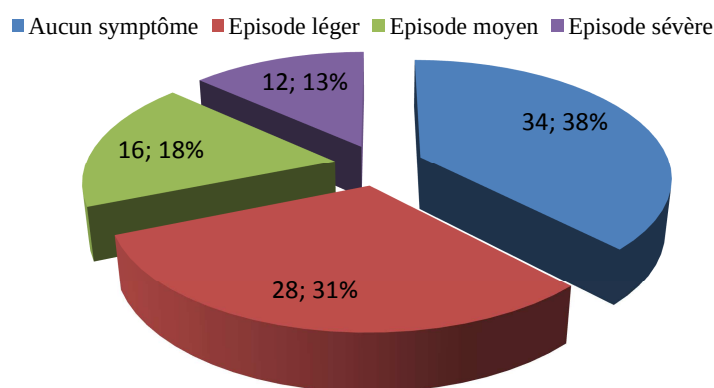


Figure 3 : Répartition selon le niveau de sévérité de l'état dépressif chez les filles

Afin de comparer la répartition selon la sévérité de l'état dépressif entre les garçons et les filles, nous avons utilisé le test Chi-deux de Pearson qui a révélé une différence très significative ($\chi^2 = 13,38$; $p < 0,01$). Ceci implique que la manifestation de la dépression diffère selon le sexe.

Selon l'âge

La répartition des cas selon leur état dépressif et selon l'âge est représentée dans la figure 4. Ce sont les adolescent(e)s âgés de moins de 14 ans qui représentent la majorité des cas ne manifestant aucun symptôme (42%). Les adolescent(e)s dont l'âge est compris entre 14 et 15 ans sont prépondérants parmi les cas manifestant un épisode dépressif moyen (53,85%). D'autre part, les adolescent(e)s âgés de plus de 15 ans présentent l'effectif le plus élevé parmi les cas qui manifestent un épisode dépressif sévère avec 92,86%.

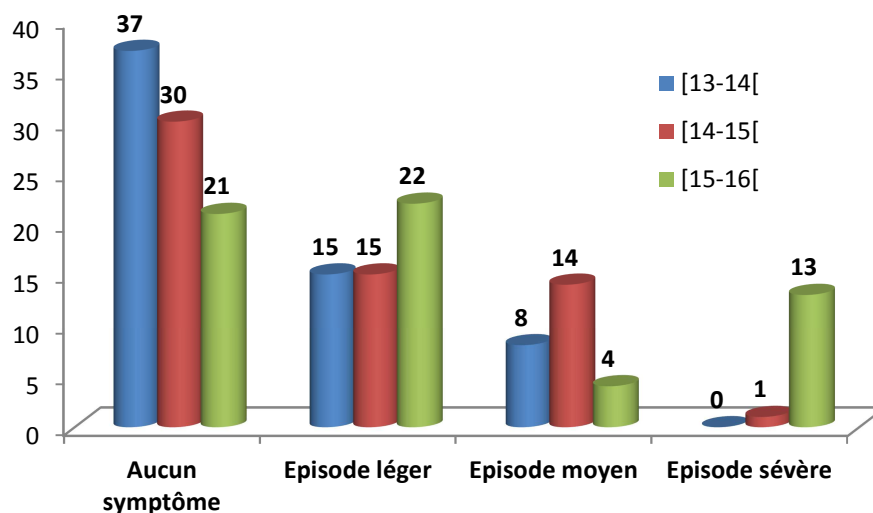


Figure 4 : Répartition selon le niveau de sévérité et l'âge.

Pour comparer la répartition selon la sévérité de l'état dépressif entre les différentes tranches d'âge, nous avons utilisé le test Chi-deux de Pearson qui a révélé une différence hautement significative ($\chi^2 = 34,54$; $p < 0,001$). Ce qui implique que la manifestation de la dépression diffère selon l'âge.

3.2 PERFORMANCE SPORTIVE

L'étude de la performance sportive dans l'échantillon a montré un score moyen de 6.60 ± 1.77 . La répartition des moyennes des scores de la performance sportive selon le sexe (Figure 5) montre que ceux-ci sont plus élevés chez le sexe masculin avec une moyenne de 7.10 ± 1.71 , par rapport au sexe féminin dont la moyenne est de 6.10 ± 1.70 .

Répartition selon le sexe

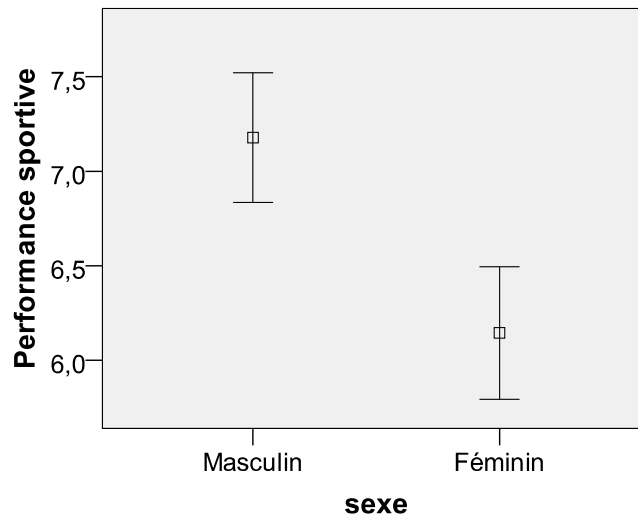


Figure 5 : Répartition des moyennes de la performance sportive selon le sexe.

L'analyse de variance de la performance sportive a montré que la différence est hautement significative entre les garçons et des filles ($F=15.39$, $p<0.001$). ce résultats montre bien que les adolescents sont plus performants que les adolescentes.

Répartition selon l'âge

Les scores de la performance sportive les plus élevés ont été enregistrés chez la classe d'âge [13-14[avec une moyenne de 7.32 ± 1.90 , suivis de ceux de la classe [14-15[avec 6.43 ± 1.78 et de la classe [15-16[avec 6.05 ± 1.37 . L'analyse de variance a montré une différence hautement significative ($F=8.70$; $p<0,001$).

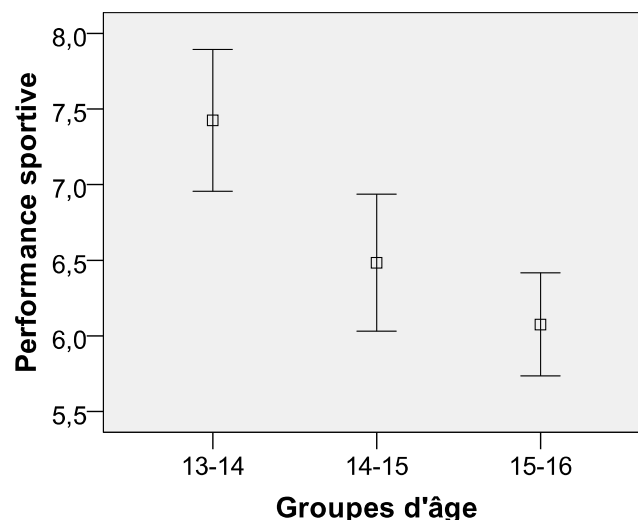


Figure 6 : Répartition des moyennes de la performance sportive selon l'âge

3.3 INFLUENCE DE L'ÉTAT DÉPRESSIF SUR LA PERFORMANCE SPORTIVE

Nous avons effectué une analyse corrélationnelle entre l'état dépressif et la performance sportive qui a révélé une association négative significative ($r = -0.153$; $p < 0.05$). Ceci implique que l'état dépressif influence négativement la performance sportive.

4 DISCUSSION

Nos sujets sont issus de milieux populaires défavorables dont les infrastructures où les adolescents peuvent pratiquer des activités sportives, artistiques ou culturelles sont quasiment absentes. Ceci pourrait expliquer la performance faible au niveau de l'échantillon étudié.

Les résultats obtenus pour les états dépressifs dans la présente étude sont plus élevés comparés à ceux obtenus à partir d'une enquête nationale, qui estime que la dépression nerveuse toucherait entre 13 à 17% de la population marocaine (ministère de la santé., 2007).

Deux périodes caractérisent le vécu psychologique de l'adolescence, la première étant une phase de détresse, communément appelée crise, et la seconde une phase de séparation-individuation (Marcelli D et Braconnier A., 1999), ces stades, bien que différents, ne sont pas nécessairement indépendants l'un de l'autre et peuvent faire émerger des bouleversements d'ordre affectif.

Notre étude montre que l'état dépressif diffère selon le sexe. En effet, selon Galambos et al., (2004), Entre l'âge de 13 et 15 ans, les filles présentent deux à trois fois plus de risque que les garçons de présenter des symptômes dépressifs et un épisode de dépression clinique.

D'autre part et en concordance avec les résultats obtenus au niveau de la présente étude, plusieurs études ont démontré une augmentation des diagnostics cliniques de la dépression (Kessler R et al., 2001; Scourfield et al., 2003) et des symptômes dépressifs (Fauth et al., 2007; Gutman et Eccles., 2007) en allant de l'enfance à l'adolescence.

En outre, de nombreuses études (Cazorla et al., 1984 ; Zerzouri., 2002) ont montré le rôle important des facteurs psychologiques dans la performance sportive. Ceci a largement été démontré par les résultats du présent travail qui indique que la performance est corrélée négativement avec l'état dépressif.

5 CONCLUSION

En conclusion, nous avons pu démontrer que l'état dépressif influence négativement la performance sportive. Par conséquent une prise en charge consciente de la santé mentale des adolescents pourrait améliorer considérablement leur performance sportive.

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Dégradation de la qualité des eaux de la nappe alluviale de l'Oued Larbaa par les déchets de la ville de Taza (Maroc)

[Degradation of water quality in the alluvial aquifer of Wadi Larbaa by waste from the city of Taza (Morocco)]

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ABSTRACT: The groundwater in the alluvial aquifer of Wadi Larbaa currently a water potential for the city of Taza. The study groundwater is located in the watershed upstream of Wadi Inaouen. To highlight a potential negative impact the waters of the Oued Larbaa, mostly polluted liquids and solids from the town of Taza releases, on the waters of the alluvial aquifer, this study has considered making a bacteriological and physicochemical characterization groundwater in the aquifer. The analysis of a number of parameters indicative of water pollution (T ° C, pH, electrical conductivity, total hardness, sulphate, orthophosphate, chloride, dissolved oxygen, nitrogen compounds and bacteria germs) found that however contents of these elements are high and indicate, for the most part, the risk of major pollution of the water table by the waters of the Oued Larbaa. However, the sources and sinks close thereof show very high concentrations of these nutrients. The alluvial aquifer has a high bacteriological contamination with fecal contamination is proven by the presence of high levels of total coliforms, fecal coliforms and fecal streptococci, the use of the web could be a significant health risk to users this water for drinking and bathing.

KEYWORDS: Alluvial groundwater, physical chemistry, bacteriology, health risk, Oued Larbaa.

RESUME: Les eaux souterraines de la nappe alluviale de l'Oued Larbaa constituent actuellement un potentiel hydrique pour la ville de Taza. La nappe étudiée est située dans le bassin versant de l'Oued Inaouen amont. Pour mettre en évidence un potentiel impact négatif des eaux de l'Oued Larbaa, majoritairement polluées par les rejets liquides et solides de la ville de Taza, sur les eaux de cette nappe alluviale, cette étude a envisagé de faire une caractérisation physicochimique et bactériologique des eaux souterraines de cette nappe. L'analyse d'un certain nombre de paramètres indicateurs de la pollution des eaux (T°C, pH, conductivité électrique, dureté totale, sulfates, orthophosphates, chlorures, oxygène dissous, les composés azotés et les germes bactériologiques) a révélé que les teneurs en ces éléments restent toutefois élevé et indiquent, pour la plupart, un risque de pollution majeure des eaux de la nappe alluviale par les eaux de l'Oued Larbaa. Cependant, les puits et les sources situés à proximité de celui-ci montrent des concentrations très élevées en ces éléments. La nappe alluviale présente une forte pollution bactériologique, avec une contamination fécale est avérée par la présence d'un degré élevé en coliformes totaux, coliformes fécaux et en streptocoques fécaux, l'utilisation de la nappe pourrait constituer un risque sanitaire important pour les utilisateurs de cette eau comme eau de boisson et de baignade.

MOTS-CLEFS: Nappe alluviale, physico-chimie, bactériologie, risque sanitaire, Oued Larbaa.

1 INTRODUCTION

La pollution aquatique est devenue une préoccupation mondiale, la plupart des pays en développement ne sont pas encore conscients de la gravité de ce problème et continuent à produire des quantités énormes des polluants qui ne cessent d'augmenter. Les gens ont besoin de l'eau consciemment, pour vivre, se laver, pour l'industrie... ; Sa qualité est un facteur influençant l'état de santé et la mortalité à la fois chez l'homme et les animaux [1].

La production des déchets au Maroc ne cesse de s'accroître. Actuellement, plus de 20 millions tonnes de déchets sont produits par jour et cela pourrait poser de graves problèmes à l'avenir [2], [3] qui constitue une menace importante que celle liée au déséquilibre quantitatif provoqué par la surexploitation des ressources hydriques. Comme les autres pays du monde, le Maroc n'échappe pas au fléau de toutes les formes de pollution des ressources en eau, mais l'activité anthropique reste la principale cause de la dégradation de leur qualité. Cette dernière continue de poser un problème sérieux pour la santé et l'environnement. Avec la croissance démographique que connaît la ville de Taza, les changements climatiques, le développement industriel et agricole. Cependant, la qualité des eaux de surface est influencée aussi bien par les rejets des eaux usées domestiques, industriels et agricoles, les déchets d'abattoirs, les lixiviats de la décharge sauvage de la ville qui située juxtaposé à oued Larbaâ, le contrôle et la surveillance de la qualité des eaux souterraines devraient susciter un intérêt particulier et doivent être permanents, afin d'éviter tout risque de contamination par une éventuelle source de pollution

L'origine des éléments chimiques indésirables et des bactéries dans divers types d'eaux souterraines proviennent du milieu de surface par transport lors de l'infiltration des eaux de surface vers les eaux souterraines [4],[5]. Pour Fenche [6], les ancêtres des bactéries autochtones dans les écosystèmes aquatiques souterrains proviendraient des microorganismes anoxigéniques qui auraient évolué. Selon Van Elsaset Heijnen [7], des conditions optimales de survie sont indispensables pour l'introduction des microorganismes bactériens dans le sol, et leurs transferts à la nappe phréatique.

L'objectif de cette étude est d'évaluer la qualité de l'eau souterraine de la ville de Taza en aval des cours d'eau qui reçoivent les eaux usées et des lixiviats sans aucun traitement préalable, et de déterminer, en étudiant différents paramètres physico-chimiques et bactériologiques.

2 MATÉRIEL ET MÉTHODES

2.1 ZONE D'ÉTUDE

La ville de Taza appartient à la région nord orientale du Maroc, elle est installée au niveau de la partie la plus étroite du sillon Sud-rifain à 120Km à l'Est de la ville de Fès et à 220Km à l'Ouest de la ville de Oujda. Elle fait partie du grand bassin de Sebou et exactement dans le bassin versant de Larbaâ d'une population d'environ 154 496 habitants [8], ce bassin est caractérisée par sa situation dans le pré-rif oriental, s'inscrit dans le domaine méditerranéen ; son contexte bioclimatique se caractérise par la dominance du climat semi-aride dans la partie nord et humide dans la partie sud (moyen Atlas) [9]. La répartition des précipitations est liée à l'importance des altitudes du relief. Le couvert végétal se caractérise par la dégradation. La lithologie des terrains du bassin versant de Larbaâ est fondamentalement composée par des formations imperméables (marne) dans la partie Nord et des formations perméables étendues sur la partie Sud. Le régime hydrologique actuel de Larbaâ se caractérise par les étiages de l'été qui se prolonge sur plusieurs mois et les crues de l'hiver. Sur le plan morphologique, la ville de Taza est traversée par un réseau hydrographique important, composé de l'oued Larbaâ affluent de l'oued Inaouen et par les oueds Taza, Larouireg, Defali et Jaouna qui traversent la ville du sud vers le nord, pour rejoindre l'oued Larbaâ. Ce dernier, le plus proche de la décharge publique, constituant un collecteur important de déchets liquides. D'un point de vue hydrogéologique, On distingue deux types de nappes à Taza [8]: Une nappe profonde constituée de calcaires et l'autre phréatique qui donne naissance de plusieurs sources à la ville de Taza.



Fig. 1. Situation des points d'échantillonnage

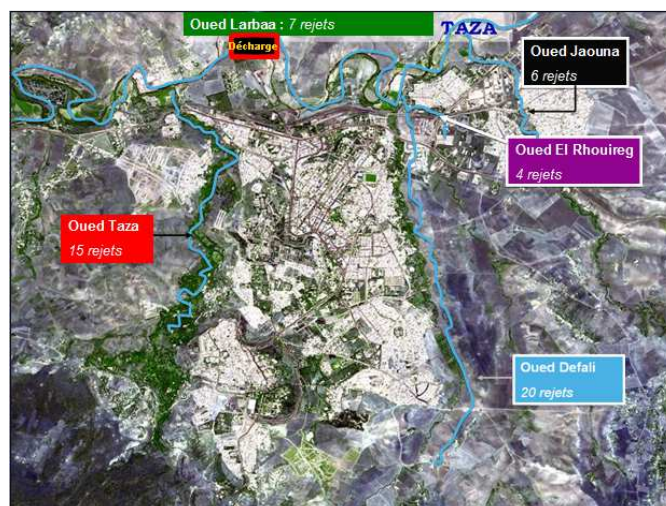


Fig. 2. Le réseau d'assainissement de la ville avec emplacement des rejets (RADEETA, 2012, modifiée)

2.2 LA SITUATION DES MALADIES HYDRIQUES AU NIVEAU DE LA VILLE DE TAZA

Aucun cas de choléra ni de Bilharziose n'a été déclaré entre 2008 et 2012 au niveau de la province de Taza. Néanmoins, et au cours de la même période, 56 cas de typhoïde et 23 cas d'hépatite virale, ont été dépistés [10].

L'évolution épidémiologique des principales maladies hydriques, durant les cinq dernières années au niveau de la ville de Taza est représentée sur la figure 3. Il ressort de cette figure que les cas des principales maladies hydriques (typhoïdes et hépatite virale) au niveau de la ville de Taza ont connu une diminution durant les cinq dernières années avec respectivement une moyenne annuelle de 11 et 5 cas.

3 PROTOCOLE EXPÉRIMENTAL

3.1 ANALYSES PHYSICO-CHIMIQUES

La fréquence d'échantillonnage adoptée durant la période d'étude comprise entre le mois d'Avril et le mois de juin des années 2011, 2012, 2013 et 2014 était d'un prélèvement par mois. Quinze paramètres ont été mesurés. Cinq de ces paramètres [11] l'ont été sur le terrain : la température, la conductivité, le pH à l'aide d'un multi paramètre analyser Type CONSORT – Modèle C535, la turbidité à l'aide d'un turbidimètre Type HACH-Modèle 2100P et l'oxygène dissous par la méthode de titrage de Winkler.

La Figure 1 montre Le choix des points d'échantillonnage qui est représentatif, le prélèvement, le transport et la conservation des échantillons d'eau font référence au protocole et procédures défini par l'Office National de l'Eau Potable (ONEP) [12], [13].

Les méthodes utilisées au sien du Laboratoire des ressources naturel et environnement de la Faculté Polydisciplinaire de Taza : la volumétrie pour les bicarbonates, les chlorures, le calcium et le magnésium ; la spectrophotométrie d'absorption moléculaire pour les sulfates, les nitrates, les nitrites, les ions ammoniums et les Orthophosphates et la spectrophotométrie à flamme pour le sodium et le potassium [13], [14].

3.2 ANALYSE BACTÉRIOLOGIQUE

L'étude des paramètres bactériologiques a porté sur la quantification des paramètres d'origine fécale: coliformes fécaux (CF), coliformes totaux (CT) et streptocoques fécaux (SF). Les prélèvements ont été effectués d'après la procédure de prélèvement et d'analyse de l'ONEP [13] avec une fréquence mensuelle. Le dénombrement des CF, CT et SF a été effectué selon la méthode indirecte de fermentation en tube multiple dans un bouillon lactosé; le nombre a été ensuite déduit statistiquement suivant la méthode du nombre le plus probable [14].

Tableau 1. Méthodes d'analyses des différents paramètres bactériologiques.

Germes	Milieux utilisés	Température et temps d'incubation	Référence
CT (Coliformes)	Bouillon Lauryl sulfate de tryptose ; Bouillon lactosé bilié au vert brillant	37°C + 1 °C/48H	NM 03.7.060 (2012)
CF (Escherichia coli)	Bouillon Lauryl sulfate de tryptose ; EC medium	37°C + 1 °C/48H ; 44°C + 0.5 °C/24H	NM 03.7.060 (2012)
SF (Entérocoques intestinaux)	Bouillon glucosé à l'azoture ; gélose biliée à l'esculine et à l'azoture (BEA)	37°C + 1 °C/48H ; 44°C ± 0.5 °C / 48H	NM 03.7.252 (2012)

4 RÉSULTATS ET DISCUSSIONS

Les résultats de mesures de différents paramètres sont présentés ci-dessous. Leur présentation pour chacun des paramètres permet de mieux montrer les éventuelles variations et peuvent faciliter les interprétations.

4.1 POTENTIEL HYDROGÈNE

Il s'agit évidemment d'un paramètre important de caractérisation des eaux. Selon Chapman et Kimstach [15], le pH est généralement compris entre 6.0 et 8.5 dans les eaux naturelles.

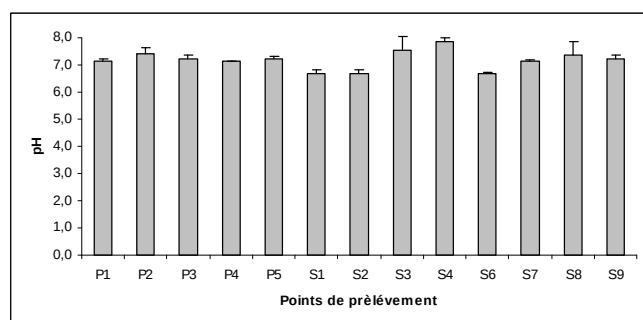


Fig. 3. Evolution spatiale des moyennes et des écarts types du pH

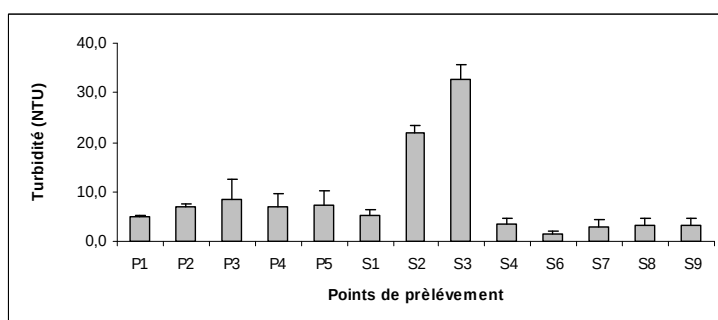


Fig. 4. Evolution spatiale des moyennes et des écarts types de la turbidité (NTU)

La figure 3 montre l'évolution de la teneur du pH en fonction de la variation des puits et des sources, les valeurs de pH au niveau de la totalité des puits avoisinent la neutralisation. En général, le pH se trouve dans la norme de potabilité qui varie entre 6,5 et 8,5 [16].

4.2 TURBIDITÉ

La turbidité est un paramètre organoleptique et une expression des propriétés optiques d'une eau à absorber ou/et à diffuser la lumière, elle est due à la présence des matières en suspension.

La turbidité varie d'une station à une autre mais elle reste dans 92% des points inférieure à la norme 5NTU à l'exception de la station S3 dont on trouve 54 NTU. D'une façon générale, la turbidité varie entre les stations selon la saison et la pluviométrie. Ceci peut agir sur la potabilité et représente un paramètre important dans le traitement de l'eau (Figure 4).

4.3 CONDUCTIVITÉ ÉLECTRIQUE

Les variations de la conductivité impliquent des modifications de la composition chimique de l'eau ainsi que les variations moins importantes expriment une accélération ou un ralentissement des processus bactériens de minéralisation de la matière organique [17], [18], [19].

On remarque d'après la carte (Figure 5) que la valeur de la conductivité dans la totalité des puits et des sources est inférieure à la norme de potabilité (NM 037001) sauf pour la source S3 qui a une valeur dépassant largement la norme. Cette augmentation est due, d'une part, à la présence de ces puits et sources aux alentours de la décharge publique qui contient

des rejets industriels et domestiques et, d'autre part, à leur proximité de l'Oued Larbaa (à moins de 2 m) qui collecte une grande partie d'eaux usées (Figure 1).

Les points de prélèvements présentent une forte minéralisation. Ceci pourrait être du à la nature du terrain traversé (lessivage de la roche réservoir), ou à l'infiltration des eaux d'Oued Larbaa caractérisées par leur conductivité très élevée [20] et/ou bien aux rejets industriels (margines) surtout que cette région est caractérisée par la présence d'huileries [21].

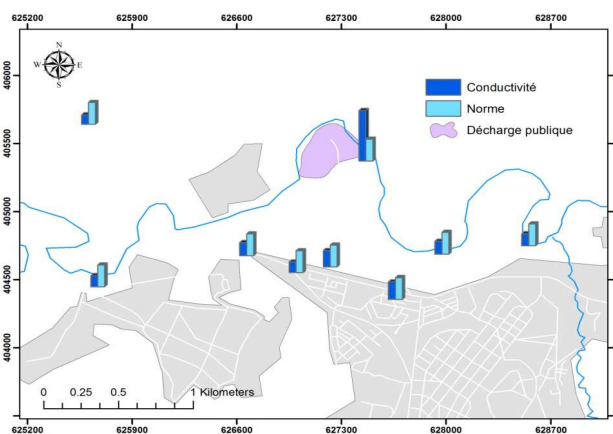


Fig. 5. Les variations de la conductivité électrique au niveau des sites échantillonnés

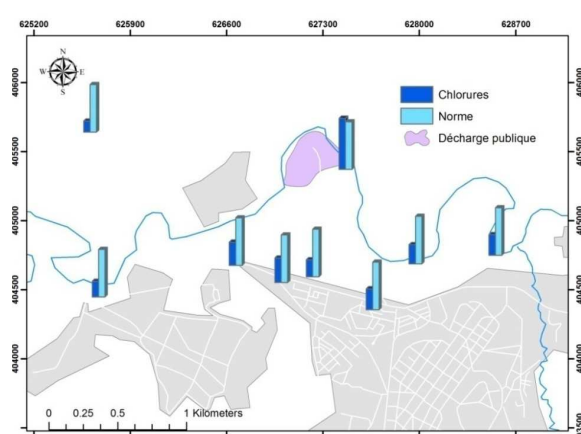


Fig. 6. Les variations de chlorures au niveau de chaque point étudié

4.4 CHLORURES

L'OMS recommande pour la teneur en chlorures dans l'eau destinée à la consommation humaine une valeur guide de 750 mg/L (NM 03.7.001) pour des considérations gustatives et des risques de corrosion.

D'après la figure 6, les chlorures présentent de faibles teneurs en nitrate pour toutes les stations sauf pour la station S3 près de la décharge publique qui enregistre une petite augmentation par rapport aux normes de potabilité (Figure 18).

Cette augmentation est liée à une contamination par les lixiviats qui sont fortement chargés en chlorures. En effet, les déchets renferment des teneurs importantes en chlorures et la dégradation de ces déchets produit des percolats très chargés en cet élément chimique.

Dans les eaux souterraines, la concentration en chlorures dépend des roches traversées, mais au niveau de la S3 le chlorure élevé est due à l'approximation de l'Oued Larbaa qui a une valeur dépassant les 1100 mg/l [20].

4.5 OXYGÈNE DISSOUS

L'oxygène dissous des eaux souterraines de Taza durant la période d'étude est d'une moyenne maximale de 7,12 mg/l et une minimale de 1,25 mg/l.

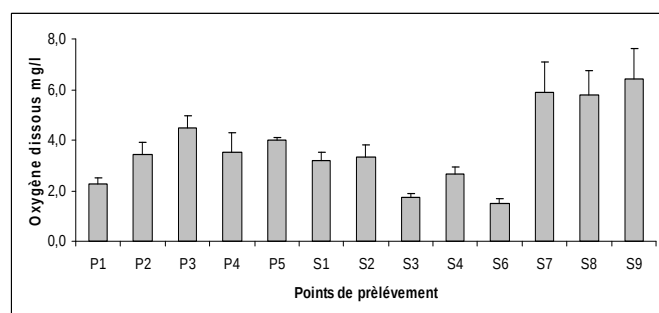


Fig. 7. Evolution spatiale des moyennes et des écarts types de l'oxygène dissous en mg/l

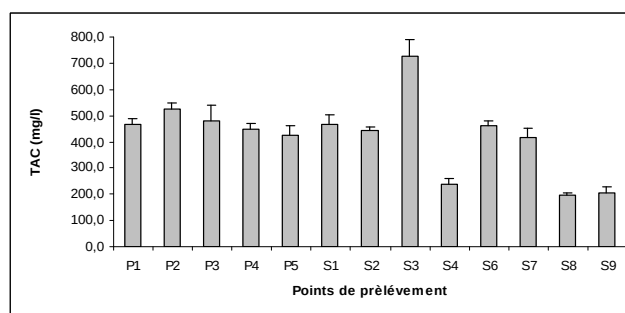


Fig. 8. Evolution spatiale des moyennes et des écarts types des hydrogénocarbonates en mg/l

D'après la figure 7, On remarque que la S7, S8 et la S9 ont des valeurs d'oxygène supérieures des autres points, les eaux de ces sources se montrent alors bien oxygénées. Cette augmentation est due à la diminution de la température de l'eau ; car une eau froide contient une plus grande quantité d'oxygène dissous qu'une eau chaude [22]. Les valeurs comparables sont très faibles dans les points P1, P2, P3, P4, P5, S1, S2, S3 situées auprès de la décharge. S4 et S6 favorisent le développement des germes pathogènes.

La faible valeur en oxygène dissous dans la station S3 près de la décharge publique est expliquée par les lixiviats issus de la décharge sauvage.

D'après le paramètre de l'oxygène dissous on trouve 76% des échantillons analysés ne répondant pas à la NM 037001 [15], ce qui reflète la situation dégradée de la qualité des eaux souterraines de la ville Taza.

4.6 LE TITRE ALCALIMÉTRIQUE COMPLET

D'après la figure 8 on note que généralement les valeurs varient très peu d'une station à l'autre et que la teneur la plus élevée est de l'ordre de 724.70 mg/l (S3), et la minimale est de 195.2 mg/l au niveau de la station S8.

La forte concentration s'explique par la dissolution importante des calcites ; contact direct avec l'atmosphère ; présence de sources naturelles de gaz et par la décomposition de substances organiques.

La concentration en ions de calcium atteint une valeur maximale en S3 de 357.67 mg/l, alors que la teneur minimale a été enregistrée au niveau de station P3 de 103.67 mg/l mais généralement les valeurs des autres stations ne présentent pas une grande variance entre eux.

L'augmentation de cet élément est le résultat direct de la nature lithologique due à la dissociation des roches évaporitiques principalement le gypse et l'anhydride qui se trouve dans cette région. Il ne présente pas de risque pour la santé mais pose plutôt un problème de goût et d'entartrage si $C > 200$ mg/l.

4.7 OXYDABILITÉ AU KMnO_4

Oxydabilité au KMnO_4 est la capacité d'oxygène à la réduction de permanganate de potassium consommée pour oxyder les matières organiques présentes dans l'échantillon.

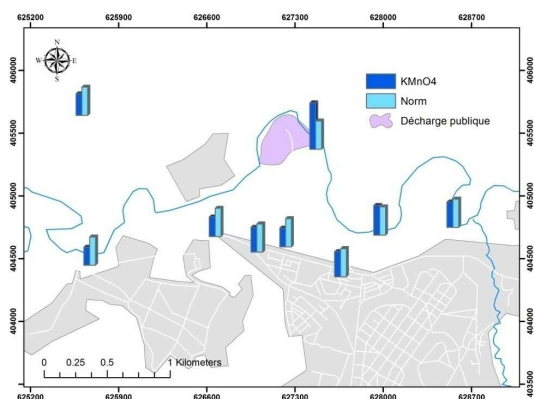


Fig. 9. Les variations de l'oxydabilité au KMnO_4 au niveau des sites échantillonnés

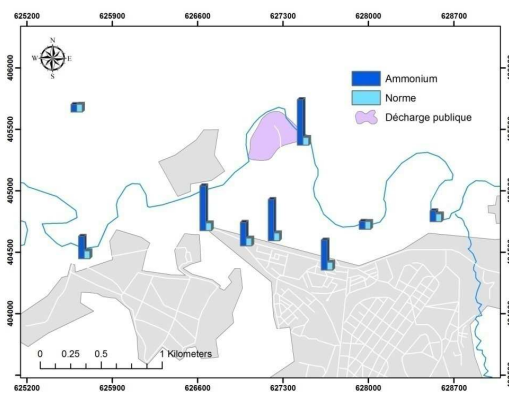


Fig. 10. Les variations des ammoniums au niveau des sites échantillonnés

Les valeurs les plus élevées sont affichées à la station S3 près de la décharge publique (8,34 mg/l) et S2 (5,30g/l), à l'inverse des autres points qui ont une valeur inférieure à la norme marocaine (< 5 mgd'O₂/l). L'augmentation de l'oxydabilité en S3 et S2 (est due à la faible profondeur) qui est en relation avec la surface qui rend ces eaux riche en matière en suspension et par conséquent augmente la matière organique biodégradable et non biodégradable (Figure 9).

4.8 AMMONIUM

L'azote ammoniacal constitue un des maillons du cycle complexe de l'azote dans son état primitif. C'est un gaz soluble dans l'eau. Il existe en faible proportion, inférieure à 0,5 mg/l d'azote ammoniacal dans les eaux naturelles. Il constitue un bon indicateur de pollution des cours d'eau par des rejets organiques d'origine agricole, domestique ou industriel.

D'après la figure 10, l'ammonium présente des teneurs élevées par rapport aux normes de potabilité pour les stations S1, S3, P1, P2, P3, P4 et P5 qui traduisent le processus de dégradation incomplète de la matière organique.

Ces valeurs permettent alors de classer ces eaux dans la classe moyenne (S2 et S4) à mauvaise qualité (S1, S3, P1, P2, P3, P4, P5) selon la grille de l'évaluation de la qualité globale des eaux souterraines.

4.9 NITRITES

Les nitrites sont considérés comme étant des ions intermédiaires entre les nitrates et l'azote ammoniacal, ce qui explique les faibles concentrations rencontrées en milieu aquatique.

La concentration en cet élément ne devrait pas dépasser 0.5 mg/l.

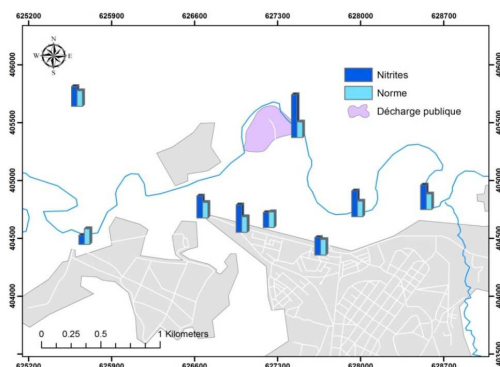


Fig. 11. Les valeurs des nitrites au niveau des sites échantillonnés

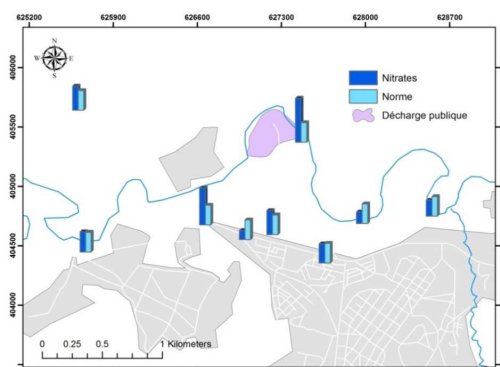


Fig. 12. Les valeurs des nitrates au niveau des sites échantillonnés

La figure 11 indique que les teneurs sont élevées au niveau de S1, S2, S3, S4, P1, P3 et P4. Cette augmentation est expliquée par la percolation des engrais chimiques. Par contre, on trouve seulement deux points (P2 et P5) qui respectent la norme de potabilisation.

Les nitrites peuvent également provoquer la formation de méthémoglobine dans le sang. Sous l'effet de la chaleur, ils sont susceptibles de se décomposer, en libérant des oxydes d'azotes fortement toxiques.

4.10 NITRATES

Les teneurs en nitrates sont très variables avec une moyenne maximale de 112,18 mg/l, et une minimale de 23,29 mg/l (Figure 12).

D'après la figure 13, les nitrates présentent des teneurs faibles pour les stations S1, S2, et P4 et très faibles pour le puits P4, S6. Ce résultat peut être expliqué par le faible usage des fertilisants chimique et pesticide lié aux activités agricoles. La teneur en nitrate enregistrée est élevée par rapport à la norme marocaine de potabilité des eaux aux stations S3, S4, P2, P4 et P5 qui sont situées près de décharge publique. Ceci provient, de la décomposition de la matière organique à partir des fertilisants agricoles azotés et par les lixiviats issus de la décharge renfermant des organiques et minéraux qui s'infiltrèrent par la suite à travers le sol jusqu'à la nappe phréatique.

Ces valeurs permettent de classer ces eaux dans la classe bonne (P3 et P4) à moyenne (P1, S1 et S2) à mauvaise qualité (P2, P5, S3 et S4) selon la grille de l'évaluation de la qualité globale des eaux souterraines.

Une concentration élevée de nitrate dans l'eau de boisson peut provoquer chez les bébés une maladie appelée méthémoglobinémie infantile, encore connue sous le nom de la maladie du « bleu bébé [23]. Celle-ci se caractérise par des maux de tête fréquents, abattement de cœur plus rapide que la normale ; un essoufflement, et éventuellement une hypoxémie et une dépression de système nerveux centrale.

4.11 ORTHOPHOSPHATES

La teneur en phosphates des eaux naturelles est normalement très faible parce qu'ils sont essentiellement le siège d'une importante sédimentation tout en subissant une série de dépôts et de reprises sur leur parcours au sein même du bassin versant.

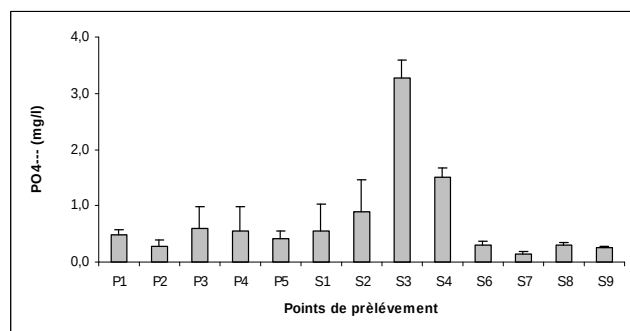


Fig. 13. Evolution spatiale des moyennes et des écarts types des Orthophosphates (en mg/l)

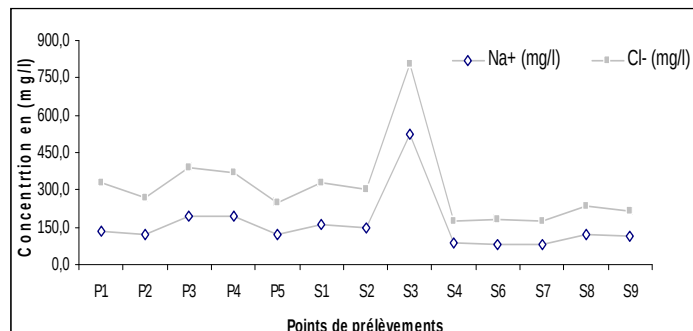


Fig. 14. Evolution spatiale des moyennes de la concentration des sodiums et de chlorures en mg/l

Les valeurs des phosphates sont variables avec une moyenne maximale de 3.96 mg/l et une minimale de 0.15 mg/l.

D'après la figure 13, les valeurs les plus élevées sont affichées à la station S3 près de la décharge publique et S4. Ceci peut s'expliquer par l'impact des percolats issus des déchets solides mis en décharge sur les eaux souterraines (environ de 82% des lixiviats ont une teneur en phosphate inférieure à 5 mg/l), par l'érosion des roches phosphatées dont la pluie tombant sur une roche va lentement dissoudre les éléments qu'elle contient et par l'utilisation des engrais chimiques.

Les Orthophosphates présentent des teneurs faibles pour les stations S2, P3, P4 et S1 P4 et très faibles pour les stations P1, P2, S6 et S8. Trop de phosphates peut provoquer des problèmes de santé, tels que de l'ostéoporose ou des problèmes aux reins. On peut aussi avoir des carences en phosphates qui sont dues à une utilisation intensive de médicaments, provoquant des problèmes de santé.

4.12 SODIUM

Le sodium (Na) est hautement soluble et se trouve souvent dans l'eau souterraine à l'état naturel. Toutes les eaux souterraines contiennent du sodium puisque la plupart des roches et des sols contiennent des composés de sodium à partir desquels cette substance se dissout.

La concentration en sodium plus ou moins constante pour les 5 puits (150 mg/l) qui sont de qualité excellente c'est-à-dire que ces eaux peuvent être utilisées pour la consommation humaine (Figure 14). Par contre le reste des sources sont constantes, seule la source 3 atteint une valeur maximale de 450 mg/l (mauvaise qualité), car elle est près de décharge. L'augmentation du sodium dans l'eau souterraine à des concentrations supérieures à la norme (< 200 mg/l Grille simplifiée pour l'évaluation de la qualité globale des eaux souterraines) peut indiquer la présence d'agents polluants ou une invasion d'eau salée.

Une consommation élevée de sodium peut causer des problèmes chez les personnes qui ont un régime appauvri en sel en raison de problèmes d'hypertension, cardiaques ou rénaux.

4.13 SULFATES

Certains sols et certaines roches contiennent des minéraux de sulfate comme l'eau souterraine se déplace à travers ceux-ci, certains sulfates sont dissous dans l'eau telle que le gypse et l'anhydrite.

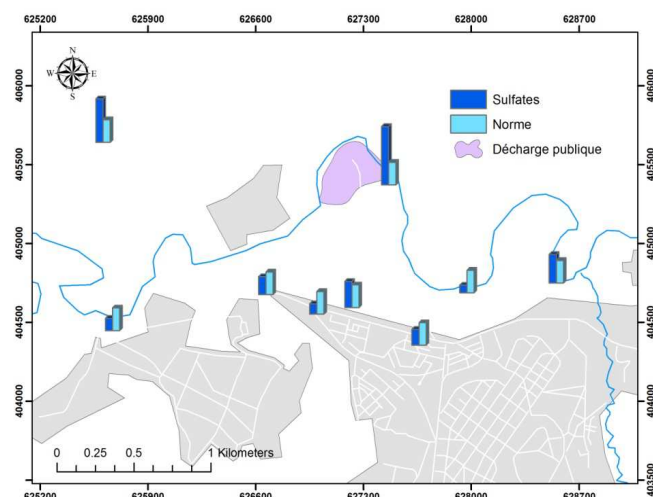


Fig. 15. Evolution spatiale des moyennes et des écarts types des sulfates (en mg/l)

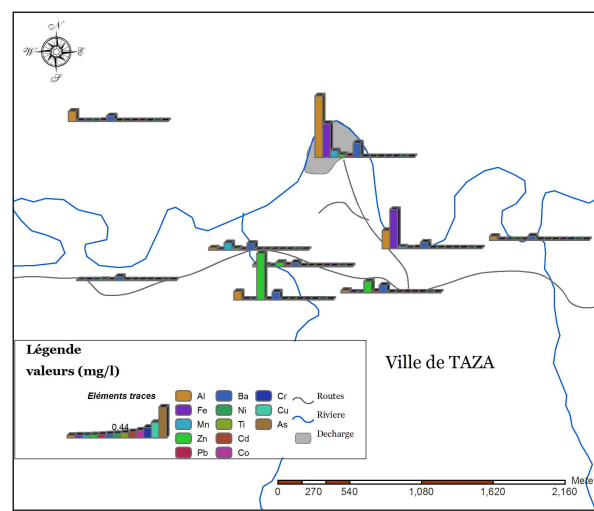


Fig. 16. Carte des métaux lourds en (mg/l).

D'après la figure 15, les valeurs les plus élevées sont affichées aux stations S3 près de la décharge publique, S1, S4 et P2. Ceci est lié à l'abondance des formations évaporitiques principalement le gypse.

L'anion sulfate est l'un des ions moins toxique, un effet laxatif a été observé chez des personnes qui consomment une eau de boisson contenant plus de 400 mg/l de sulfates.

4.14 MÉTAUX LOURDS

Les métaux lourds dosés ont montré une pollution métallique des eaux souterraine par rapport à la norme marocaine de potabilité (NM 03.7.001, 2006) [15] concernant la concentration en plomb (0,02 mg/l dans les puits (P1, P3) et la source S3 ; et la concentration en fer (0,875mg/l) et aluminium (0,558 mg/l) dans les sources S3 et S2 en parallèle (Figure 16). Ceci témoigne de la percolation des eaux usées et des lixiviats à travers les différentes couches en fonction de leur degré de perméabilité.

4.15 COLIFORMES TOTAUX

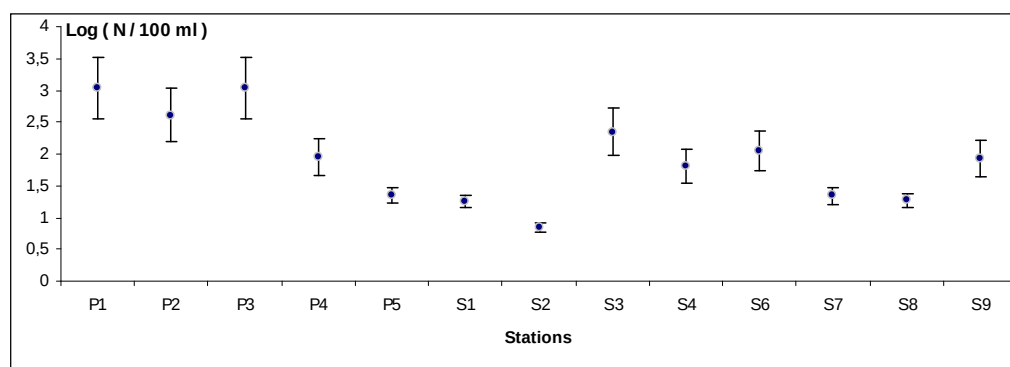


Fig. 17. Evolution spatiale des moyennes et des écarts types des coliformes totaux (N / 100 ml)

La figure 17 montre que les CT représente un maximum de 1100N/100ml au niveau des P1, P3 et S3 avec un minimum de 7 N/100ml au niveau du S2.

Les bactéries coliformes totaux sont présentes dans les matières fécales mais se développent également dans les milieux naturels (sols, végétation, eaux naturelles). L'augmentation de l'effectif bactérien pourrait être le résultat de l'augmentation de la température qui provoque la croissance et la multiplication des CT.

Le dénombrement des CT dans les différents échantillons a montré que de fortes concentrations ont été enregistrées au niveau du P1, P2 et S3 durant la période d'étude. La présence de coliformes totaux dans l'eau potable est un indicateur de risque très imprécis [24], en effet, une eau sans coliformes peut aussi être à l'origine de problèmes de nature gastro-entérique [25], malgré qu'une association entre la détection de coliformes totaux et l'apparition d'épidémies d'origine hydrique a été mise en évidence dans certains cas. [26], [27].

4.16 COLIFORMES FÉCAUX

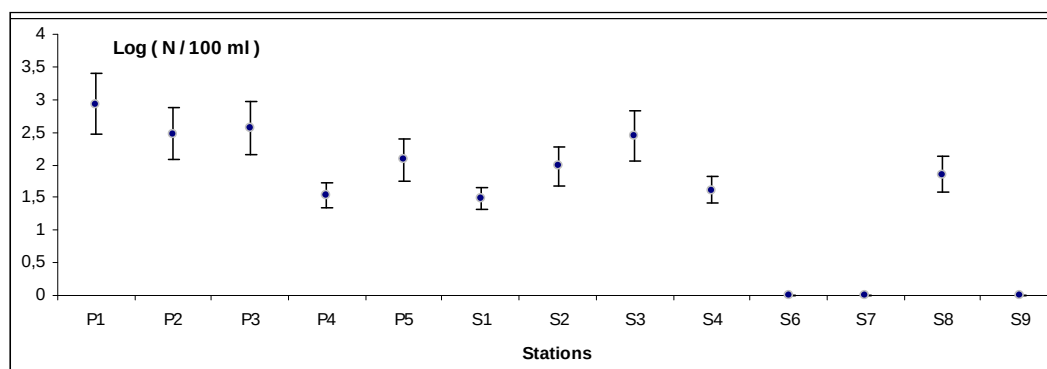


Fig. 18. Evolution spatiale des moyennes et des écarts types des streptocoques fécaux (N / 100 ml)

Les teneurs en coliformes fécaux varient entre 0 au niveau du S6, S7, S9 et 303N/100 ml au niveau du P1 (Figure 18).

L'augmentation des coliformes fécaux pourrait être un résultat de l'abondance des nutriments, de l'oxygène dissous et d'autres éléments nécessaires au développement bactérien.

A l'exception du S6, S7 et S9, tous les autres sites présentent des concentrations quasiment constantes en CF durant toute la période d'étude. La détection de coliformes fécaux doit faire soupçonner une contamination d'origine fécale [28], leur densité est généralement proportionnelle au degré de pollution produite par les matières fécales [29]. Or, la présence de coliformes fécaux peut être une indication de la présence de micro-organismes entéropathogènes [30], ce qui rend que la détection d'un seul coliforme fécal/100 ml entraîne un avis immédiat de faire bouillir l'eau [31].

4.17 STREPTOCOQUES FÉCAUX

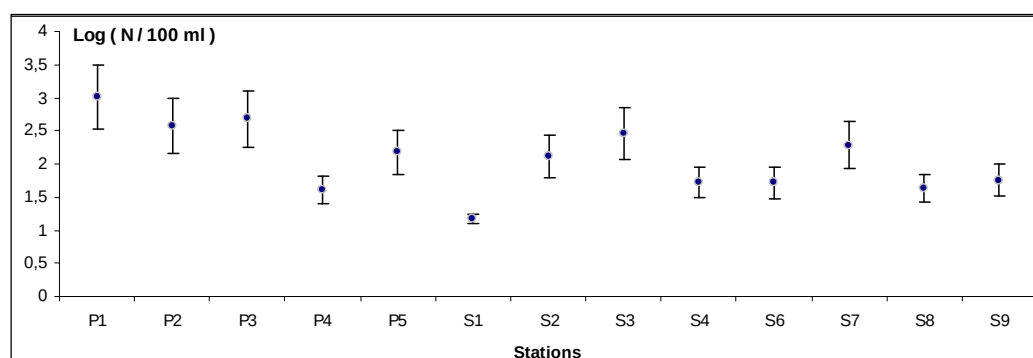


Fig. 19. Evolution spatiale des moyennes et des écarts types des streptocoques fécaux (N / 100 ml)

Le dénombrement des SF dans les différents points échantillonnés durant la période d'étude a montré une augmentation de leur nombre au niveau de la majorité des sites et puisque l'aquifère devrait être exempt d'entérocoques [32], cette détection doit faire sérieusement soupçonner une contamination d'origine fécale et la présence de micro-organismes entéropathogènes [32]. Or, une certaine corrélation entre la présence d'entérocoques et celle de coliformes fécaux dans une eau de consommation non traitée a été mise en évidence avec un risque accru de développer une gastro-entérite avec un nombre relativement restreint de streptocoques fécaux (3 à 10 bactéries/100 ml) [33, 31].

Les résultats obtenus, suite aux différents analyses effectués pour cette étude, nous a permis de réaliser la figure, ci-dessous, en se basant sur les normes de qualité des eaux souterraines SEEE [34].

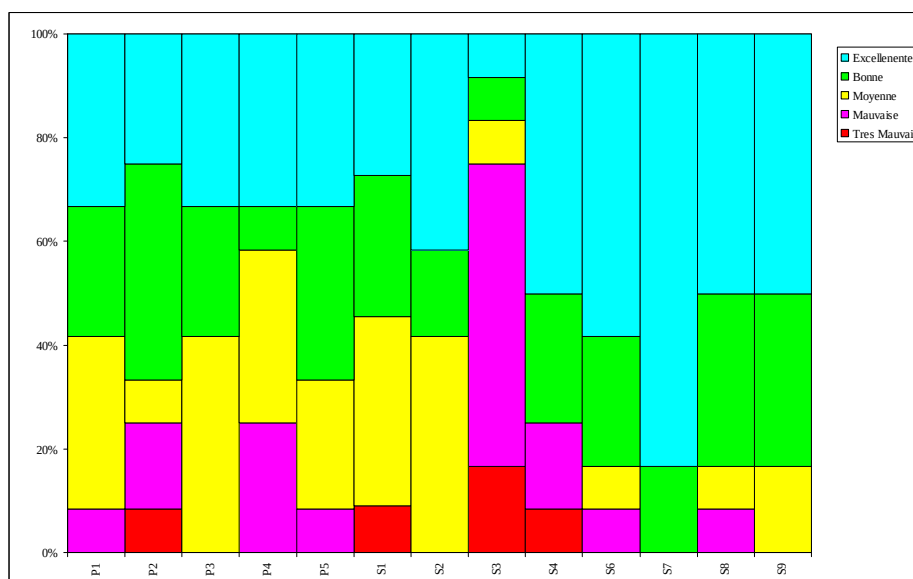


Fig. 20. Qualité détaillée des eaux souterraines de la ville de Taza

4.18 UTILISATION DES EAUX POUR LA BOISSON ET L'IRRIGATION

D'après les résultats microbiologiques et selon la conformité des eaux de sources, il s'est révélé qu'aucune eau de source n'est conforme aux eaux de boisson. La valeur maximale admissible (VMA) est de 0/100ml pour les coliforme fécaux et les streptocoques fécaux (NM, 03.7.001 [15], or toutes les eaux de sources ont excédé cette valeur. Pour les points P3, P4, S3 et S4 dépassent la VMA pour l'irrigation concernant les concentrations des chlorures et des sulfates.

Tableau 2. classe d'utilisation des eaux de sources

Point de prélèvement	Utilisation des eaux souterraines	
	Boisson (NM, 03.7.001, 2006)	Irrigation (SEEE, 2007)
P1	Non conforme	Conforme
P2	Non conforme	Conforme
P3	Non conforme	Non conforme
P4	Non conforme	Non conforme
P5	Non conforme	Conforme
S1	Non conforme	Conforme
S2	Non conforme	Conforme
S3	Non conforme	Non conforme
S4	Non conforme	Non conforme
S6	Non conforme	Conforme
S7	Non conforme	Conforme
S8	Non conforme	Conforme
S9	Non conforme	Conforme

Non conforme

Conforme

5 CONCLUSION

A la lumière des résultats obtenus par l'analyse des paramètres physico-chimiques et bactériologiques des eaux souterraines de la ville de Taza, on constate qu'ils présentent un danger pour la consommation.

D'un point de vue des paramètres physico-chimiques, les points étudiés présentent des concentrations élevées en nitrate (112.18 mg/l), nitrite (1.37 mg/l), orthophosphate (3.96 mg/l), sulfate (1033.23 mg/l), et chlorure (807.10 mg/l) qui dépassent la norme marocaine des eaux.

Cette pollution aurait comme origines le rejet des eaux usées brutes domestiques ou provenant de l'activité agricole du fait de la prédominance de celle-ci dans la région et ou industrielle (margines), en particulier, en provenance des unités de trituration de l'huile d'olive disséminées dans la région.

Parmi les points analysés, la source 3 présente une pollution accentuée et remarquable en enregistrant dans la quasi-totalité des paramètres des valeurs qui dépassent largement les valeurs limites de qualité, ce qui prouve l'impact négatif de la décharge publique de la ville sur les eaux souterraines.

Les analyses bactériologiques des eaux étudiées ont mis en évidence une pollution de ces eaux par les CT, CF et SF avec une prédominance de ces deux derniers groupes (SF et CF). Or ; les coliformes fécaux, l'E. Coli et les entérocoques sont des indicateurs de risque plus valides.

Du fait de la cohabitation des autres germes pathogènes avec les indicateurs de contamination fécale dénombrés, et qu'il est suggéré de ne pas consommer une eau souterraine dans laquelle des entérocoques ont été identifiés, la consommation de ces eaux expose la population qui les utilise à des risques sanitaires graves.

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Offline Handwritten Sanskrit Character Recognition Using Hough Transform and Euclidean Distance

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ABSTRACT: In this paper, we describe the methodology derived for offline handwritten Sanskrit character recognition. This paper will provide a way for researcher to develop a dataset and techniques for offline handwritten Sanskrit character recognition. This paper describes basics of dataset; challenges associated with character system and proposed techniques to recognize Sanskrit Compound Characters.

KEYWORDS: Offline Character Recognition, Hough Transform, Prewitt Edge Detection, Enclosed Region, Normalization, Euclidean Distance Classifier.

1 INTRODUCTION

Recognizing handwritten compound character is the most challenging task in recognition system. Many works has been done in character recognition, but still it needs much more improvements. We have developed a system that will recognize compound characters of Sanskrit language.

Optical character recognition is the process of recognizing optically scanned characters. Character recognition has two types: Offline and Online. One of the challenging problems in pattern recognition is Offline character recognition. Offline character recognition takes scanned image of required document paper. Offline character recognition can be done in two ways: Handwritten and Printed.

Handwritten character recognition is abbreviated as HCR; handwritten characters have number of variations as different people have different writing styles. HCR can recognize offline character and online characters. Offline HCR takes input from scanned image of paper document and Online HCR takes input from digital pen. There are many handwritten historical documents exist in electronic form, HCR is used to recognize such documents.

1.1 SANSKRIT

Sanskrit is an historical language, many works has been written in Sanskrit Language and are need to be recognized. In these documents recognizing compound characters are more challenging. Sanskrit language is written in Devanagari script. Each character in Sanskrit language consists of a Horizontal line at the top of character. This horizontal line is called as Shirorekha. Compound character is a combination of two characters. These compound characters are difficult to recognize due to variation in their shapes. Therefore it is required to develop such system that would recognize these compound characters.

2 LITERATURE REVIEW

In paper [1], they have proposed to recognize handwritten Sanskrit word using a Prewitt's operator for the edge detection. In this they have use Freeman chain code (FCC) as the representation technique of an image character. They have chosen Support vector machine (SVM) for the classification step.

Chain coding used to extract chain code features at the feature extraction stage and use Combined MLP and Minimum Edit Distance Classifier for classification [2].

In paper [3] Median and Wiener filters are used for denoising. They have used Structural segmentation algorithm for segmentation purpose and for feature extraction they have used Zone based approach.

A work on multi-stage character recognition system for an Indian script is reported by [4]. They have used MLPs for classification and have fuzzy features as inputs. The MLP outputs represent the belongingness of an input pattern to different fuzzy character pattern classes.

In paper [5], they have presented a combined DCT-DWT approach for tri-script identification at block level for the handwritten documents. KNN classifier is used in recognition phase that yielded better results for $k=1$.

In Paper [6] various Feature Extraction Method has been described, such as Template matching, Deformable templates, Graph description, Discrete features, Zoning and Fourier descriptor. They found that Real- Valued feature vectors are ideal for statistical Classifier.

3 HCR SYSTEM

Handwritten character recognition system consists of Preprocessing, Segmentation, feature extraction, classification and recognition.

3.1 PREPROCESSING

Preprocessing technique is used to do improvement of image data that enhances some image features required for processing and suppresses unwanted noise and distortion from image data and aims to correct degradation in an image.

- Binarization

Binarization is the process of converting grayscale image in to binary (Black and White) image, so that image data will only contain 0 and 1. Binarization technique is usually used for separating foreground from background using required level of thresholding.

- Noise Removal

Digital image consist of variety of noises. These noises are required to be removed from an image for better processing. Morphological operation, Median filter and Weiner filter is used to remove noise from an image. Median filter reduces blurring of edges. We have used Morphological Opening Operation. Morphological opening operation is Erosion followed by Dilation, using the same structuring element for both the operations. This operation removes small objects from an image while preserving the shape and size of larger objects in the image.

- Thinning and Filling

Smoothing implies both Filling and Thinning. Thinning reduces width of character while Filling eliminates gap, small breaks and holes in digitized character.

- Normalization

To obtain characters of uniform size, rotation and slant Normalization is applied on image. To improve the accuracy of character recognition Normalization reduces shape variation.

- Skew Detection and Correction

During the digitization of document page it is often that image is not align correctly or it may be happen by human while writing document. To make in correctly align Skew detection and correction technique is used.

Skew detection technique can be classified in to groups: Analysis of Projection profile, Hough transform, clustering, connected component and correlation between line techniques.

3.2 SEGMENTATION

Segmentation of an image is the process of subdividing image into number of parts. Segmentation takes the form as Paragraph Segmentation, Line Segmentation, Word Segmentation and Character Segmentation.

Paragraph wise segmentation divides the document into paragraph. Line wise segmentation divides paragraph into line. Line wise segmentation can use a horizontal projection profile based techniques Word wise segmentation divides line into word. Finally, Character wise segmentation divides words into characters. Chain code histogram can be used for each segment. Horizontal projection file method is used for segmentation.

3.3 FEATURE EXTRACTION

Feature extraction technique is aims to extract the essential and important features and characteristic of the given image. In Pattern recognition this is one of the difficult stages to implement. Selection of right feature extraction technique leads to achieving high performance for recognition.

Feature extraction technique is divided into three groups: Distribution of points, Transformation & series expansion and Structural analysis. Structural analysis extracts the feature which represents geometric and topological structure of character. Structural analysis gives feature with high tolerance of noise and style variation. Commonly used features are intersection between lines and loops.

Structural classification is used to detect presence of vertical line, its position in the character and presence of holes in character image [7].

3.4 CLASSIFICATION

After selection of the features, next step is to classify them according to its properties. Training and testing is done at the classification phase. Number of classifier can be used to train the character, such as Neural Network, K-NN, Support Vector Machine and Euclidean Distance Classifier.

- Neural Network:

Neural network is one of the well known classifier used for character recognition system. Neural network are advantageous of their adaptive nature. Feed forward NN and Back propagation NN is used for character recognition mostly.

- SVM:

Support vector machine construct the hyper-planes in high or infinite dimensional space. SVM is based upon statistical learning theory. The SVM was defined for the two class problem and it looked optimal hyper-plane, which maximized the distance, margin, between the nearest examples of both classes.

4 PROPOSED SYSTEM

Proposed system is shown in figure-1. It takes input image from user then preprocessing operations is performed on that image such as Binarization, Morphological opening, Character thicken and pass it to Structural classification. Structural classification stage will detect presence and position of vertical line and enclosed region within character image. Character is then normalized and Euclidean distance classifier applied on character image. At final stage, proposed system will give result for character recognition.

4.1 DATASET DEVELOPMENT

Researcher has to develop own character dataset collected from minimum 10-15 people, because there is no standard dataset available for handwritten characters. Different person has different writing styles; it includes variations in dataset which will be useful while training and testing phase for character recognition.

Offline Handwritten character recognition takes scanned image of required document paper. For this purpose we have taken a blank paper. Small blocks created on that blank paper. We have also added Name, Age and Sub-code field to the document. Although these fields are optional, but it is good to keep information about user which will help us to recognize handwritten styles with different age groups. After this block creation document paper is ready to take data from user. We have taken dataset from 26 people. For the reorganization process this image is converted to grayscale and then Binarization is applied on grayscale image. So that image can contain information only in 0 or 1.

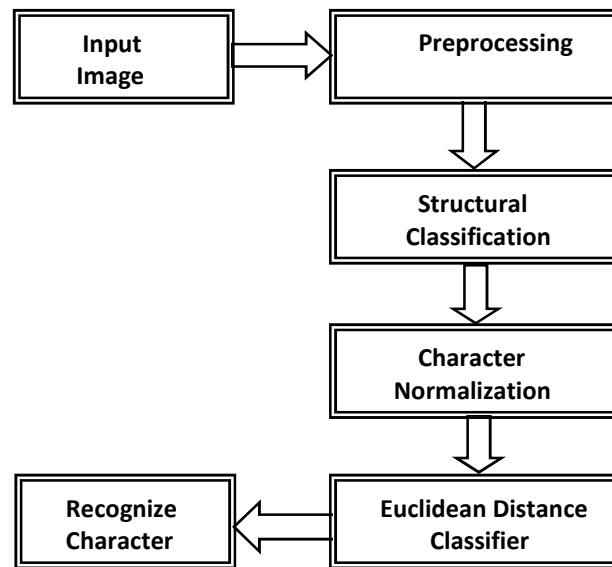


Fig. 1. Proposed System

Sub-Code: 003A			Name: Manasi Dhawane			Age: 20		
क्य	क्य	क्य	च्य	च्य	च्य			
क्त	क्त	क्त	त्थ	त्थ	त्थ			
प्त	प्त	प्त	ज्व	ज्व	ज्व			
व्व	व्व	व्व	स्व	स्व	स्व			
न्म	न्म	न्म	श्म	श्म	श्म			
स्त	स्त	स्त	न्य	न्य	न्य			
द्व	द्व	द्व	त्व	त्व	त्व			
म्ह	म्ह	म्ह	व्व	व्व	व्व			
हस्तेन पुस्तक योगेश्वर								

Fig. 2. Datasheet for Sanskrit Compound Characters

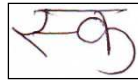


Fig. 3. Sample of Cropped Compound Character

4.2 STRUCTURAL CLASSIFICATION

Structural Classification of a character implies detection of Vertical line, its Position in an image and Enclosed Region detection. For vertical line detection we have used Hough Transform and Prewitt Edge Detection algorithm. Enclosed region is detected with help of boundary tracing algorithm.

4.2.1 HOUGH TRANSFORM

Hough transform is applied on the binarized edge map to generate the Hough image of it. The Hough Transform was originally developed for detecting lines and it is still popular in this particular area. Therefore, a large amount of different line parameterizations and various algorithmic modifications exist [8].

In automated analysis of digital images, a frequently arising problem is detecting the simple shapes like straight line, circle or ellipse. In most of the cases an edge detector can be used as a pre-processing stage to obtain image points or image pixels that are on the desired curve in the image space. But due to imperfections in either the image data or the edge detector there may be missing or isolated or disjoint points or pixels on the desired curves as well as there may be spatial deviations between the ideal lines or circle or ellipse and the noisy edge points as obtained from the edge detector. For these reasons, it is often non-trivial to group the extracted edge features to an appropriate set of lines, circles or ellipses. The purpose of the Hough transform is to address this type of problem by making it possible to perform groupings of edge points into object candidates by performing an explicit voting procedure over a set of parameterized image objects.

4.2.1.1 PREWITT EDGE DETECTION

The Prewitt operator is used in image processing, particularly within edge detection algorithms. Technically, it is a discrete differentiation operator, computing an approximation of the gradient of the image intensity function. the operator calculates the gradient of the image intensity at each point, giving the direction of the largest possible increase from light to dark and the rate of change in that direction. The result therefore shows how abruptly or smoothly the image changes at that point and therefore how likely it is that part of the image represents an edge, as well as how that edge is likely to be oriented.

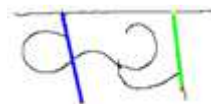


Fig. 4. Vertical Line Detection

- **Position of Vertical Line:**

Once the vertical edge has been detected, next task is to find its position in character image such as Middle Line and End Line. For this reason, character image is divided in two parts vertically. If edge is exist then using its beginning point line position is find out. If point position is less than image half then line is called as Middle Line. If point position is greater than image half then line is called as End Line.

- **Position of End Point:**

Detection of End point is done with the analysis of position of line end points. For this reason image is divided horizontally, then lower part is again divided vertically and checked for the end points. If end point position is less than lower half then End point is in Fourth Quadrant. If point position is greater than lower half then End Point position is in Third Quadrant.

4.2.2 DETECTION OF ENCLOSED REGION

In Sanskrit language, there are many characters formed with the enclosed region. Hence, we have detected enclosed region within the character too. We have traced boundaries within binary image with the help of connected component.



Fig. 5. Enclosed Region Detection

4.3 CHARACTER NORMALIZATION

Character Normalization is the process of making images to be uniform in their size. After Structural classification, character normalization is performed. We have normalized character in to 32x32 size. Distance measurement can be efficiently applied on 32x32 image and these can minimize computation time for distance calculation.

4.4 EUCLIDEAN DISTANCE CLASSIFIER

Euclidean Distance classifier is used to classify features. We have calculated Euclidean distance between the input image and training images. After calculation, we have considered those classes whose Euclidean distance is minimum. Accordingly, testing has been done and Output is displayed.

5 RESULTS AND DISCUSSION

We have collected a database of 34 compound characters from individuals of different groups. Resulting into 60 samples for each character. There are 2040 total characters into the database. These samples are preprocessed and applied for segmentation. At preprocessing stage Morphological opening operation fill the gap between characters and removes unwanted strokes from character image. And then it is thinned. At the segmentation stage Vertical lines are detected using Hough transform and Prewitt Edge detection.

Position of a vertical bar and presence of enclosed region is detected at the Feature extraction. After extracting features, image is then normalized to 32x32 images. This image is then proceeding for a Classification. Minimum Distance classifier used to classify features. We have calculated Euclidean distance between input image and training images. Class, whose distance is Minimum, is qualified for the recognition. Based upon these testing has been made and Corresponding Recognition result is displayed.

Proposed system is designed using MATLAB R2013a. Proposed system provides overall 94% recognition rate.

Table 1. Recognition Rate of Individual Character

Characters	Correctly Classified	Misclassified	Percentage of Recognition
Bba	58	2	96
Bda	58	2	96
Bja	54	6	90
Chya	56	4	93
Dha	54	6	90
Dhya	55	5	91
Dya	56	4	93
Gwa	57	3	95
Jva	56	4	93
Jya	57	3	95
Kta	58	2	96
Kva	60	0	100
Kya	60	0	100
Mha	55	5	91
Nha	55	5	91
Nma	56	4	93
Nta	56	4	93
Nya	54	6	90
Pta	57	3	95
Pya	58	2	96
Rya	58	2	96
Shka	59	1	98
Shta	58	2	96
Ska	58	2	96
Sma	56	4	93
Spa	55	5	91
Sta	54	6	90
Swa	56	4	93
Sya	56	4	93
Tma	57	3	95
Tpa	58	2	96
Tta	60	0	100
Tva	59	1	98
Tya	59	1	98

ACKNOWLEDGMENT

The Authors are grateful to Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. The authors would like to thank all the faculty members and staff and also to the University Authorities for providing the infrastructure to carry out the research.

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Applications of Algorithmic Graph Theory to the Real World Problems

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ABSTRACT: With the development of computers, researchers have gathered special interest in the algorithmic aspects of mathematics. Due to this graph models have emerged as a necessary and important tool for solving real-world problems. Algorithmic solutions to the graphical problems have large number of applications. Its area of applications ranges from VLSI circuit design to scheduling, from resource allocation to physical mapping of DNA. If we look at the mathematical aspect, graph classes have provided rich soil for deep theoretical results which provide a deep insight into the problems related to artificial intelligence to pavement deterioration analysis. This paper intends to highlight the significance of graph theory in solving the real world problems by presenting some of the existing applications with special emphasis on operations research and computer science.

KEYWORDS: Graph Theory, Algorithms, Networks.

1 INTRODUCTION

It was 1736, when Leonhard Euler (1707-1783) presented a paper at the Academy of Sciences of St. Petersburg (an English translation of this paper can be found in Biggs et al., 1976).[1] In this paper he settled a famous long standing unsolved problem of his time called 'The Königsberg bridge problem.' The solution of this problem introduced the concepts of Graph Theory. Thus, Euler became the father of Graph Theory and hence of topology. The term 'graph' was given in 1878 by Sylvester in his paper which was published in Nature. [2]

Nothing very concrete came forward for about a century after the publication of Euler's paper on the bridges of Königsberg until Cayley studied a particular structure using differential calculus and originated a particular class of graphs called the trees [3]. This study gave birth to 'Enumerative Graph Theory', which found its utility in chemistry. In 1845, Gustav Kirchhoff applied the concept of tree, to calculate the current in electrical networks or circuits. In computer science, a data structure can be designed in the form of tree which in turn utilized vertices and edges.

In 1852 Francis W. Guthrie, a graduate of University College London posed an interesting question to his brother Frederick: 'Imagine a geographic map on the earth (i.e., a sphere) consisting of countries only—no oceans, lakes, rivers, or other bodies of water. The only rule is that a country must be a single contiguous mass—in one piece, and with no holes. Is it true that any such map drawn in the plane may have its regions coloured with four colours, in such a way that any two regions having a common border have different colours?' This is one of the most famous problems in graph theory and is known as the Four Colour Problem. The four colour problem remained unsolved for more than a century. Many incorrect solutions were proposed. The works of Ramsey on colourations and also the results obtained by Turán in 1941 originated another branch of graph theory called 'Extremal Graph Theory'. In 1969 Heinrich Heesch published a method for solving the problem using computers [4]. This concept of graph colouring is utilized in the areas like resource allocation and scheduling.

Graph theoretical ideas are highly utilized by researchers especially in areas of network topologies. Various concepts like paths, walks and circuits in graph theory are used in various applications for example traveling salesman problem, database

design concepts and resource networking. This leads to the development of new algorithms and new theorems that are being used in tremendous applications.

2 GRAPH THEORY; A VERSATILE TOOL FOR SCIENTISTS

‘Where there is a network, there lies the application of graph theory.’ This statement clearly reflects the range of areas where one can apply graph theoretic models to solve the various problems. Any system involving binary relations can be represented by graphs. To get an idea some of the existing applications are listed below.

2.1 GRAPH THEORY AND BIOLOGY

Graph theory provides a practically good framework to model biological system and its properties. These models are successfully applied in proteomics and in the study of metabolic networks. The geometrical protein structure can be expressed as the different graphical structures. These structures may differ in terms of the conformational features (geometry) but still can have the same topology (the gross shape). Also, protein–protein interactions, social structure, and food webs have been modeled [5]. These protein-protein interaction networks are commonly represented in a graph format, in which vertices correspond to proteins and edges corresponds to interactions. Study of these interactions is important as it gives useful information about the inner workings of cells and their mutual relations which may lead to some breakthrough in fighting diseases.

Another emerging field is landscape genetics which gives an insight that how factors like migration, genetic drift, the distribution and connectivity of populations affect genetic structure [6].

Biological networks are networks of biochemical reactions, containing various objects and their relationships. Understanding of biological networks is the beginning of gaining some knowledge about biological systems. Recent technological advances in experimental biology have yielded large amounts of biological network data. To understand living cells, studying them as systems rather than as a collection of individual parts is more useful. Graph theory is capable of modeling the complex events with molecules, cells, or living organisms as constituent. Nodes in biological networks represent bio-molecules such as genes, proteins or metabolites, and edges connecting these nodes indicate functional, physical or chemical interactions between the corresponding bio-molecules. These graph theoretic networks are convenient to analyze the interactions among these parts.

2.2 GRAPH THEORY AND CHEMISTRY

Graph theory is used to study molecules in chemistry. A molecule can naturally be modeled as a graph with vertices representing atoms and edges representing bonds [7]. This approach is especially used in computer processing of molecular structures, ranging from chemical editors to database searching. A wealth of information has been derived on electron delocalized molecules by considering electrons and atomic orbital as vertices and overlap between them as edges [8-11].

Balaban has reviewed various applications of for chemical nomenclature, coding and information processing/storage/retrieval in chemistry [12].

Graph enumeration describes a class of combinatorial enumeration problems in which one must count undirected or directed graphs of certain types, typically as a function of the number of vertices of the graph. [13] The credit goes to the mathematicians namely Pólya, [14] Cayley [15] and Redfield [16]. Arthur Cayley (1821-1895) used the concept of a tree to describe the problem of hydrocarbon chemistry in finding isomers [17]. Isomers are compounds that have the same molecular formula but have different structures. These chemical isomers are very important in modern chemistry. With the development of chemistry, scientists led research in calculating the number of isomers using Cayley’s graph concept.

Thus, graph theory can be applied in quantum electronic structures, molecular mechanics, and stimulated condensation phase, the design of the structure of molecules, polymers, topography, potential energy, and biological macromolecules (including proteins). [18].

2.3 GRAPH THEORY AND AGRICULTURE

An agro-ecosystem can be viewed as a subset of a conventional ecosystem. As the name implies, core of an agro ecosystem is agriculture. It is the basic unit of study for an agro-ecologist, and is somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity, and includes the living and nonliving components involved in that unit

as well as their interactions. [19] Using well known graph theory theoretical concepts with the help of computers helps to control huge systems that are difficult to survey by other existing methods. Agricultural production can be controlled through a complex system, which integrates biological, technological and economical factors. [20]

2.4 GRAPH THEORY IN OPERATIONS RESEARCH

Graph theory is a powerful tool in operations research. Graph theoretical concepts are widely used in Operations Research. Some important OR problems like transport problems, man-machine allocation problems etc can be solved using graphs.

A transport network is one where a graph is used to model the transportation of commodity from one place to another. The objective is to maximize the flow or minimize the cost within the prescribed flow. The graph theoretic approach is found more efficient for these types of problems though they have more constraints. The network activity is used to solve large number of combinatorial problems.

The most popular and successful applications of networks in OR is the planning and scheduling of large complicated projects. Beginning of project management and scheduling date back to the development of the Gantt chart by Henry Gantt (1861–1919). This charting system for production scheduling formed the basis for two scheduling techniques, which were developed to assist in planning, managing and controlling complex organizations: the Critical path Method (CPM) and Program Evaluation and Review Technique (PERT)

Game theory is applied to the problems in engineering, economics and war science to find optimal way to perform certain tasks in competitive environments. To represent the method of finite game a digraph is used. Here, the vertices represent the positions and the edges represent the moves

2.5 GRAPH THEORY AND COMPUTER SCIENCE

Computer Science has been the biggest beneficiary of the developments in graph theory. Data mining, image segmentation, clustering, image capturing, networking etc are highly dependent on the advancement in the graph theory. The major role of graph theory in computer applications is the development of graph algorithms. Algorithmic graph theory is a part of the interface between combinatorial mathematics and computer science. Care should be taken while developing an algorithm so that their adaptation to any programming language is relatively easy. The complexity of every algorithm should be analyzed so extent of its efficiency can be determined. Numerous algorithms have been developed to solve problems that can be modeled in the form of graphs. These algorithms are being used in solving the theoretical concepts of graphs and hence in solving the corresponding computer science application problems. Some algorithms are as follows:

- Shortest path algorithm in a network: In graph theory, the shortest path problem is the problem of finding a path between two vertices (or nodes) in a graph such that the sum of the weights of its constituent edges is minimized. This is analogous to the problem of finding the shortest path between two intersections on a road map: the graph's vertices correspond to intersections and the edges correspond to road segments, each weighted by the length of its road segment. Zhan and Noon has evaluated 15 shortest path algorithms in his paper. [21]. Two of these well known algorithms are Bellman–Ford algorithm and Dijkstra's algorithm [22].

Dijkstra's algorithm is a graph search algorithm that solves the single-source shortest path problem for a graph with non-negative edge path costs, producing a shortest path tree. This algorithm is often used in routing and as a subroutine in other graph algorithms.

The Bellman–Ford algorithm computes shortest paths from a single source vertex to all of the other vertices in a weighted digraph. It is slower than Dijkstra's algorithm for the same problem, but more versatile, as it is capable of handling graphs in which some of the edge weights are negative numbers. It is also known as Bellman–Ford–Moore algorithm [23-25].

- Algorithm to find a minimum spanning tree: A minimum spanning tree (MST) or minimum weight spanning tree is then a spanning tree with weight less than or equal to the weight of every other spanning tree. Two of these are: Kruskal's algorithm [26] and Prim's algorithm [27]
- Algorithm to find graph planarity: Some of the algorithms are Path addition method [28], Vertex addition method [29] and Edge addition method [30].
- Algorithms to find adjacency matrices.
- Algorithms to find the connectedness.

- Algorithms to find the cycles in a graph.
- Algorithms for searching an element in a data structure: Very well-known algorithms are: Depth-first search (DFS), Breadth-first search (BFS).
- Algorithms for finding Maximum flow in a network. Ford–Fulkerson algorithm is one such algorithm.
- Algorithms to solve Traveling Salesman Problem
- Algorithms to find the connectedness

[31] Internet is one of the most complex and useful network, which is operated and built by thousands of large and small entities. These entities collaborate with each other to process and deliver end-to-end flows originating from and terminating at any of them. The distributed nature of the internet implies a lack of coordination among its users. Instead, each user attempts to obtain maximum performance for self.

Methods from game theory (which has its origin in graph theory) and mathematical economics have been proven to be a powerful modeling tool, which can be applied to understand, control, and efficiently design such dynamic, complex networks. Game theory provides good starting point for computer scientists in their endeavor to understand selfish rational behavior in complex networks with many agents (players). [32]

3 CONCLUSION

Graph theory has been found very useful for characterizing various processes that take place in complex interconnected systems in diverse disciplines such as physics, mathematics, chemistry, biology, sociology etc. [33]. Thus, graph theory is very useful in almost every aspect of our life from social to technical and economics to ecology. With increasing global interaction, it is going to be a wonderful tool to study various phenomenon of the real world. This paper is attempted to make researchers aware of the importance of graph theory in real life problems.

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Video conferencing: An Efficient E-Learning Tool for Distance Education

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ABSTRACT: Today world is making rapid progress on the path, towards the utilization of technical applications in the field of education. This is particularly true in the area of distance education, as the possibilities of its realization and growth have multiplied in ways not possible in the past. Video conferencing is a two-way connection between the teacher and the students at two or more locations through audio and video equipment. Out of all the available distance teaching technologies, video conferencing is very similar to the formal classroom teaching and therefore includes a very important element of teaching-learning process. However, there are a few key differences in the teaching and learning process that require attention for faculty and students to use video conferencing successfully. This paper studies the elements of distance education and role of e-learning (particularly the video conferencing) in benefiting the students via distance education.

KEYWORDS: Formal Education, Distance learning, online learning, e-Learning, Videoconferencing.

1 INTRODUCTION

History of distance education is almost two centuries old [1]. During this time period the learning and communication techniques have changed significantly. It started with the basic correspondence through postal service and has come a long way with the application of the different electronic tools, which are now available due to the rise of internet. One such form is online learning. First ever access to online learning dates back to 1980's. Another term used for online learning is 'e-Learning'. E-learning is a standard abbreviation for electronic learning. This term has become more popular now. But the origin of this term is not known [2]. E-learning is defined as "learning that is delivered, enabled or mediated using electronic technology for the explicit purpose of training in organizations" [3].

2 BENEFITS OF DISTANCE EDUCATION

With the increasing demand of education, distance education seeks to assist in the achievement of equivalence of educational opportunities to all. Distance learning is a wonderful media to expand access of education and training. Its flexible scheduling structure lessens the effects of the many time-constraints imposed by personal responsibilities and commitments. It is beneficial even for those, whose circumstances do not permit them to enroll in traditional classroom-based learning or those whose personal, economic or social circumstances prevented them from access to education. [4]

Distance education may be an alternative to the students who cannot afford formal education due to economic constraints. Distance education can provide some relief to students as it is a more cost-effective form of learning, and so can sometimes save students a significant amount of money as opposed to traditional education [5].

Distance learning may enable students who are unable to attend a traditional school setting, due to disability or illness such as decreased mobility and immune system suppression, to get a good education [6]

Distance education may provide equal access regardless of socio-economic status or income, area of residence, gender, race, age, or cost per student [7]. Distance learning may also offer an opportunity for adolescents that are no longer

permitted in the formal education system due to behavior disorders. In this way these students having no other academic opportunities, may continue their education from their homes and earn their diplomas, offering them another chance to be an integral part of society.

Distance education can also help in fulfilling the requirements of the national development plans. It can prepare trained and qualified human resources by increasing the opportunities for continuous education. It can be used for training and professional development for those who are working and have no time for pursuing a regular course. [8].

3 THE NATURE OF E-LEARNING

E-Learning is the use of electronic media and information & communication technologies (ICT) in education. Various audio-visual materials, search engines, electronic libraries, text, images, animation, and streaming video, and websites are used to accomplish teaching-learning process in the classroom or at a distance.[9]

This type of education is basically delivered through the medium of the World Wide Web. Using this technique, educational institutions can make their programs and materials available on their website in such a manner that students can easily access and interact with them through closed or shared networks, the internet or through use of e-mail and online discussion groups. The two parties participating in the educational process interact through these media to achieve specific educational objectives.

4 SYNCHRONOUS AND ASYNCHRONOUS E-LEARNING

E-learning may either be synchronous or asynchronous. Synchronous learning occurs in real-time in which all participants interact at the same time. Asynchronous learning is self-paced. It allows participants to engage in the exchange of ideas or information without the dependency of other participants' involvement at the same time.

Synchronous learning involves the exchange of ideas and information with one or more participants during the same period of time. A face-to-face discussion is an example of synchronous communications. In e-learning environments, examples of synchronous communications include online real-time live teacher instruction and feedback, Skype conversations, or chat rooms or virtual classrooms where everyone is online and working collaboratively at the same time. Synchronous e-learning environments are characterized by different types of interactions through chats, real-time audio, application sharing, whiteboards, web casting, video teleconferencing, and so on, which imposes additional considerations concerning usability and its evaluation

In asynchronous online courses, students can learn at their own pace. It works on the idea 'learning anytime, anywhere'. Asynchronous learning may use technologies such as email, blogs and discussion boards, as well as web-supported textbooks, hypertext documents, audio-video courses, and social networking. [10]

Asynchronous learning is particularly beneficial for students who are slow learners or have health problems or have child care responsibilities and cannot attend a course regularly by leaving homes. In this environment students have lower stress to complete their work and has flexible timeframe. If student need to listen to a lecture as many times as they wish. They can think about a question taking their own time without any peer pressure.

Students also have access to an incredible variety of enrichment courses in online learning, and can participate in college courses, internships, sports, or work and still graduate with their class. Both the asynchronous and synchronous methods rely heavily on self-motivation, self-discipline, and the ability to communicate in writing effectively. [11]

5 VIDEOCONFERENCING

Video conferencing is revolutionizing the way of connecting to the participants by giving the benefits of a face-to-face meeting even when participants are miles apart. A video-conference is a live video connection between people in separate locations for the purpose of communication or interaction. Video-conferencing allows people to communicate visually from anywhere in the world. Uses of video-conferencing include:

- Distance Learning
- Sharing lectures with students at other universities
- Job Interviews
- Giving and receiving lectures/presentations from remotely located sites from around the world
- Conducting meetings between research groups and academics based at different universities

5.1 COMPONENTS REQUIRED FOR VIDEOCONFERENCING

Components required for system include:

- Video input : Video camera or webcam
- Video output: Computer monitor, television or projector.
- Audio input: Microphones, CD/DVD player, cassette player, or any other source of PreAmp audio outlet.
- Audio output: Usually loudspeakers associated with the display device or telephone.
- Computer: A data processing unit that ties together the other components, does the compressing and decompressing, and initiates and maintains the data linkage via the network. [12].

5.2 VIDEO-CONFERENCING AND DISTANCE EDUCATION

Video conferencing systems are often used for distance learning, linking distant teachers and learners for instruction delivery. Some of the ways the technology is used for achieving this goal, bringing benefits to teachers, administrators and students, include the following: [13]

- Students can easily enroll themselves in the subjects which are not offered at their institution.
- Video conferencing can assist educational institutions to offer classes during off-hours so that the students who cannot attend traditional classes can be benefited.
- Different institutions can work as a team to offer employee training or certification.
- Teachers can team-up with other teachers and institutions and can share their subject matter expertise or unique approach to a topic. This real-world contact can heighten interest, improving motivation and retention
- “Master teachers” in particular subjects can be made available to a larger audience of students of wider geographic reaches.
- Students can meet with tutors for enrichment, remediation, or a helpful bit of personal attention. This is a good way for businesses to support schools.
- Students can communicate with video pen pals across the globe. This is a cost effective way to experience diverse cultures and ways of life. This can lead in enhancing trust and universal brotherhood.
- Schools known for outstanding courses or projects can model those projects for other schools and thus can easily work toward the betterment of society.

Video conferencing can facilitate distributed cooperative learning, where groups at distant sites take on a learning task and teach remote peers.

6 CONCLUSION

In small states and developing countries like India, for widening access to education, the cost- effectiveness of the delivery method takes on great importance. Distance education can be more cost-effective than traditional education. The implementation of the distance education platform ensures an average cost per student lower than that in conventional systems. Though a broadband satellite connection with studio-quality equipment to produce an excellent full-motion video connection with the required equipment and transmission is expensive and is not always affordable. But still in developing countries where quality educational institutions are still not available in the remote areas and drop-out rates are quite large; cost-effectiveness of video conferencing can be justified by considering the fact that masses can be reached out at a time at more than one site. This way drop-out rates can be reduced and students can interact with the expert teachers even at the remote areas. Also, the students engaged in e-learning activities will be able to construct their own knowledge through self directed learning. Eventually performance of the students may increase by implementation of e-learning at various places. The students can be benefited by using advanced e-learning technologies even after the lecture classes via E-learning portal through intranet facilities [14]. Thus, Video conferencing provides a viable alternative for the delivery of distance education not only for larger countries, but also for smaller states. A lot of care should be taken in the implementation process to optimally utilize both the equipments and the transmission media.

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Evaluation de la Sensibilité et Résistance des *Anophèles gambiae ss* aux Moustiquaires Imprégnées d'Insecticide

[Assessment of the Sensibility and Resistance of *Anopheles gambiae ss* to the Mosquito Impregnate Of Insecticide]

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ABSTRACT: The mosquito netting treated with permethrine 2% mark Olyset Net is effective against the *Anopheles gambiae*. The resistance of this vector due to this insecticide is more worrying from the third month of use. Mesh of that mosquito would be 4mm permanent contact between humans and the vector which explains the perpetuation of this epidemic in our study area despite the extension of nets made by health agencies.

KEYWORDS: Assessment, sensitivity, resistance, Anopheles, mosquito net with 2% permethrin.

RESUME: La moustiquaire imprégnée de la perméthrine à 2% de marque Olyset net est efficace contre les *Anophèles gambiae*. La résistance de ce vecteur due à cet insecticide devient plus inquiétante à partir du troisième mois de son utilisation. La maille de cette moustiquaire étant de 4mm de diamètre ne limiterait le contact permanent entre l'homme et le vecteur, ce qui explique la pérennisation de cette endémie de notre aire d'étude en dépit de la vulgarisation des moustiquaires faite par les organismes sanitaires.

MOTS-CLEFS: Evaluation, sensibilité, résistance, anophèles, moustiquaire à perméthrine 2%.

1 INTRODUCTION

Actuellement, l'humanité fait face à beaucoup d'endémies parmi lesquelles le paludisme occupe une position non négligeable en termes d'endémie surtout dans la zone intertropicale. Le paludisme encore appelé malaria est une maladie due à un hématozoaire du genre *Plasmodium* ayant quatre espèces (*Plasmodium falciparum*, *P. malariae*, *P. vivax* et *P. ovale*). De toutes ces espèces la plus dangereuse est *P. falciparum* car elle attaque toutes les hématies en dépit de leur âge [1].

Ces parasites sont transmis à l'homme lors de la piqûre par le moustique femelle du genre *Anophèles* qui est un hématophage [2]. Dans notre aire d'étude il a été constaté la présence des 6 espèces dont *A. gambiae*, *A. funestus*, *A. marshalli*, *A. demelloni*, *A. coustani*, et *A. chrystii* [3]. De toutes les espèces, les deux premières sont plus importantes en

termes de transmission parasitaire. Cependant, leur fréquence relative décroît de *A. funestus*, *A. marshalli*, *A. gambiae*, *A. demelloni*, *A. coustani* puis aux *A. chrysti* [4].

Le paludisme entraîne des millions de décès chaque année dont les personnes plus victimes sont surtout les femmes enceintes et les enfants en bas âge suite à leur faible immunité [5]. Cette endémie est déplorée non seulement sur le plan sanitaire mais aussi sur le plan socio-économique car une population affectée par cette dernière devient improductive. Ce manque de production entraîne la pauvreté qui sévit dans les régions les plus touchées par le paludisme. Le paludisme est la plus importante des maladies intertropicales avec 270 millions de personnes infectées chaque année dont 2 millions de décès annuellement, soit un enfant qui meurt toutes les 40 secondes [6]. En République Démocratique du Congo, le paludisme reste endémique; cependant son degré d'endémicité varie d'une province à l'autre suite aux différents climats; toutefois, le taux de parasitémie est compris entre 11 et 50% et le taux de mortalité reste alarmant, ce qui nécessite le concours des uns et des autres pour sa réduction [7].

D'après les études menées au laboratoire d'Entomologie Médicale du Centre de Recherche en Sciences Naturelles de Lwiro depuis les années 1980 jusqu'à présent, il s'avère que les six espèces d'anophèles précitées sont permanentes dans cette région de l'Est de la RD Congo. De ces espèces, *A. gambiae* et *A. funestus* présentent une prévalence de 97%, elles sont les vecteurs du paludisme et disponibles tout au long de l'année [8]. Les mesures sont envisagées pour réduire le taux de mortalité dû au paludisme parmi lesquelles, la lutte biologique, lutte physique et chimique au niveau des vecteurs.

A celles-ci s'ajoute la lutte contre les parasites responsables de cette affection. Signalons que dans le cadre de lutte antimalaria, certains médicaments qui jadis étaient efficaces contre la paludisme; le plasmodium présente une certaine résistance à leur égard ; c'est le cas de la chloroquine qui n'est plus efficace actuellement [9].

S'agissant de la lutte physico-chimique, actuellement l'usage des moustiquaires imprégnées d'insecticide (MII) est pris à grande échelle surtout pour les enfants à bas âge et les femmes enceintes. La question fondamentale reste à savoir l'impact de ces MII vulgarisées par les organismes sanitaires dans la lutte contre le paludisme et pourtant cette endémie continue à être source de mortalité infantile et d'avortements dans la région intertropicale. La résistance des agents vecteurs (anophèles) à l'égard de certains insecticides (DDT) constitue un frein à l'éradication de cette endémie [10]. A cela s'ajoute l'inefficacité que présentent certaines moustiquaires imprégnées d'insecticides suite à leurs mailles plus larges qui n'empêchent pas le contact homme-vecteur. Ce travail a pour objectif d'évaluer la sensibilité et la résistance des *Anophèles gambiae* aux moustiquaires Olyset net à perméthrine 2% et aussi de déterminer le temps où les MII restent encore efficaces. De ce fait, une étude était réalisée sur une MII de marque « Olyset net » rectangulaire fabriquée en polyéthylène dont la perméthrine à 2% est l'insecticide utilisé. Cette MII est d'origine chinoise ayant une dimension de 150cm de hauteur, 180cm de longueur et 160cm de largeur. Elle était fabriquée par l'entreprise Sunitomo chemical Co.ltd et distribuée par la compagnie PSI dont le nom commercial est «mama séréna».

2 METHODOLOGIE

2.1 ZONE D'ÉTUDE

Cette étude a été réalisée au Centre de Recherche en Sciences Naturelles de Lwiro situé vers la côte Ouest du lac Kivu à 1760m d'altitude, 28° 48' de longitude Est et 2° 14' de latitude Sud [11]. Cette aire a un climat tropical humide qui est caractérisé par une précipitation allant à 1500mm/an et la température qui varie entre 18° et 20°c [11].

Deux saisons y sont caractéristiques : la saison des pluies allant de septembre à mai soit 9 mois et la saison sèche s'étend sur trois mois soit de juin jusqu'en Août. Le mois de janvier étant marqué par des petites précipitations.

2.2 METHODE ET MATERIELS

2.2.1 ELEVAGE DES ANOPHÈLES

Les pêches larvaires ont été réalisées dans notre aire d'intervention grâce aux poires aspirantes, assiettes métalliques et tubes à essai. Cette étape était suivie d'une identification des larves au laboratoire d'Entomologie Médicale avant qu'intervienne l'élevage des adultes d'*Anophèles gambiae* ss. Les larves identifiées étaient gardées dans des cages jusqu'au stade adulte. Pour tout élevage, l'âge d'anophèles à tester variait entre trois et cinq jours.

2.2.2 MOUSTIQUAIRE IMPREGNEE D'INSECTICIDE (MII) ET ANOPHELES A EVALUER

Six moustiquaires de marque Olyset net à 2% de perméthrine étaient disposées dans des cages métalliques où s'était fait l'exposition. La méthode standard de l'OMS (2007) était utilisée pour exposer les anophèles dont *A. gambiae* qui est une des espèces les plus dangereuses. Pour chaque test, 25 anophèles étaient introduits au même moment dans la cage ayant la MII disposant 4mm de mailles et observées pendant 60 minutes. Les anophèles retrouvés dans la cage à MII après 60 minutes étaient récupérés et conservés dans un tube à OMS où ils devaient s'émouvoir, mais aussi ces tubes nous rassuraient quant à la sensibilité et la résistance de ces vecteurs après 24 heures.

La deuxième étape était en rapport avec les anophèles témoins. De ce fait, avant toute expérience sur les témoins, les MII furent lavées au savon dix fois avant toute exposition en vue de se rassurer qu'elles sont débarrassées de l'insecticide [12].

Ces mêmes expériences étaient reprises avec intervalle de 7 jours l'une après l'autre et cela vingt fois avant l'analyse globale des résultats.

Quant aux anophèles ayant servi pour l'expérimentation, ils étaient capturés de l'insectarium existant au laboratoire et identifiés grâce à la clé de Vouchet (1985), pour se rassurer effectivement de l'espèce, car *A. gambiae* est l'une de deux espèces plus dangereuses qui transmettent le plasmodium à l'homme.

2.2.3 EXPOSITION DES ANOPHELES AUX MII

Les adultes d'anophèles femelles étaient capturés dans notre insectarium et préalablement identifiés. Après identification, les vecteurs à tester étaient simultanément introduits dans le tube à OMS de 125mm de longueur sur 44mm de diamètre [13]. Le taux de mortalité était calculé après 60 minutes d'exposition où on devait récupérer les anophèles testés dans un autre tube à OMS tel que recommandé par la procédure de WHO. Ce test était répété 20 fois avant de déterminer le taux de mortalité après 60 minutes mais aussi évaluer la résistance après 24 heures. Les moustiquaires expérimentales n'étaient jamais lessivées ni exposées au soleil pendant toute la durée de l'expérience.

Pour trouver la moyenne du taux de mortalité et de résistance, nous avons utilisé la moyenne échantillonnale de tests effectués chaque mois.

$$\bar{X} = \frac{\sum fx}{N}$$

Avec

$\bar{X}$: Moyenne échantillonnale

$\sum fx$: Somme du produit entre fréquence et moyenne pour chaque test

N : Nombre de tests réalisés

3 RESULTATS

L'activité anophélinocide de la perméthrine à 2% contenue dans la moustiquaire de marque Olyset net est relevée dans le tableau ci-dessous.

Tableau : Taux de mortalité, de résistance des *Anophèles gambiae* à la perméthrine à 2%

Moyenne mensuelle		Taux de mortalité dans la MII	Taux de résistance dans la MII	Taux d'évasion dans la MII	Taux d'évasion dans la MII témoin
1 ^{er} mois	– X en % /25 testés	67 (16,75)	16 (4)	17 (4,25)	56 (14)
2 ^{ème} mois	– X en % /25 testés	77 (19,25)	13 (3,25)	10 (2,5)	75 (18,75)
3 ^{ème} mois	– X en % /25 testés	77 (19,25)	12 (3)	11 (2,75)	78 (19,5)
4 ^{ème} mois	– X en % /25 testés	68 (17)	21 (5,25)	14 (3,5)	76 (19)
5 ^{ème} mois	– X en % /25 testés	64 (16)	27 (6,75)	13 (3,25)	75 (18,75)
Moyenne		70,6	17,8	13	

Légende : $\bar{x}$: moyenne échantillonnale

MI : moustiquaire imprégnée d'insecticide

% : Pourcentage

() : Moyenne d'*Anophèles gambiae* tués ou résistants ou évadés selon les colonnes

L'activité anophélinocide de la perméthrine à 2% contenue dans la moustiquaire olyset net s'avère indispensable. Cependant, cette MI utilisée à plus de trois mois, le taux de mortalité anophélien commence à baisser. Au regard du tableau présentant les résultats, il s'avère que non seulement les anophèles présentent une résistance vis-à-vis de l'insecticide utilisé après trois mois mais aussi et surtout que la maille de la moustiquaire de 4mm de diamètre favoriserait le contact entre l'homme et l'agent vecteur bien qu'il soit sous moustiquaire. On constate que le taux de mortalité dû à l'impact de l'insecticide ne fait que diminuer dans trois mois ; ce qui ferait croire que si la même moustiquaire utilisée, ne serait plus efficace après une année et pourtant la distribution n'est pas faite trimestriellement.

Quant à la moustiquaire témoin, les résultats montrent que cette dernière, était dépouillée de tout insecticide, raison pour laquelle le taux de mortalité y relatif était nul. Cependant, il s'observe un taux d'évasion important dans la moustiquaire témoin suite à ses mailles plus larges. Cela explique la persistance du paludisme car après autant de lessives de la MI, elle devient inefficace à l'égard des agents vecteurs ; ce qui favoriserait le contact entre l'homme et anophèles.

4 DISCUSSION

S'agissant de la résistance des anophèles aux insecticides, disons que *Anophèles gambiae* a présenté une résistance à l'égard de la perméthrine à 0,25 % au Cotonou (Benin) et Korhongo en Côte d'Ivoire [14]. Cette résistance était également observée à l'égard de la deltaméthrine et au DDT dans trois pays de l'Afrique de l'Ouest dont le Bénin, Burkina Faso et Sénégal [15] ainsi qu'au Cameroun et au Botswana [16]. Le test était réalisé sur les femelles d'*Anophèles gambiae* selon le protocole de l'OMS et en observant le nombre de moustiques morts au cours de leur exposition à une moustiquaire contenant l'insecticide à partir de l'effet de choc « Knock down ». La baisse de l'effet de choc était significative avant qu'on observe la mortalité. Elle a été à ce titre considérée comme un indicateur précoce de la résistance des *Anophèles gambiae* à la perméthrine [14]. Les moustiques survivants après knock down, étaient gardés et nourris dans l'insectarium établi à cette fin durant 72heures.

Le tableau résume les moyennes en % du taux de mortalité et de résistance des *Anophèles gambiae* à la perméthrine à 2%.

Le faible taux de mortalité du premier mois (67%) par comparaison au deuxième mois, s'expliquerait par le fait que les vecteurs testés disposeraient d'un arsenal enzymatique particulier, cela ne peut être confirmé qu'après l'analyse du PCR. L'écart de résistance (moyenne de 0.25) entre le deuxième et troisième mois n'est pas significatif. Cependant, plus la durée d'usage de la MI est longue, plus la résistance devient de plus en plus importante. Quant à la MI, l'évasion au-delà de 50%, mets en cause les mailles, ce qui ne limiterait pas le contact vecteur-homme.

Ce travail donne des indications sur l'épidémiologie du paludisme dans notre zone d'étude. Les résultats illustrent certaines limites que présentent les moustiquaires pré-imprégnées, qui sont par ailleurs, utilisées dans la lutte physico-chimique contre les vecteurs du paludisme. Dans le monde, les insecticides sont de plus en plus utilisés à des fins de santé publique, soit pour arrêter la transmission des grandes endémies, soit en hygiène urbaine pour éliminer les vecteurs des maladies [8]. L'usage abusif des insecticides entraîne la résistance des vecteurs face à certaines molécules d'insecticides. Par résistance aux insecticides, on entend, l'apparition dans une souche d'insectes, de la faculté de tolérer des doses de substances toxiques qui exerceraient un effet létal sur la majorité des individus composant une population normale de la même espèce. Cette résistance des *Anophèles gambiae* fut observée quant au DDT, qui, jadis était efficace face aux anophèles [15]. Partant des expériences faites au Bénin, la perméthrine dispose d'une bonne efficacité comme insecticide contre *Anophèles gambiae* [16] ; cependant, la résistance de ces vecteurs a été observée pour le DDT (4%), le bendiocarb (0,1%) et la deltaméthrine (0,05%) où 39/40 en moyenne d'anophèles femelles testées avaient survécus dans six départements du Sud du Bénin [16]. La moustiquaire pré-imprégnée de la perméthrine à 2% dispose d'une bonne efficacité durant le premier trimestre de son usage. Durant cette période, cette moustiquaire contribue efficacement à la lutte contre les vecteurs responsables du paludisme. Cependant, ses mailles de 4mm de diamètre ne constituent pas une barrière efficace, pour empêcher le contact homme-anophèles. Etant donné que certains vecteurs ont été trouvés hors de la moustiquaire, le danger reste imminent bien que l'insecticide y afférent soit efficace.

5 CONCLUSION

Au regard des résultats tels que présentés dans le tableau, la moustiquaire imprégnée de la perméthrine à 2% est efficace dans le cadre de la lutte anti vectorielle contre le paludisme. Cependant, après 3 mois d'utilisation sans quelconque lessive, le taux de résistance des *Anophèles gambiae* à cet insecticide devient plus important voire même au-delà de 20%. A cette résistance s'ajoute l'évasion constatée lors du test de rémanence suite au diamètre de la maille (4mm).

Il est urgent à l'heure actuelle où des nombreux pays envisagent de lancer divers programmes de lutte contre le paludisme par l'usage des différentes MII, de mettre en place un réseau de surveillance de la résistance des agents vecteurs de cette endémie et d'évaluer l'efficacité de telle ou telle autre MII ainsi que les insecticides y relatifs.

Ce réseau de surveillance évaluerait l'extension des agents vecteurs suite aux variations climatiques. Ledit réseau ferait le monitoring continu des insecticides ainsi que les MII vulgarisées car, autant le plasmodium développe la résistance aux antipaludiques, les vecteurs résistent de plus en plus aux insecticides.

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ACTIVITE ANOPHELINOCIDE DES EXTRAITS AQUEUX, TERPENIQUES, ET STEROÏDIQUES DES PLANTES *Mentha aquatica* ET *Artemisia annua*

[ANOPHELINOCIDE ACTIVITY OF THE AQUEOUS, TERPENIC AND STEROIDIC EXTRACTS OF THE PLANTES *Mentha aquatica* AND *Artemisia annua*]

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ABSTRACT: *Artemisia annua* and *Mentha aquatica* are plants, the first being an annual plant of variable size and the second in a perennial grass rependu D.R.CONGO. Both are used because of their toxic activity in *Acanthoscelides obtectus* and against *Plasmodium falciparum*. Aqueous extracts, terpene, and steroids from the leaves are equipped with a power that acts anophélinocide for 6 days. The DL100 and the LD50 of total extracts are respectively 0.37g/ml and 0,16g/ml for *M. aquatica*, 0.16g/ml and 0.08g/ml for *A. annua*.

KEYWORDS: activity anophélinocide, aqueous extracts, terpenes, steroids, *Mentha aquatica* and *Artemisia annua*.

RESUME: *Artemisia annua* et *Mentha aquatica* sont des plantes, la première étant une plante annuelle de taille variable et la seconde une herbe pérenne rependue en R.D.CONGO. Toutes les deux sont utilisées suite à leur activité toxique chez *Acanthoscelides obtectus* et contre le *Plasmodium falciparum*. Les extraits aqueux, terpéniques, et stéroïdiques issus de leurs feuilles sont dotés d'un pouvoir anophélinocide qui agit pendant 6 jours. Les DL100 et le DL50 des extraits totaux sont respectivement de 0,37g/ml et 0,16g/ml pour *M. aquatica* ; 0,16g/ml et 0,08g/ml pour *A. annua*.

MOTS-CLEFS: activité anophélinocide- extraits aqueux- terpéniques- stéroïdiques- *Mentha aquatica* et *Artemisia annua*.

1 INTRODUCTION

Le paludisme est une maladie due à un hématozoaire du genre plasmodium transmis à l'homme lors de la piqûre par le moustique femelle du genre anophèle caractéristique de la région intertropicale. Cette maladie entraîne plus de deux millions de décès chaque année dont les enfants en âge pré-scolaire et les femmes enceintes sont les plus affectés avec plus de 15% de mortalité [1]. Les études entomologiques réalisées à Lwiro et ses périphéries (province du Sud –Kivu, RD.Congo) situé à 1750m d'altitude depuis 1998 jusqu'en 2008 font état de six espèces d'anophèles entre autre *Anophèles gambiae*, *Anophèles funestus*, *Anophèles marschalli*, *Anophèles demeilloni*, *Anophèles coustani* et *Anophèles christyi* [2]. Les deux

premières espèces atteignent un taux de prévalence allant jusqu'à 97,5% et sont les vecteurs plus dangereux du plasmodium dans cette aire d'étude et permanentes tout au long de l'année [3].

En RD. CONGO, le paludisme est endémique ; cependant son degré d'endémicité varie d'une région à une autre. A Lwiro par exemple, le niveau d'endémicité du paludisme selon la classification internationale, est compris entre 11% et 50% [4]. Dans cette aire, le paludisme est la cause principale des consultations dont 20% d'hospitalisation sont causés par le paludisme parmi lesquels un taux de 8% est observé d'année en année [4].

La réduction de cette endémie, demande l'intégration des mesures curatives et préventives bien que le parasite responsable de cette endémie est résistant à l'égard de certains médicaments comme la chloroquine [4]. La même résistance est observée chez les vecteurs à l'égard de quelques insecticides considérés comme polluants [5].

Parmi les méthodes préventives du paludisme, l'utilisation des substances capables soit de chasser ou de tuer les anophèles pour briser le cycle de développement des vecteurs contribuerait à la réduction du paludisme. De ce fait, *Mentha aquatica* et *Artemisia annua* contiendraient des principes actifs anophélinocides contre les anophèles adultes, agents vecteurs du paludisme.

Le deux plantes étaient choisies suite à leur activité toxique sur *Acanthoscelides obtectus* et *Sitophilus zeamais*; insectes ravageurs des denrées stockés [6] et l'action des feuilles de *Artemisia annua* L sur le plasmodium [7]. Elles ont été récoltées au centre de recherche de Lwiro situé à 1750m d'altitude à l'Est de la R.D.Congo et identifiées au laboratoire de botanique du même centre.

Mentha aquatica est une herbe pérenne, odoriférante à tige pourpre rampante, s'amincissant aux nœuds de 30 à 50cm de longueur. Les feuilles opposées courtement pétiolées ovales à la base. Les fleurs rosâtre-bleues ou blanches jusqu'à 7mm de longueur. *Artemisia annua* est une plante annuelle très odorante, de taille variable de 20cm à plus de 2m de hauteur. La tige principale est dressée sillonnée –striée avec des rameaux alternes. Ses feuilles glabres à lobes dentées pectinées, les inflorescences terminales sont en panicules globuleuses de 2 à 3mm de diamètre. Les fleurs centrales sont hermaphrodites avec une couleur jaune pâle et les fruits sont des akènes obovoïdes glabres et striés [8].

2 MATERIELS ET METHODES

2.1 MATERIEL VEGETAL ET PREPARATION DES EXTRAITS

Les deux plantes *Artemisia annua* (Asteraceae) et *Mentha aquatica* (Lamiaceae) étaient collectées à la station de Lwiro, province du Sud-Kivu à l'Est de la R.D.Congo en juin 2008 et identifiées au laboratoire de botanique du même centre.

Après séchage, 30g de poudre issus de chaque plante étaient macérés dans 300ml d'éthanol pendant 24heures dans un bœcher. Après filtration, et évaporation du solvant, les résidus étaient analysés par screening phytochimique pour identifier les différents principes actifs contenus dans ces deux plantes et leur teneur [6].

S'agissant des extraits aqueux totaux, 30g de poudre pour chaque plante étaient également macérés dans 300ml d'eau distillée ce qui nous a permis de faire le pré-test.

2.1.1 EXTRAITS TERPÉNIQUES

Les résidus des extraits organiques totaux étaient récupérés dans un mélange d'hexane et d'eau distillée dans la proportion 2:1. Deux phases de solutions, différentes par leurs couleurs se sont créées, puis séparées par décantation étant donné que celle terpénique était émergente et de couleur verdâtre par rapport à la phase aqueuse contenant encore les stéroïdes. La phase terpénique était chauffée, évaporée et les résidus étaient récupérés par l'eau distillée avant de procéder aux différentes dilutions.

2.1.2 EXTRAITS STÉROÏDIQUES

La phase stéroïdique était chauffée et évaporée. Les résidus étaient récupérés dans 5ml de chloroforme puis dilués dans l'eau distillée en vue d'obtenir les différentes concentrations des extraits stéroïdiques. Les papiers disques étaient imprégnés des solutions terpéniques, stéroïdiques de différentes concentrations avant le test d'activité anophélinocide.

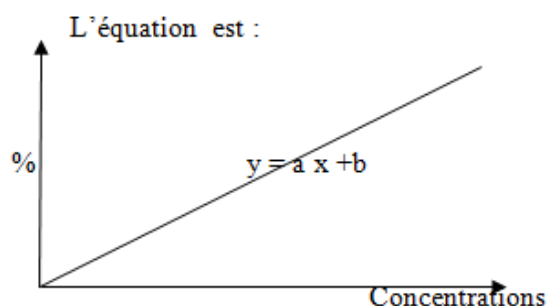
2.2 TEST D'ACTIVITÉ ANOPHÉLINOCIDE

La capture des anophèles dont les deux espèces *Anophèles gambiae* et *Anophèles funestus* était faite dans les maisons d'habitation de Lwiro entre 4h -6h du matin par notre équipe technique du laboratoire d'entomologie médicale outillée des lampes torches, des tubes à essai et l'ouate. L'identification des spécimens était réalisée au sein du même laboratoire [9], suivi du test proprement en utilisant les tubes cylindriques et transparents de 125mm de longueur et 44mm de diamètre ayant le papier disque contenant l'extrait soit de la solution- mère ou celle déjà diluée et où nous exposons les anophèles à tester.

Après exposition pendant une heure, les anophèles testées étaient gardées dans le tube à OMS ne contenant pas d'imprégnation et cela durant 24 heures pour une observation. Le taux de mortalité était évalué après toutes les observations pour se rassurer de l'impact de ces extraits tel que recommande la procédure de WHO [10]. Chaque test répété trois fois était suivi de l'évaluation du taux de mortalité entraîné par tel ou tel principe actif.

2.3 CALCUL DU TAUX DE MORTALITE

Le calcul du taux de mortalité s'effectue à partir de la moyenne de pourcentage pour les différentes expériences réalisées. Après la détermination du taux de mortalité, nous avons calculé le taux de mortalité théorique (DL50 et DL 100) à partir d'une équation de la droite de régression qui traduit la corrélation entre le taux de mortalité et les concentrations de différents extraits de ces deux plantes [10].



3 RESULTATS

Les résultats des extraits aqueux issus de ces deux plantes prouvent que toutes les deux ont une action anophélinocide; cependant *Mentha aquatica* paraît plus efficace à l'égard des anophèles par rapport à *Artemisia annua* tel que présenté dans le tableau1.

Tableau 1: Taux de mortalité moyen à partir des extraits aqueux totaux

Plantes	Anophèles	Test 1	Test2	Test3	Moyenne du taux de mortalité (%)	Concentration en g/l
<i>Mentha aquatica</i>	7	6	5	5	76.2	0.28
	7	1	2	3	28.6	0.028
	7	1	1	1	14.3	0.0028
	7	0	0	0	0.0	0.00028
<i>Artemisia annua</i>	7	1	2	2	23.8	0.04
	7	0	0	0	0.00	0.004
	7	0	0	0	0.00	0.0004
	7	0	0	0	0.00	0.00004
Témoin (eau)	7	0	0	0	0.00	

S'agissant des extraits terpéniques, le constant était le même car les extraits issus de *Mentha aquatica* s'avèrent plus efficaces que issus de *Artemisia annua* nonobstant leur concentration tel qu'on peut le constater dans le tableau 2

Tableau 2: Taux de mortalité moyen à partir des extraits terpéniques

Plantes	Anophèles	Test 1	Test2	Test3	Moyenne du taux de mortalité (%)	Concentration en g/l
<i>Mentha aquatica</i>	7	7	7	7	100.00	0.04
	7	1	1	0	9.5	0.004
	7	0	0	0	0.00	0.0004
	7	0	0	0	0.00	0.00004
<i>Artemisia annua</i>	7	3	4	4	52.4	0.6
	7	0	1	0	4.8	0.06
	7	0	0	0	0.00	0.006
	7	0	0	0	0.00	0.0006
Témoin (eau)	7	0	0	0	0.00	

Quant aux extraits stéroïdiques, le taux de mortalité varie en fonction de la concentration comme on peut le constater dans le tableau 3. Cela se traduit par la similarité constatée entre ces deux plantes à partir du screening phytochimique relevant l'abondance des stéroïdes chez *Mentha aquatica* et *Artemisia annua*.

Tableau 3: Taux de mortalité moyen à partir des extraits stéroïdiques

Plantes	Anophèles	Test 1	Test2	Test3	Moyenne du taux de mortalité (%)	Concentration en g/l
<i>Mentha aquatica</i>	7	2	1	2	23.8	0.03
	7	0	0	0	0.00	0.003
	7	0	0	0	0.00	0.0003
	7	0	0	0	0.00	0.00003
<i>Artemisia annua</i>	7	4	3	4	52.4	0.05
	7	2	1	1	19.1	0.005
	7	0	0	0	0.00	0.0005
	7	0	0	0	0.00	0.00005
Témoin (eau)	7	0	0	0	0.00	

Une fois les différents extraits testés, nous avons déterminé la dose susceptible d'entraîner la mort de 50% et 100% (DL 50 et DL 100) à partir de l'équation de la droite de régression dont l'indice variait en fonction de l'extrait et compris entre 0.9 et 1.

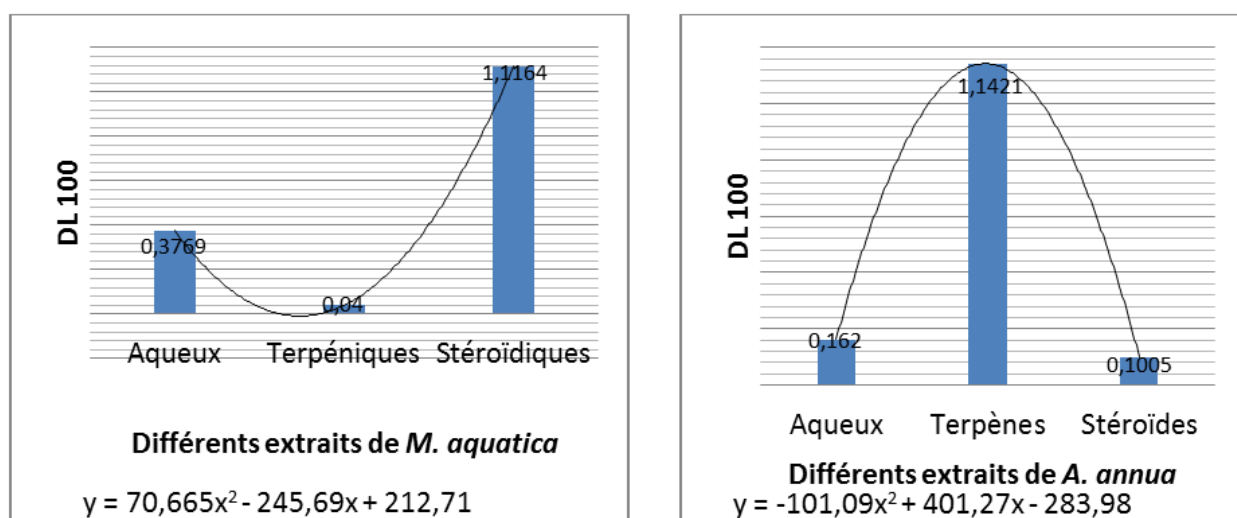


Fig 1 : La plus faible dose qui tue 100% d'anophèles (DL100) pour les extraits issus de ces deux plantes

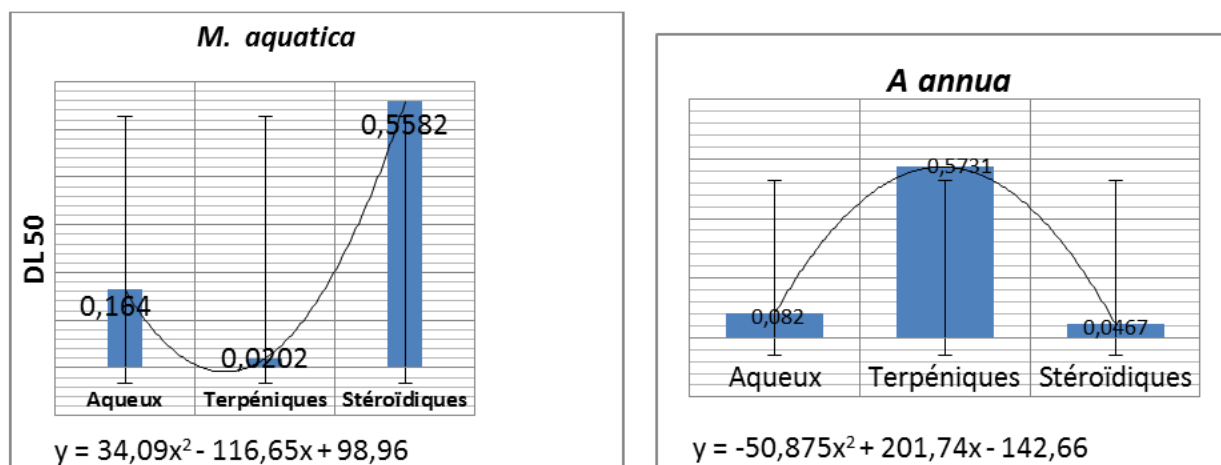


Fig 2 : La plus faible dose qui tue 50% d'anophèles (DL50) pour différents extraits

Légende

DL 100 : dose létale la plus faible qui tue 100% d'anophèles

DL 50 : dose létale la plus faible qui tue 50% d'anophèles.

Y : équation de la courbe de tendance

Au regard de la figure 2 (DL50), le constat est que les doses létales pour *Mentha aquatica* augmentent de terpènes, puis aux stéroïdes et en fin aux extraits aqueux. Ceci signifie que les terpènes manifestent une activité anophélinocide importante car une moindre concentration entraîne une mortalité importante chez les anophèles. Quant à *Artemisia annua*, nous constatons que les doses létales augmentent des stéroïdes puis aux extraits aqueux totaux et en fin aux terpènes; cela se justifie par la proportion plus importante en stéroïdes contenus dans cette plante par comparaison aux terpènes. Le DL100 dans *M aquatica*, les extraits terpéniques sont plus anophélinocides, suivis de ceux aqueux et en fin les extraits stéroïdiques. La faible teneur en stéroïdes dans cette plante explique mieux cette concentration importante à faible activité anophélinocide. Le screening phytochimique de *A annua* relève la présence des terpènes à l'état de trace, ce qui nécessite une concentration importante pour avoir une activité anophélinocide (DL 50 et DL100).

4 DISCUSSION

La lutte antipaludique nécessite l'intégration des mesures curatives ainsi que celles préventives. Le plasmodium présente une résistance face à certaines molécules telle que la chloroquine. Les vecteurs ont également une résistance à l'égard des insecticides [2].

Il est à signaler que l'activité anophélinocide décroît des terpènes aux extraits aqueux et en fin aux stéroïdes car pour *Mentha aquatica* où ses extraits (stéroïdiques) sont présents, les terpènes paraissent plus efficaces à moindre concentration.

Considérant la différence de concentration des extraits contenus dans ces deux plantes, nous comprenons mieux la différence entre elles en termes d'efficacité anophélinocide. Eu égard au tableau 2, nous le remarquons car pour *Mentha aquatica*, 0.04g/ml des extraits terpéniques entraînent la mortalité de 100% tandis que 0.6g/ml issus de *Artemisia annua* tuent 50% pour les mêmes extraits (terpéniques). Ainsi donc, les terpènes issus de *Mentha aquatica* ont une activité anophélinocide importante que ceux extraits d'*Artemisia annua*.

Le taux de mortalité sous l'action de stéroïdes contenus dans *M. aquatica* est dû aux différentes concentrations utilisées pour le DL100 et le DL50 (fig 1 et 2). De ce fait, 0.03g/ml issu de *Mentha aquatica* a un taux de mortalité de 25% tandis que 0.05g/ml extrait *Artemisia annua* entraîne 50% comme taux de mortalité (tableau 3). Le taux de mortalité causé par les stéroïdes ne varie pas en fonction de ces principes actifs issus de telle ou telle plante mais plutôt en fonction de la concentration de l'échantillon utilisé pour chaque plante. Les extraits aqueux totaux de *A. annua* sont efficaces non seulement aux vecteurs mais aussi aux parasites du paludisme [11].

Les extraits aqueux totaux de *Mentha aquatica* ont une activité anophélinocide plus importante par rapport à ceux d'*Artemisia annua*. Ceci se justifie pour deux niveaux: d'abord, c'est *Mentha aquatica* que sont fortement concentrés les

terpènes plus anophélinocides par rapport à *Artemisia annua* mais aussi, l'échantillon de *Mentha aquatica* est plus concentré (0,28g/ml) comparativement à celui de *Artemisia annua* (0,04g/ml).

S'agissant des extraits terpéniques, ils sont non seulement efficaces à très faible concentration mais aussi plus insecticide que les extraits stéroïdiques en général (tableaux 2 et 3).

L'utilisation des extraits aqueux, terpéniques et stéroïdiques issus de ces deux comme anophélinocides, contribuerait à la réduction des vecteurs du paludisme, car ces extraits ont une activité toxique contre *Sitophilus zeamais* et *Acanthoscelides obtectus*, insectes ravageurs des denrées stockées [6].

5 CONCLUSION

Ainsi donc, l'utilisation extraits terpéniques de ces deux plantes pallierait aux insecticides qui restent par ailleurs coûteux. Cela contribuerait à la lutte contre les vecteurs pour réduire la prévalence du paludisme dans notre région et partout ailleurs où cette endémie décime la population.

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Détermination de la résistance des *Anopheles gambiae* vis-à-vis de quelques insecticides à Lwiro et ses environs

[Determination of the resistance of *Anopheles gambiae* towards of some insecticides at LWIRO and its surroundings]

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ABSTRACT: Larva of *Anopheles gambiae* ss were collected in the sites at Lwiro and the surrounding areas, to study the sensibility and resistance of these vectors in front of four insecticides in the entomology laboratory of medicine and parasitology, CRSN-Lwiro. The test was carried on the adult female vectors, twenty five individuals whose age ranged from two and five days. Indeed, this test concerned four insecticides mainly perméthrine (0.75%), deltaméthrine (0.05%) two components of pyrethrinoides, malathion (5%) and lambdacyhalothrine (0.05%) largely used in public health for the vectorial control. After more tests, all the *Anopheles* population have been noticed sensible to all the precited insecticides. Within an hour of test, *Anopheles gambiae* presented a certain resistance to deltamethrine with a rate of mortality of 46.6%. Twenty four hours after, the rate of resistance for anopheles raised to 95.5%. Statistically, at .05, between permethrine, malathion and lambdacyhalothrine, the difference is not significant in term of resistance. However, the deltamethrine compared to the three insecticides cited above, displays a significant difference and the vectors are resistant. The vectors of malaria may display a certain resistance to the insecticides owing to their origin and concentration.

KEYWORDS: status, resistance, sensibility, *Anopheles gambiae*, insecticides.

RESUME: La sensibilité et la résistance des *Anopheles gambiae* face à quatre insecticides ont été étudiées au laboratoire d'entomologie médicale et parasitologie de Lwiro, à l'est de la République Démocratique du Congo. Ce travail portait sur la perméthrine (0,75%), la deltaméthrine (0,05%), deux composés pyrethrinoides ; le malathion (5%) et le lambdacyhalothrine (0,05%), utilisés en santé publique. L'objectif était d'établir leur importance opérationnelle, pour une lutte anti vectorielle efficace contre le paludisme. Les larves d'anophèles ont été pêchées dans les gîtes de Lwiro et ses environs où le paludisme sévit de façon permanente. Les tests de sensibilité ont porté sur les vecteurs femelles adultes dont l'âge variait entre 2 et 5 jours. La population anophélienne sur qui portait le test, était totalement sensible à ces insecticides. Cependant, à une heure, la résistance est conférée à la deltaméthrine avec un taux de mortalité égal à 46,6%. Vingt quatre heures après, face à ce même insecticide, la résistance était susceptible d'être confirmée avec 95,5% de taux de mortalité. Statistiquement, au .05, entre la perméthrine, le malathion et lambdacyhalothrine, la différence n'est pas significative en termes de résistance. La deltaméthrine en comparaison avec les trois précités, a une différence significative et les vecteurs lui sont résistants. L'origine et concentration de ces insecticides peuvent leur conférer une éventuelle résistance face aux vecteurs du paludisme. Il revient de faire une surveillance épidémiologique des moustiquaires pré imprégnées, de la population

anophélienne et de différents insecticides, car bon nombre de vecteurs développent du jour le jour un arsenal enzymatique sélectif pour la tolérance et résistance à quelques insecticides.

MOTS-CLEFS: Statut, résistance, sensibilité, *Anophèles gambiae ss*, insecticides.

1 INTRODUCTION

La malaria est une endémie caractéristique de la zone intertropicale, due à un hématozoaire du genre plasmodium, transmis à l'homme lors de la piqûre par le moustique femelle du genre anophèles. Cette maladie entraîne plus des deux millions de décès chaque année et plus observée chez les enfants à bas âge et chez les femmes enceintes chez qui plus de 15% de mortalité sont dus au paludisme [1]. Cette endémie en R.D.Congo, connaît un degré d'endémicité variant d'une région à une autre. A Lwiro par exemple, le niveau d'endémicité du paludisme selon la classification internationale caractérisée par le taux de parasite est compris entre 11% et 50% [2].

Dans notre zone d'étude, six espèces d'anophèles : *Anophèles gambiae*, *Anophèles funestus*, *Anophèles marschalli*, *Anophèles demeilloni*, *Anophèles coustani* et *Anophèles christyi* sont présentes. Les deux premières espèces atteignent un taux de prévalence allant jusqu'à 97,5% et sont les vecteurs les plus dangereux du plasmodium dans cette aire d'étude et permanentes tout au long de l'année [3].

Dans le monde entier, les insecticides sont de plus en plus employés à des fins de santé publique, soit pour arrêter la transmission de grandes endémies, soit en hygiène urbaine pour faire disparaître les insectes vulnérants, qu'ils soient ou non vecteurs des maladies. Cet emploi massif d'insecticides a rapidement entraîné, en de nombreux points du globe, l'apparition de populations d'insectes résistantes aux insecticides employés, nécessitant un remaniement important des campagnes en cours, et parfois même leur abandon.

Le comité des Experts des insecticides de l'organisation Mondiale de la Santé a donné de la résistance la définition de la résistance comme étant l'apparition, dans une souche d'insectes, de la faculté de tolérer des doses de substances toxiques qui exerceraient un effet létal sur la majorité des individus composant une population normale de la même espèce.

Le développement de la résistance des populations d'anophèles aux pyréthrinoides, est devenu récurrente, entraînant la prolifération du paludisme [4]. L'émergence de la résistance des populations d'*Anophèles* aux insecticides utilisés en santé publique a été reportée dans bon nombre des pays africains [5].

2 METHODOLOGIE

2.1 SITUATION GÉOGRAPHIQUE DE LA ZONE D'ÉTUDE

L'étude était réalisée au Centre de Recherche en Sciences Naturelles de Lwiro. Dans cette zone d'étude, le paludisme y est observé de façon endémique [2]. Ce centre se trouve dans le territoire de Kabare, province du Sud-Kivu en République Démocratique du Congo. Les coordonnées du centre sont pour la longitude 28° 48'50,7" Est et latitude 2°14'25,5" Sud et à 1750m d'altitude. Cette aire a un climat tropical humide qui est caractérisé par une précipitation allant à 1500mm/an et la température qui varie entre 18° et 20°c [6].

Deux saisons y sont caractéristiques : la saison des pluies allant de septembre à mai soit 9 mois et la saison sèche s'étend sur trois mois soit de juin jusqu'en Août. Le mois de janvier étant marqué par des petites précipitations.

Le choix de ce milieu d'étude se justifie par le fait que, le paludisme y est observé de façon récurrente et la permanence inquiétante des *Anophèles* en dépit de la vulgarisation des moustiquaires pré-imprégnées.

2.2 COLLECTE D'ANOPHÈLES

Les larves d'anophèles furent pêchées dans les gîtes de Lwiro et ses environs. La pêche larvaire a eu lieu dans quelques localités telles que Kayandja, Nyakadaka, Bishibiru, Maziba, Lwiro, Buloli et Cegera dès mi-juillet jusqu'en septembre 2011. Sur terrain, nous avons utilisé les poires aspirantes, les louches, les tubes à essai, et les assiettes plates. Une fois au laboratoire, les larves étaient identifiées par l'usage de la clé de détermination [7], en se servant du microscope optique du type Wilkx 100x, les verres de montre et des lames. Les *Anophèles gambiae* une fois identifiées, étaient gardées dans des cages où elles ont achevé leur cycle de développement jusqu'au stade d'imago. Les mâles étaient nourris au sucre ordinaire.

Les femelles d'anophèles sur qui portait le test, furent nourries non seulement au sucre, mais aussi au cobaye placé dans un dispositif ne lui permettant pas d'effectuer des mouvements et cela 48h avant le test.

2.3 TEST DE RESISTANCE AUX INSECTICIDES

Les moustiques femelles d'*Anophèles gambiae* ss ayant l'âge compris entre 2 à 5 jours étaient placés dans des tubes à OMS contenant des papiers disques buvards pré-imprégnés des différents insecticides tel que prescrit le protocole de test standard [8,9]. Les insecticides utilisés à cet effet étaient la Permethrine (0,75%), le Malathion (5%), la Deltaméthrine (0,05%), le Lambdacyhalothrine (0,05%). La sélection de ces insecticides s'explique par le fait que ce sont eux les plus utilisés dans des moustiquaires pré-imprégnées vulgarisées dans le cadre de la prévention contre le paludisme dans notre zone d'étude. Dans chaque tube contenant le papier pré-imprégné, 25 *Anophèles gambiae* femelles y étaient testés. Le dépouillement de la résistance fut réalisé toutes les 5 minutes jusqu'à la soixantième minute (une heure) pour évaluer le temps de l'effet de choc « knock-down » de ces vecteurs. Le score de résistance ou de mortalité était confirmé 24 heures après chaque exposition des vecteurs aux insecticides. Pour chaque test, cinq tubes étaient utilisés parmi lesquels, quatre contenaient les papiers disques contenant divers insecticides et un autre tube témoin contenant le même nombre d'anophèles, mais contenant seulement les papiers imbibés au glucose. Une heure après le test, les moustiques étaient récupérés dans un autre tube contenant du coton. Vingt-quatre heures après, le taux de mortalité et la détermination de la résistance des anophèles furent réalisés tel que le recommande notre protocole.

2.4 TRAITEMENT ET ANALYSE DES DONNÉES

Une comparaison en termes de résistance et sensibilité des moustiques aux différents insecticides était réalisée. La résistance des vecteurs aux insecticides était évaluée suite aux critères standards pour cette population anophélienne. La résistance des vecteurs face à tel ou tel autre insecticide est confirmée pour un taux de mortalité inférieur à 80%. Lorsque le taux de mortalité des vecteurs va de 80 à 98%, ceci explique une tolérance des vecteurs à l'insecticide 24h après chaque test [9]. Le temps de l'exposition susceptible d'entraîner 50 à 95% ($Kd_{T_{50}}$ et $Kd_{T_{95}}$) de choc pour la population anophélienne testée était mis en évidence [10]. L'analyse s'est effectuée par le logiciel Excel, Epi-info pour évaluer la résistance des *Anophèles gambiae* ss aux insecticides testés.

Le test de student « z » était utilisé sur différents pourcentages à partir des formules ci-dessous :

$$\sigma P = \sqrt{\frac{P1(100-P1)+P2(100-P2)}{n-1}} \quad \text{et} \quad zC = \frac{P1-P2}{\sigma P}$$

Avec σP : écart type; **P1 et P2**: différents pourcentages, **n** = taille de l'échantillon

3 RESULTATS

La pêche larvaire suivie de l'identification était faite avant que le test ne soit réalisé à l'égard des insecticides. Le test fut réalisé quatre fois pour chaque insecticide avec le même nombre d'*Anophèles gambiae*. Chaque test était accompagné de celui témoin pour évaluer la résistance des vecteurs. Malathion à 5% et lambdacyhalothrine à 0,05% entraînent un taux de mortalité de 100%, une heure après le test. La résistance (R) des vecteurs se traduit par un taux de mortalité inférieure à 80% ; l'efficacité (S) est conférée à l'insecticide pour un taux de mortalité supérieur à 98% et le taux de mortalité situé entre 80 et 98% (RC) pour une résistance susceptible d'être confirmée [9].

Tableau 1 : Pourcentage de mortalité des *Anophèles gambiae* ss

Insecticides	30'	45'	60'	24h
Permethrine	57,7	57,7	91,1	100
Malathion	60	88,8	100	100
Deltamethrine	17,7	44,4	46,6	95,5
Lambdacyhalothrine	64,4	93,3	100	100

Il ressort du tableau 1 que, la lambdacyhalothrine présente une grande efficacité comparativement aux autres insecticides testés malgré sa faible concentration (0.05%). Les vecteurs responsables de la transmission du paludisme dans

notre région sont résistants [9] à la deltaméthrine (à 0.05%), un insecticide contenu dans bon nombre des moustiquaires vulgarisées dans la région.

Tableau 2 : Sensibilité et résistance des vecteurs aux insecticides

Timing	Permethrine		Malathion		Deltamethrine		Lambdacyhalothrine	
	% de mortalité	C/WHO	% de mortalité	C/WHO	% de mortalité	C/WHO	% de mortalité	C/WHO
30'	57,7	R	60	R	17,7	R	64,4	R
45'	57,7	R	88,8	RC	44,4	R	93,3	RC
60'	91,1	RC	100	S	46,6	R	100	S
24h	100	S	100	S	95,5	RC	100	S

Légende :

%: pourcentage

C/WHO: Classification de WHO

R : Résistance des vecteurs (taux de mortalité inférieur à 80%)

RS : Taux de mortalité situé entre 80 et 98%

S : Satisfaction ou efficacité de l'insecticide (à 100%)

Au regard des résultats du tableau 2, les vecteurs disposent d'une potentielle résistance face à la deltaméthrine. Cet insecticide étant plus utilisé dans l'imprégnation des moustiquaires, le risque dû au paludisme, reste imminent pour la population vivant dans la zone intertropicale.

4 DISCUSSION

Partant du classement de résistance [9], le malathion à 5% et le lambdacyhalothrine à 0,05% entraînent au regard du timing expérimental, la même mortalité. A 30' de test, *Anophèles gambiae* est résistant en face de ces deux insecticides en dépit de leurs différences de concentration. Lambdacyhalothrine bien qu'ayant la même concentration que le deltaméthrine (0,05%), présente un effet insecticide plus important et serait donc plus recommandée en cas de pré-imprégnation des moustiquaires utilisées contre la malaria. Le DDT jadis utilisé, se heurte à des résistances pour beaucoup des vecteurs. *Anophèles gambiae* est résistant à 30 minutes face à la perméthrine (0,75%), une potentielle résistance une heure après. Ces résultats sont similaires aux expériences réalisées sur *Anophèles arabiensis* [11]. Cette étude montre que les insecticides couramment utilisés en santé publique agissent différemment sur la faune anophélienne. La résistance de ces vecteurs fut constatée également face non seulement au DDT mais aussi à la dieldrine [12]. Les premières observations concernant *Anophèles gambiae* résistant à l'action de la dieldrine ont été faites dans l'ouest du Sokoto au Nord du Nigeria [13]. *Anophèles gambiae* résiste non seulement face au DDT et à la dieldrine, mais aussi, cette résistance était observée face à la perméthrine (0,05%), lors d'une étude faite à Gaschiga au Cameroun où la mortalité est inférieure à 70% [11]. *Anophèles gambiae* et *Culex quinquifasciatus* font objet de résistance à l'égard non seulement de la deltaméthrine mais aussi de la dieldrine, la perméthrine et le DDT [14]. Une heure après, au .05 la différence est significative entre la deltaméthrine et comparativement aux trois autres insecticides. Entre la perméthrine (91,1%) et deltaméthrine (46,6%), $z_c=1,4$ tandis que $z_t=\pm 1,15$. La perméthrine par comparaison au malathion et Lambdacyhalothrine, au .0, 05 la différence n'est pas significative.

5 CONCLUSION

La sensibilité et la résistance des vecteurs du paludisme à l'égard de quatre insecticides, montre le danger auquel la population humaine en zone intertropicale reste exposée. Cela se justifie par le fait que, les grands vecteurs du paludisme développent des résistances à différents insecticides au fil des années. La perméthrine et la deltaméthrine plus utilisées dans les moustiquaires pré-imprégnées et vulgarisées dans la région, montrent certaines limites dans la réduction des vecteurs du paludisme. Les observations éthologiques des *Anophèles gambiae* et autres vecteurs face aux différents insecticides méritent d'être effectuées de façon régulière pour prévenir une quelconque catastrophe, liée à la résistance. Soulignons par ailleurs que, les stratégies basées sur l'usage des moustiquaires pré-imprégnées à évaluer de façon semestrielle devraient intégrer l'évaluation de la résistance pour le choix, la concentration et le changement des molécules avec l'étude de ces impacts sur le plan écologique.

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Investigation of Selected Heavy Metal Concentration in the Groundwater of Coal Camp and Abakpa Nike, Enugu, Nigeria

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ABSTRACT: The presence of heavy metals in water is widespread, affecting hundreds of cities. In high dosages, these heavy metals are toxic to human, even deadly. The study was therefore aimed at investigating the heavy metal concentration on the groundwater of Enugu. Three (3) groundwater samples each were collected from Coal Camp and Abakpa Nike and the samples acidified with drop of nitric acid before it was sent for analysis at Union Recycling Plant, Ibeto Group of Companies, Nnewi, Anambra State. The analyzed heavy metals are: As, Cr, Pb, Fe, Zn, Cu, Mg, Cd and Hg. The results revealed heavy metal contamination of the groundwater of the area. The study tested whether there is significant difference between the selected heavy metals concentration from that of W.H.O standard. When compared with WHO standard, As, Cr, Pb and Hg of the groundwater of Coal Camp showed significant difference, whereas that of Abakpa Nike showed no significant difference with the standard. To remediate the effects of the polluted water in some parts of the area, it is recommended that a systematic study of the heavy metals concentrations in groundwater sources should be carried out regularly. This is very imperative as the inhabitants of the area depend on groundwater for drinking purposes. More importantly, mass awareness should be generated about the effects of improper and careless waste disposal on water quality and human health.

KEYWORDS: industrial, Pollutants, contamination, health, safety.

1 INTRODUCTION

Water is a marvelous substance flowing, rippling, swirling around obstacles in its path, seeping, dripping, trickling, and constantly moving. According to Miller [1], we live on a water planet. Current estimate indicates that the total volume of water on earth is 1.4×10^6 km, 97.3% of which is ocean and seawater and the rest 2.7% is freshwater [2]. For all practical purposes, it is surface water and part of groundwater amounting to 1% of total freshwater that constitutes the basic available supply for man. Thus, it is one of the scarcest resources, it is one of the essential requirements of human life, without which survival is not possible.

Groundwater is essential for human survival [3]. Groundwater supplied for human consumption should not only be safe but also wholesome [4]. [4] defined safe and wholesome water as water that is free from pathogenic agents; free from harmful chemical substances, pleasant in appearance, odour and taste; and usable for domestic purposes. The negative aspects of water signify adversity, and its total absence, inadequacy or poor quality has a direct effect on the health of the people and the environment all over the world [1]. The primary adverse human impact on water is felt in the area of water quality.

Groundwater supply is contaminated from natural source and/or anthropogenic sources and can be interrupted by chemical, biological or physical contaminants from industries, agricultural wastes, non-point source pollution and spills [5]. The most chemicals involved are petroleum, hydrocarbons, solvents, pesticides, and heavy metals. The occurrence of this phenomenon is correlated with the degree of industrialization and intensities of chemical usage [6]. Consequently, various levels of wastes in different states, including solid, liquid and gaseous, are released into the environment at discrete intervals

or on continuous basis. These pollutants and contaminants, which may have short or long half-lives in the environment, have continued to damage the environment, having defied many painstaking control programs [7].

1.1 STUDY PROBLEM

Coal Camp is an industrial area in Enugu State, with abundance of auto-repair and servicing outlets and their associated businesses. Metallic materials like engine blocks, pistons, rings, rim; plastic products like fan belts and other numerous associated automobile parts, motorcycles, tricycles, refrigerators and air conditioners abound. Thinners paints, and sprays which are made of lead, chromium, cadmium etc and used or spent fuel and oil are carelessly discarded and dumped on the soil and ground. Similarly, Abakpa Nike is the largest town in Enugu State with its attendant population and waste generation. Wastes are disposed carelessly in open dump and left to accumulate and pose serious threat to the environment. These include household wastes, medical wastes and others.

These products are left on the open space; rain continuously falls on them, resulting to rusting and corrosion. The resultant particles are washed by flowing rainwater giving rise to pollutants movement via the hydrologic environment. These seep or percolate into the groundwater or carried to the nearby surface water bodies giving rise to groundwater pollution. These materials are rich in heavy metals e.g. paint which is made of lead, a carcinogen and mutagen as well.

Detailed field visits to the areas revealed careless way of living and the handling of wastes by the people of the area. This poses a serious threat to the groundwater of the area and hence the health of the inhabitants. Refuse dumps with their numerous potential pollutants are scattered/littered around the place. These dumps are rich in both organic (rubbish and garbage) and inorganic wastes (chemicals, plastics, electronics, cosmetics containers, aerosols, rusted roofing materials, etc) with its attendant leachates. Pit toilets and septic/soakaway pits are sited near wells and boreholes, most times in the same compound without observing W.H.O recommendation of at least 30m distance from water sources. These pit toilets / soak away are serious pollution source as leakages normally find their way into the groundwater sources and pollute them, thereby affecting human health negatively.

Coal Camp and Abakpa Nike are underlain by Ajali Sandstone and Mamu Formation respectively. Each of them is a Sandstone formation of loose and unconsolidated particles and thus have high porosity and permeability. According to [8], the porosity of Ajali Sandstone is 28% with a hydraulic conductivity value of 0.0049cmk/sec. This means that the groundwater of the place must be under a serious threat, as pollutants, with time, will eventually flow with ease through these formations, considering the hydrogeopollution circle. Groundwater is the major source of domestic water supply in the place. This includes boreholes and wells. Sequel to the above, there is need to assess the quality of groundwater of the study area so as to know the suitability of ingesting it.

The aim of this paper is to investigate selected heavy metal concentration in the groundwater of Enugu. To achieve this aim, the following objectives must be pursued:

- to establish the concentration in mg/l of the selected heavy metal in the groundwater samples;
- to establish if there was significant difference between the groundwater samples from that of W.H.O standards
- to establish if there was significant difference between the groundwater concentrations of Coal Camp from that of Abakpa Nike.

1.2 AREA OF STUDY

Coal Camp is found in Enugu South Local Government Area of Enugu State in the Eastern part of Nigeria. It lies within Latitude 6°30N and Longitude 37°20E. It is bordered on the North by Ogbete, to the west by Garki, to the East by Uwani and to the south by Awkunanaw. Abakpa Nike is found in Enugu East Local Government Area. It lies within latitude 6°32N and longitude 7°32E and is bordered on the North by Trans-Ekulu, to the west by New Haven, to the East by Iji Nike and to the south by Emene (www.enugustate.gov.ng, accessed 23.11.2012). See fig 2 and 3

The town lies within the humid tropical rainforest belt, which has two climatic seasons; the wet season and the dry season. The wet season is experienced from the month of March to October while the dry season is November to February. The dry season is marked by dry and dusty air, which causes high evapo-transpiration rate and lowering of water tables. The rainy season is characterized by heavy downpour accompanied by thunderstorms, heavy flood, soil leaching, extensive sheet out wash, and groundwater infiltration and percolation [9].

The rainfall of the study area is tropical with an average yearly rainfall of 1478mm. the average daily minimum temperature is 32°C. The relative humidity for wet months is 90% while the dry months of November – February have 60 – 70% [9].

1.3 HYDROGEOLOGY OF THE AREA

The hydrologic units within the study area includes confined, semi-confined water table and perched aquifers. Confined conditions exist over the Ajali Sandstones and also in the Mamu Formation where overlying Ajali Sandstones are considerably reduced in thickness or eroded. Semi-confined situation exist in places and usually comprises inter-bedded thick sequence of sand (aquifer) and sandy clayey-sand aquicludes. Unconfined aquifers units in the study area occur mostly in the Ajali Sandstone and represent sections of the Formation where semi-permeable or impermeable cap beds have either been eroded or they are absent. The thickness of these aquifer units vary from shallow to deep in some places (www.enugustate.gov.ng// geology; assessed 28.09.2012). Coal Camp and Abakpa Nike are underlain by Ajali Sandstone and Mamu Formation respectively. Each of them is a Sandstone formation of loose and unconsolidated particles and thus have high porosity and permeability.

1.4 THEORETICAL/CONCEPTUAL FRAMEWORK OF THE STUDY

The theoretical basis of this paper takes a cue from the hydrogeopollution cycle. This encompasses hydrologic and geologic cycle and emphasizes structure, interrelationships within and between different aspects of the environment. Hydrologic cycle is an open system with the input of energy from the sun and matter it has eight sub-systems namely: precipitation, interception, percolation, overland flow, evapotranspiration, evaporation and condensation [7].

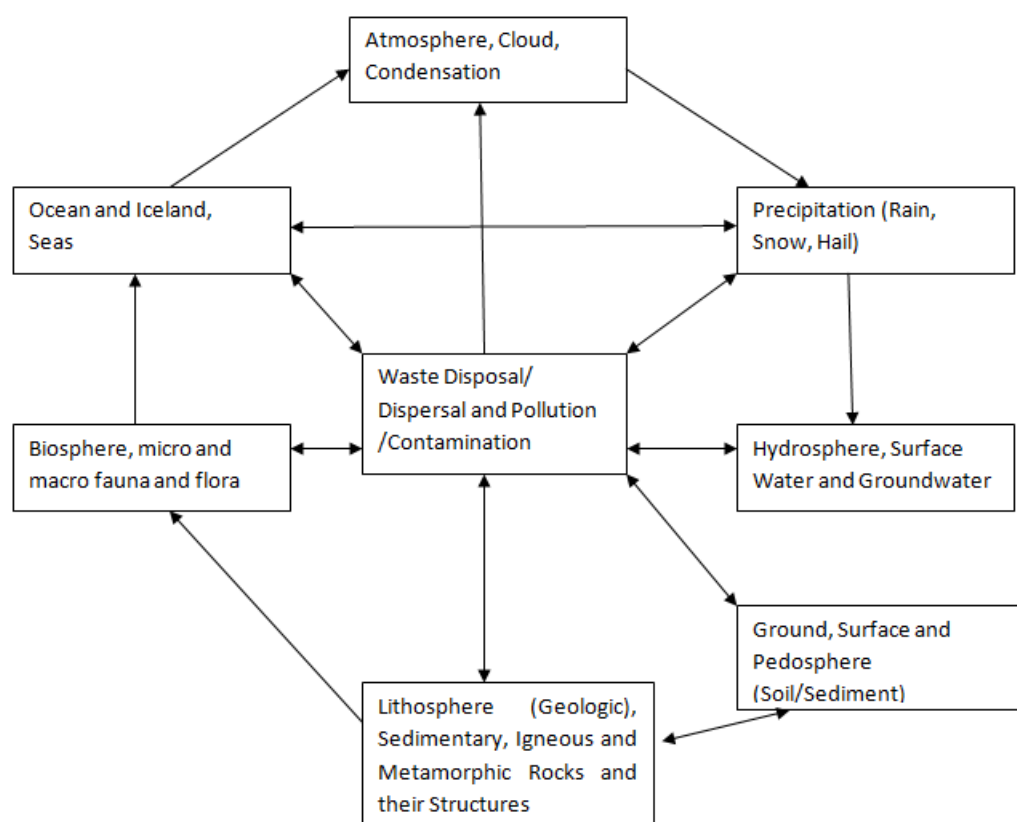


Fig.3: The Hydrogeopollution Cycle (after Egboka et al, 1989)

The mismanagement of the system means the entry of pollutants into the hydrologic cycle from the geologic cycle through leaching (percolation), precipitation of atmospheric pollutants as acid rain, etc. According to [10], the cycle is the endless circulation of water between the ocean, atmosphere and land, which is driven by sun's energy. Some of the evaporated water is returned as precipitation, part of which is rapidly evaporated back into the atmosphere. Some drain into lakes and rivers to commence a journey back to the sea. Some infiltrates into the soil and later percolates to become groundwater. Groundwater is subsurface water that fills voids in geologic formations [7]. The hydrodynamics of the surface and groundwater are linked inextricably. In all the stages of the hydrological cycle; pollutants and contaminants may be introduced and cyclically dispersed from one point to another. Sources of pollution are either point source or distributed (diffused). Point sources of contamination are geographically defined; can be mapped; and are discernible in size, shape and location. Distributed sources are usually widespread throughout a large area with difficult boundaries to define. From the foregoing, therefore it is quite clear that the proper understanding of the migration of pollutants/contaminants will stem from the understanding of the hydrogeopollution cycle, part of which is the lithosphere.

2 MATERIALS AND METHODS

In selecting water samples for laboratory analysis, samples of water (well) were collected from 3 points along the mechanic workshops in Coal Camp. Also, 3 water samples were collected from the area chosen in Abakpa Nike, Enugu. The sampling points were selected based on the settlement pattern, that is on the location of wells around the site. Samples of water were preserved by adding drops of nitric acid at PH<2 (APHA,1995) and stored below 4°C in a refrigerator prior to analysis. All collected samples were transported to Union Recycling Plant, Ibeto Group of Companies, Nnewi, Anambra State laboratory for analysis.

Students T-test was used to test whether there is significant difference between the heavy metal concentrations of the area from that of W.H.O Standard for drinking water and also, whether there is significant difference between the groundwater concentrations of Coal Camp from that of Abakpa Nike.

3 RESULTS

The distribution of heavy metal of the groundwater samples are presented below:

Table 1: Heavy Metal concentration of Coal Camp groundwater samples of Coal Camp

Parameters	SS1	SS2	SS3	Mean	Max acceptable conc. (WHO)	Max. acceptable conc. (NAFDAC)
Arsenic	0.05	0.08	0.03	0.05	0.01	0.0
Chromium	0.90	0.79	0.829	0.836	0.05	-
Lead	0.41	0.87	0.78	0.673	0.01	0.0
Iron	0.11	0.91	0.02	0.346	0.3	-
Zinc	2.02	3.89	1.97	2.646	5	5
Copper	0.98	1.25	0.43	0.886	1	-
Magnesium	8.22	12.11	11.94	10.75	50	30
Cadmium	0.005	0.028	0.001	0.011	0.003	0.0
Mercury	0.028	0.057	0.036	0.211	0.001	0.0

Source: Author's Field Work (2012)

Table 1 shows that the arsenic values were above WHO stipulated standard with SS1 having a concentration of 0.05mg/l; SS2 0.08mg/l and SS3 0.03mg/l. the readings for chromium were all beyond acceptable threshold with SS1 having 0.90mg/l, followed by SS3 at 0.82mg/l and SS2 0.7mg/l. Lead, iron, copper, cadmium and mercury were found to be above the standard, with SS2 having the highest concentration at 0.87, 0.91, 1.25, 0.028 and 0.057 respectively. zinc and magnesium were found to be below the standard in all three sites. Values for zinc are 2.02, 3.89 and 1.97 respectively for SS1, SS2 and SS3. Magnesium concentration were 8.22, 12.11 and 11.94 respectively for SS1, SS2 and SS3.

Table 2: Heavy Metal concentration of groundwater samples of Abakpa Nike

Parameters	SS1	SS2	SS3	Mean	Max acceptable conc. (WHO)	Max. acceptable conc. (NAFDAC)
Arsenic	0.05	0.02	0.01	0.026	0.01	0.0
Chromium	0.62	0.18	0.04	0.28	0.05	-
Lead	0.98	0.09	0.34	0.47	0.01	0.0
Iron	0.88	0.18	0.42	0.49	0.3	-
Zinc	2.03	3.69	2.67	2.796	5	5
Copper	0.52	0.38	0.92	0.606	1	-
Magnesium	22.48	8.27	16.08	6.373	50	30
Cadmium	0.006	0.001	0.003	0.003	0.003	0.0
Mercury	0.09	0.01	0.03	0.043	0.001	0.0

Source: Author's Field Work (2012)

Table 2 again shows that the arsenic values were above WHO stipulated standard, with SS1 and SS2 having a concentration of 0.05mg/l; SS2 0.02mg/l and is equal to the standard in SS3 with 0.01mg/l. The readings for chromium were all beyond acceptable threshold in SS1 and SS2 having a concentration of 0.62 and 0.18mg/l and is below in SS3 with 0.04mg/l. Lead, iron, cadmium and mercury were found to be above standard with SS2 having the highest concentration at 0.98, 0.88, 0.006 and 0.09 respectively. zinc, Copper and magnesium concentrations were below the WHO standard in the three sites. Zinc concentrations were with 0.52mg/l, 0.38mg/l and 0.92mg/l for SS1, SS2 and SS3 respectively. zinc and magnesium were found to be below the standard in all three sites. Values for zinc are 2.03mg/l, 3.69mg/l and 2.26mg/l; copper are 2.02mg/l, 3.89mg/l and 1.97mg/l; and magnesium 22.48mg/l, 8.827mg/l and 16.08mg/l respectively for SS1, SS2 and SS3.

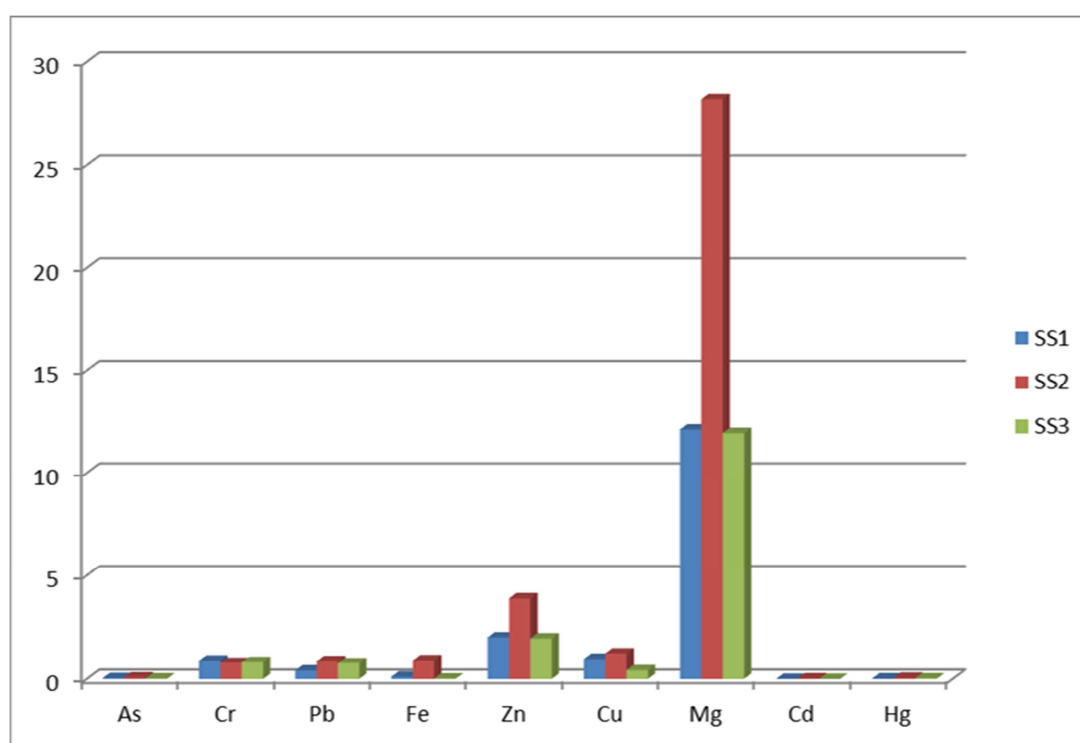


Fig 4. Heavy Metal distribution of Coal Camp Groundwater.

Source: Author's Field Work. Laboratory Analysis(2012)

Fig.4 shows that in the groundwater of Coal Camp, magnesium was shown to have the highest concentration, followed by Zinc, Copper, Iron, lead, chromium, arsenic, mercury and cadmium.

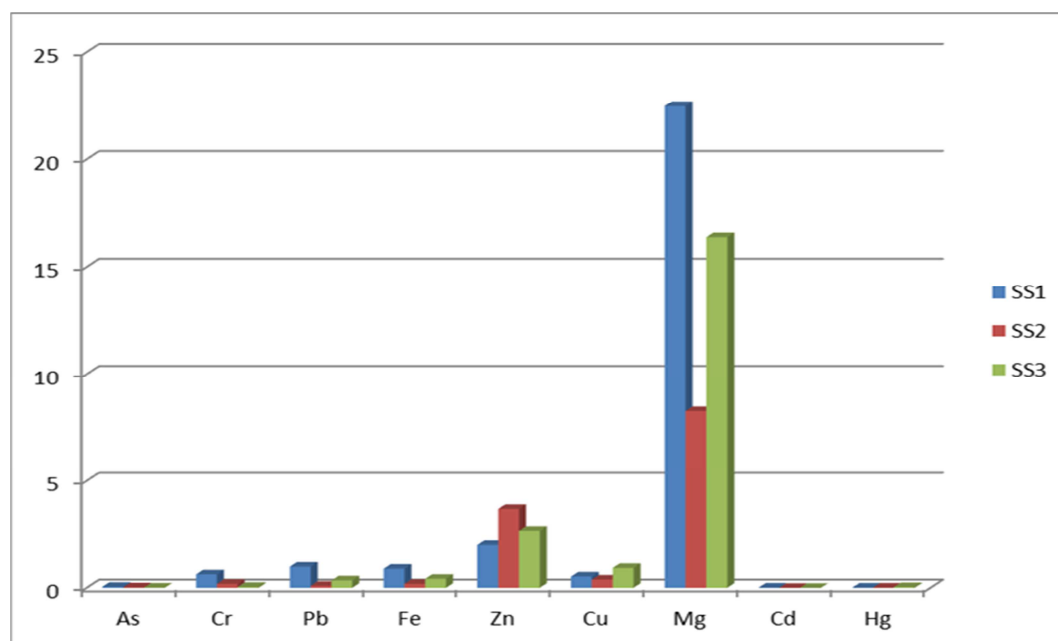


Fig. 5 Heavy Metal distribution of Abakpa Nike Groundwater.

Source: Author's Field Work. Laboratory Analysis(2012).

Fig.5 shows that in the groundwater of Abakpa Nike, magnesium has the highest concentration, followed by zinc, lead, copper, iron, chromium, arsenic, mercury and cadmium.

4 DISCUSSION OF FINDINGS

From hypothesis 1, In Coal Camp, arsenic, chromium, lead and mercury were significantly above WHO standard ($t_{cal} > t_{tab}$), thus we reject H_0 and accept the alternative hypothesis (H_1) for them, all at 95% confidence limit. We accept H_0 for iron, zinc, copper, magnesium and cadmium as there was no significant difference with WHO standards ($t_{cal} < t_{tab}$). However, in Abakpa Nike, however, we accept H_0 for all the other analyzed elements as there was no significant difference with WHO standards.

The empirical higher concentration of the metals in the groundwater signifies contamination and hence implies its unfitness for consumption, as groundwater seems to be the main supply of domestic water in developing countries [8]. The distribution showed

$Mg > Zn > Fe > Pb > Cu > As > Cr > Hg > Cd$ in Coal Camp, while it is as follows:

$Mg > Zn > Fe > Pb > Cu > Cr > As > Cd > Hg$ in Abakpa Nike. The consistent higher concentrations of the sampled heavy metals in the groundwater of Coal Camp compared to that of Abakpa Nike, and hence, increasing concentration of the metals in the ground water can be attributed to automobile wastes being more concentrated with heavy metal than that of household, medical wastes as seen in that of Abakpa Nike dumpsite. From hypothesis 2, there was significant difference in the heavy metal properties of Coal Camp from that of Abakpa Nike at ($P < 0.05$), thus we reject the null hypothesis and accept the alternate hypothesis. The presence of metals such as arsenic, lead, chromium, mercury calls for serious concern as these metals are highly deleterious to human health and safety [11], [12].

5 CONCLUSION

The results of the study reveal that some of the heavy metal concentration in the groundwater sources in the area is high in some locations. This calls for serious concern, as the levels of contamination needs remediation. To remediate the effects of the polluted water on the health of the inhabitants, the authorities concerned should designate a properly engineered landfill in the area, putting into consideration the groundwater and its flow directions. There is need to also establish functional and operational waste disposal mechanisms in the area with sanitation inspectors recruited with strict enforcement of sanitary bye-laws. More importantly, systematic study of the heavy metals concentrations in groundwater

sources in the area should be carried out regularly. This is imperative since groundwater is the main supply of domestic water supply in developing countries, of which Nigeria is one. The practice of 3Rs of waste management – reuse, reduce, recycle should be encouraged by the mechanic shops and government and industries to minimize the amount of metallic wastes generated by this auto-repair outlets.

Moreso, mass awareness should be generated about the effects of waste disposals on water quality and human health

APPRECIATION

The authors wish to acknowledge Prof. Nnodu V.C. and the entire academic and non-academic staff of the Department of Environmental Management, Nnamdi Azikiwe University, Awka, Nigeria for their numerous assistances.

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Face Recognition and Gender Classification Using Features of Lips

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ABSTRACT: This paper presents a novel approach for Face Recognition and Gender classification strategy using the features of lips. Here feature extraction is carried out by using Principal component analysis (PCA) and Gabor wavelet. The proposed algorithm converts the RGB image into the YCbCr color space to detect the skin regions in the facial image. But in order to detect facial features the color image is converted in to gray scale image. This method locates the lip region and the mouth region. The gender classification method classifies almost all the images with different image sizes. The best classification rate is achieved by using the methods given in this work. The whole idea is offering a simple, reliable and robust method for extracting features of lips for face recognition and gender identification. For recognition experiments we used face images of persons from different sets of the FERET and AR databases. Recognition experiments with the FERET database (containing photographs of persons) showed that our method can achieve maximal 97-98% first one recognition rate and 0.3-0.4% Equal Error Rate.

KEYWORDS: Face recognition, Gender classification, Principal Component Analysis, Gabor wavelet, YCbCr.

1 INTRODUCTION

Biometrics is the study of methods for measuring unique biological and psychological characters of human being that can be used for uniquely recognizing or verifying the individual's identity. Biometric identification methods have been proved to be very efficient, more natural and easy for users than traditional methods of human identification. There are several biometric methods such as face recognition, fingerprint recognition, iris localization, palm-vein recognition, signature analysis etc. But we need to investigate novel methods of authentication that find mass appeal. This brings us to identification and authentication using FACE RECOGNITION SYSTEMS.

This paper proposes a new technique for Face Detection and Gender Identification by using the features extraction of lips. Lip detection is one of the biometric systems based on which a genuine system can be developed which holds an advantage of making the system secure. The Gender classification tells us that whether the given facial image belongs to the gender male or female. Here face detection and gender classification methods are combined. The face detection acts as a pre-processing step for the gender classifier that determines the gender of the individual. The most important factors are usually the detection and classification accuracies. The other important factors are detection and classification speeds. The main issues of the face detection and gender classification are the selection of the color space to detect skin region, face detection and gender classification methods. The connection between face detection and gender classification are examined experimentally. Face Detection in feature-based approach, the apparent properties of the face such as skin color and face geometry are exploited. In this system face detection method depends on feature derivation and analysis to gain the required knowledge about face. Facial features may be skin color, face shape, or facial features like mouth, eyes, and nose. In all the face and skin detection algorithms, the 2-D image are used. The threshold values (of intensity) are applied on the image to determine the skin region on the face. The face feature area is calculated. The facial features such as mouth, eyes and nose are estimated through the lip point detection and applying the standard threshold values of measurements (in number of pixels) to get the entire portion of the features. Lips have certain advantages over the more established biometric

traits such as ear, palm-vein, fingerprint etc, they have a rich and stable structure that is preserved well even at the old age. The size of the lip is large compared with the iris, retina, and fingerprint and therefore is more easily captured.

Here database is generated and images of the faces are stored for future verification. In our system Feature extraction is carried out by using two methods first one is PCA transform and second one is Gabor wavelet. After transformation feature extracted image is given for testing and identification of the gender is done by using Minimum distance classifier method which tells us that either the input image is male or female.

The paper is organized as follows: first literature review of different methods is given then next point is about system development followed by conclusion and references.

2 LITERATURE SURVEY

This section gives an overview on major human face detection and gender classification methods that apply mostly on frontal faces. The main issues of the face detection and gender classification are the selection of the color space to detect skin region, face detection and gender classification methods. The connection between face detection and gender classification are examined experimentally. Face Detection in feature-based approach, the apparent properties of the face such as skin color and face geometry are exploited. Feature-based face detection method depends on feature derivation and analysis to gain the required knowledge about face. Facial features may be skin color, face shape, or facial features like mouth, eyes, and nose. Among the face and skin detection algorithms, the 2-D image are used. The threshold values (of intensity) are applied on the image to determine the skin region on the face. The face feature area is calculated. The facial features such as mouth, eyes and nose are estimated through the lip point detection and applying the standard threshold values of measurements (in number of pixels) to get the entire portion of the features.

Evaluation of Gender Classification Methods with Automatically Detected and Aligned Faces [1]. This paper included study and comparison of four fundamentally different gender classification methods and four automatic alignment methods together with non-aligned faces and manually aligned faces. They also analyzed how the classification accuracy was affected when face image resizing occurred before or after alignment. Finally, they conducted a sensitivity analysis for the classifiers by varying rotation, scale, and translation of the face images.

Gender Classification with Support Vector Machines [2], the first automatic system for combined face detection and gender classification. They used maximum-likelihood estimation for face detection and for facial feature detection. For gender classification, they used several different classifiers. The experiments were carried out with a set of FERET images [3]. The most interesting findings in the context of this paper were that the Support Vector Machine (SVM) performed better than the other classifiers and resolution of the face did not affect the classification rate with the SVM.

A Unified Learning Framework for Real Time Face Detection and Classification [4]. This paper combined the cascaded face detector by Viola and Jones with discrete Adaboost-based gender and ethnicity classification. The advantage of the system. is that many preprocessing and book keeping calculations can be shared by the face detector and the gender classifier. Boosting Sex Identification Performance [5] presented an Adaboost system for gender classification with manually aligned faces. They carried out a thorough experimental comparison between the Adaboost and an SVM classifier by varying face image scaling, translation, and rotation. Similar comparative analysis was conducted An Experimental Study on Automatic Face Gender Classification [6] reported a detailed analysis of how different normalizations affect gender classification accuracy. They had three different methods for alignment and three gender classifiers: an SVM, an FLD, and a two-layer Real Adaboost classifier. They used Chinese face images in the experiments. The most interesting fact from the viewpoint of this paper was their claim that shape-free alignment may produce better classification results with methods that use local features such as haar-like features, while shape preserving alignment methods may produce better results with global features.

3 SYSTEM DEVELOPMENT

The face detection and the gender classification methods are described in the flow chart given in figure given below.

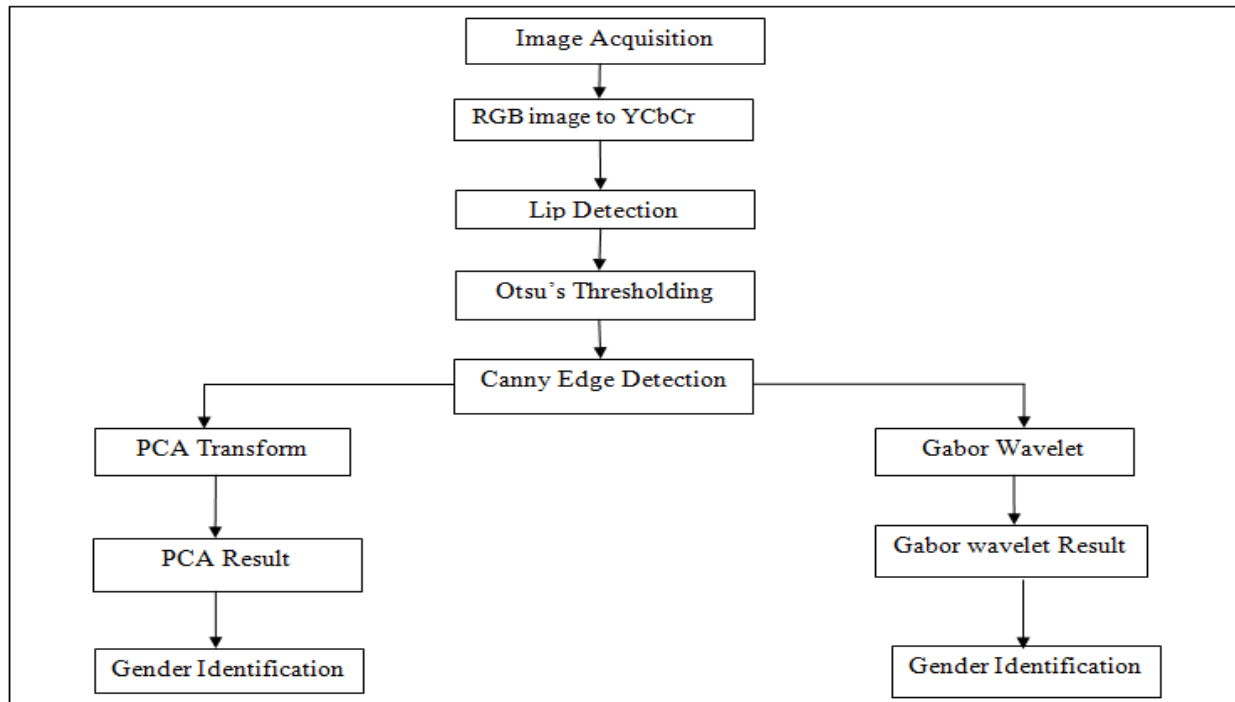


Fig 1: Flow Chart

3.1 FACE DETECTION

The proposed algorithm first locates the face region using skin-color. The YCbCr color space is used to detect the skin region on the given input face image. The given input RGB image is converted into the YCbCr color space. Color is a powerful cue of human faces. The distribution of skin clusters is in a small region of the chromatic color space. Processing color is faster than processing other facial features. Therefore, skin color detection is firstly performed on the input color image to reduce the computational complexity as described in Face Detection System Based on Feature – Based Chrominance Color Information [7]. In order to improve the performance of skin color clustering, YCbCr space is used to build a skin color model. The chrominance components are almost independent of luminance component in the space. There are non-linear relations between chrominance (Cb, Cr) and luminance (Y) of skin color in the high and low luminance region. As stated in 'Face Detection in color Images Using AdaBoost algorithm' based on skin color information[8] the apparent difference in skin color perceived is mainly due to the darkness or fairness of the skin, characterized by the difference in the brightness of the color, which is governed by Y but not Cb and Cr in YCbCr color space. Y, luminance component is brightness component, whereas Cb and Cr are chrominance components, which correspond to color components. In the color detection process, each pixel is classified as either skin or non-skin based on its color components. The gamma corrected RGB value is determined through the formula as in "Digital Image Processing" [9] that uses the constant values. Then lip detection is carried out by cropping lip part from the whole face region. After lip detection Otsu's thresholding is done for the segmented image acquisition. Lastly Canny edge detection is performed for perfect shape analysis to be done in our system. Once the perfect shape analysis is done then we may proceed for the feature extraction of lips and then to identify the gender of the particular individual. The whole work is done by programming in MATLAB. In programming we initialize the wait bar for showing our progress of detection and identification. One training set is generated in which images of faces are stored for the verification and one testing set for the verification. Feature extraction of ROI i.e. lip here is done by the following two methods:

- **PCA Method:**

The purpose of PCA is to reduce the large dimensionality of the data space (observed variables) to the smaller intrinsic dimensionality of feature space (independent variables), which are needed to describe the data economically. This is the case when there is a strong correlation between observed variables. The jobs which PCA can do are prediction, redundancy removal, feature extraction, data compression, etc. Because PCA is a classical technique which can do something in the linear domain, applications having linear models are suitable, such as signal processing, image processing, communications, etc. Face recognition has many applicable areas, moreover, it can be categorized into face identification, face classification, or gender determination. Starting from the successful low dimensional reconstruction of faces using KL or PCA projections eigen

pictures have been one of the major driving forces behind face representation, detection, and recognition. It is well known that there exist significant statistical redundancies in natural images. For a limited class of objects such as face images that are normalized with respect to scale, translation, and rotation, the redundancy is even greater. One of the best global compact representations is KL/PCA, which decorrelates the outputs. Some of this noise may be due to small occlusions, as long as the topological structure does not change. For example, good performance under blurring, partial occlusion and changes in background has been demonstrated in many eigen picture based systems, as illustrated in This should not come as a surprise, since the PCA reconstructed images are much better than the original distorted images in terms of their global appearance. Computing the eigenvectors: Performing PCA directly on the covariance matrix of the images is often computationally infeasible. If small, say 100×100 , greyscale images are used, each image is a point in a 10,000-dimensional space and the covariance matrix S is a matrix of $10,000 \times 10,000 = 10^8$ elements. However the rank of the covariance matrix is limited by the number of training examples: if there are N training examples, there will be at most $N - 1$ eigenvectors with non-zero eigenvalues. If the number of training examples is smaller than the dimensionality of the images, the principal components can be computed more easily as follows. Let T be the matrix of preprocessed training examples, where each column contains one mean-subtracted image. The covariance matrix can then be computed as $S = TT^T$ and the eigenvector decomposition of S is given by

$$SV_i = TT^T V_i = \lambda_i V_i$$

However TT^T is a large matrix, and if instead we take the eigenvalue decomposition of

$$T^T T u_i = \lambda_i u_i$$

then we notice that by pre-multiplying both sides of the equation with T , we obtain

$$TT^T T u_i = \lambda_i T u_i$$

Meaning that, if u_i an eigenvector of $T^T T$, then $v_i = T u_i$ is an eigenvector of S . If we have a training set of 300 images of 100×100 pixels, the matrix $T^T T$ is a 300×300 matrix, which is much more manageable than the $10,000 \times 10,000$ covariance matrix. Notice however that the resulting vectors v_i are not normalised; if normalisation is required it should be applied as an extra step.

- **Gabor Wavelet Method:**

If Gaussian window is used in STFT, it is also named Gabor Transform, which is widely used due to its less leakage in time-frequency domain. The major advantage of SHFT is that it could provide us the time-frequency location of the signal, which we are interested in, and some of their applications in Pattern recognition. Gabor filters are examples of Wavelets having two bases for images, Pixels are localized in space & Fourier are localized in frequency, so such filters can be used for measuring frequency locally. The Gabor transform can be explained as: Its impulse response is defined by a sinusoidal wave (a plane wave for 2D Gabor filters) multiplied by a Gaussian function. Because of the multiplication-convolution property (Convolution theorem), the Fourier transform of a Gabor filter's impulse response is the convolution of the Fourier transform of the harmonic function and the Fourier transform of the Gaussian function. The filter has a real and an imaginary component representing orthogonal directions.^[4] The two components may be formed into a complex number or used individually. The Gabor transform is like the short time Fourier transforms. We can see that the Gabor transform kernel is the Fourier transforms kernel plus a Gaussian function. Therefore we can make a lot of transforms like the Gabor transform. Since the Gaussian signal is more concentrated than the rectangular function in the frequency domain, the frequency resolution of the Gabor transform is much better than short time Fourier transform, Gabor transform, or named by short time Fourier transform (STFT).

Complex

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = \exp\left(-\frac{x'^2 + \gamma^2 y'^2}{2\sigma^2}\right) \exp\left(i\left(2\pi\frac{x'}{\lambda} + \psi\right)\right)$$

Real

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = \exp\left(-\frac{x'^2 + \gamma^2 y'^2}{2\sigma^2}\right) \cos\left(2\pi\frac{x'}{\lambda} + \psi\right)$$

Imaginary

$$g(x, y; \lambda, \theta, \psi, \sigma, \gamma) = \exp\left(-\frac{x'^2 + \gamma^2 y'^2}{2\sigma^2}\right) \sin\left(2\pi\frac{x'}{\lambda} + \psi\right)$$

where

$$x' = x \cos \theta + y \sin \theta$$

and

$$y' = -x \sin \theta + y \cos \theta$$

In this equation, λ represents the wavelength of the sinusoidal factor, θ represents the orientation of the normal to the parallel stripes of a Gabor function, ψ is the phase offset, σ is the sigma/standard deviation of the Gaussian envelope and γ is the spatial aspect ratio, and specifies the elasticity of the support of the Gabor function.

3.2 GENDER IDENTIFICATION

After the feature extraction process two databases are created, one for testing and another for training. It is mandatory for the image to be tested is stored in the database of training images. First perform the feature extraction of lips of test image by using PCA and Gabor then apply Minimum distance classifier method for the gender identification. Minimum distance classifier method means test image is compared with image of training set individually. If the extracted features of test image matches with female features then it will gives the result of that particular individual as female or else it can be considered as male that means extracted features of the test image matches with male features.

4 CONCLUSIONS

In this paper, face recognition and gender identification is carried out by feature extraction of lips and for extraction purpose PCA and Gabor filter are used. The extracted features of lips are then stored in the database known as training set and are then compared with the test image from test set. For the gender identification of particular individual the Minimum distance classifier method gives the best result with no extra efforts. Out of two techniques i.e. PCA and Gabor used for feature extraction the results of Gabor filter are more accurate and fast because it is having less leakage in time frequency domain.

ACKNOWLEDGMENT

Thus I would like to express my gratitude and appreciation to all those who give me an opportunity for doing this dissertation work.

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Market Accessibility for Marginal Rice Grower in Papua New Guinea

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ABSTRACT: This paper examines statistical approaches for interpolating market related data over large regions, providing different interpolation techniques for market access variables used in agricultural research. Splines interpolation process was evaluated to distribute different variables related to market accessibility for total land area of Papua New Guinea. Different independent market access variables like village points, minor market, major market, capital market, telecommunication, airstrip and airports, major road network and major wharfs, were used for the interpolation process. Suitable market access zones were modeled using each independent market access variable. The accessible area was coded as 1 and rest area as 2 for each case. Overlay operation (intersection and union) was performed to find out the suitable market access zones using previously modeled seven types of market accessibility results. Then the final market accessibility layer was classified into 3 categories as Good, Medium and poor access. These market accessibility characteristics were applied to all the villages of Papua New Guinea to determine the market accessibility zone for each of them. Rice crop suitability analysis was carried out for entire Papua New Guinea base on multi-criteria decision-making approach using slope and altitude, soil texture, water holding capacity, soil depth, soil drainage, pH, exchange base saturation, nitrogen, potassium, phosphorus, temperature and rainfall data sets. Finally overlay analysis was carried out between market accessibility and suitable agriculture land zones for entire Papua New Guinea to show the prospects of rice cultivation for marginal farmer in term of market accessibility.

KEYWORDS: Geographic Information System, Spatial analysis, Agriculture, Market access, Mapping

1 INTRODUCTION

Papua New Guinea is located between the equator and 12°S latitude and consists of the eastern half of the large island of New Guinea and the Bismarck Archipelago and many other small islands. The majority of the Papua New Guinea peoples have subsisted on cultivation of non-cereal crops, such as tare, yam, banana, and sweet potato, and/or exploitation of sago palm. One of the most striking human ecological characteristics in this country is seen in different population densities in association with the environments where they have lived and the major foods which they have grown and eaten. Traditional food-production systems in Papua New Guinea can be broadly classified into four categories: two in the high-altitude zone and two in the low-altitude zone. In the high-altitude zone, sweet potato-dependent agriculture has been dominant in the central Highlands and taro-dependent agriculture in the Highlands fringe. In the low-altitude zone, cultivation of various crops, such as taro, yam, and banana, has been common in the eastern part of the main island and the islands region, whereas exploitation of sago has been prevailing in the western part of the main island. Interventions that improve transport and logistics infrastructure and services, including rural roads, motorized and non-motorized transport, storage facilities, markets, marketing and farm-to-market logistics, can have a substantial impact on reducing poverty and increasing food security. While initiatives are being implemented in countries of the region, physical access, especially in rural areas, remains a general problem. In some countries, 30 to 40 per cent of villages are without all-weather road access and minorities have no road access at all. In other countries, many road connections between the capital city and provincial capitals are unpaved and large percentages of provincial roads remain unpaved and may be impassable during the rainy season. This study mainly

focused on the market access facility in the Papua New Guinea depending of some factors as-minor, major and capital market, telecommunication, airstrip transportation, major road transport and major wharfs.

2 STUDY AREA AND ITS PHYSICAL CONDITIONS

Papua New Guinea occupies the eastern half of the rugged tropical island of New Guinea (which it shares with the Indonesian territory of Irian Jaya) as well as numerous smaller islands and atolls in the Pacific. The Geographical Extension of Papua New Guinea is-0 degree to 12 degree south and 141 degree east to 160 degree east. The smaller island groups of Papua New Guinea include the Bismarck Archipelago, New Britain, New Ireland and the North Solomons. Some of these islands are volcanic, with dramatic mountain ranges, and all are relatively undeveloped. Nearly 85 percent of the main island is carpeted with tropical rain forest, containing vegetation that is a combination of Asian and Australian species. Papua New Guinea's climate is tropical, as one would expect in a country located just south of the Equator. December to March is the wet season, although occasional rain falls year-round. While Port Moresby, the capital, and other towns on the coast are quite hot in the summer months, temperatures are considerable cooler in the highlands.

3 DATA USED FOR THE STUDY

Different types of data are used for preparation of market accessibility map of different market access variables of Papua New Guinea, like village points, minor market, major market, capital market, telecommunication, airstrips and airports, major road network and major wharfs.

Table 1. Different data used for market access analysis

Market access variables	Year & Source
Village point, minor, major, capital & central markets	Geobook 2009
Mobile phone/telecommunication	Digicel Network coverage map, 2000 census
Airstrip transportation	PNG Airlines & Air Niugini, CAA, Geobook 2009 [1]
Major road/transport	PNGRIS 2009 [2] and Geobook 2009 [1]
Major wharf	PNG Ports, 2009 [1]

4 STUDY METHODOLOGY

4.1 SPATIAL INTERPOLATION

Interpolation predicts unknown values for cells in a raster from a limited number of sample data points. Unknown values are predicted with a mathematical formula that uses the values of nearby known points. The assumption that makes interpolation a viable option, this is spatially distributed objects as well as spatially correlated; in other words, things that are close together tend to have similar characteristics. Global interpolation techniques (e.g. IDWA) fit a model through the prediction variable over all points in the study area. Typically, global techniques do not accommodate local features well and are most often used for modeling long-range variations. Local interpolation techniques, such as splining, estimate values for an un-sampled point from a specific number of neighboring points. Consequently, local anomalies can be accommodated without affecting the value of interpolation at other points on the surface [3]. Splining, for example, can be described as deterministic with a local stochastic component [4]. Spline is an interpolation method that estimates values using a mathematical function that minimizes overall surface curvature, resulting in a smooth surface that passes exactly through the input points. Conceptually, the sample points are extruded to the height of their magnitude; Spline bends a sheet of rubber that passes through the input points while minimizing the total curvature of the surface. It fits a mathematical function to a specified number of nearest input points while passing through the sample points. This is a deterministic, locally stochastic interpolation technique that represents two dimensional curves on three dimensional surfaces [5], [6].

4.2 SPATIAL MODELING AND ANALYSIS

The easiest way to understand cell-based modeling is from the perspective of an individual cell as opposed to the entire raster. To calculate an output value for specified location (cell) using any spatial analyst operation or function, there are three things need to know- (i) the value of your specified location (cell), (ii) The manipulation of the operator or function and (iii) Which other cell locations and their values to include in calculations. This three-step process occurs for each location

(cell) in the raster dataset within any spatial analyst function. All operators and functions work on a cell-by-cell basis, and each calculation for each cell requires the value of the cell, the manipulation that is being applied, and other cell locations to include in the calculations. The spatial analyst operators and functions are grouped into categories based on how they manipulate values.

4.2.1 OVERLAY ANALYSIS

The overlay toolset contains tools to overlay multiple coverage to combine, erase, modify or update spatial feature into a new coverage. New information is created when one set of features is overlaid with another. There are five types of overlay operations; all involve joining two existing sets of features into a single set of features to identify spatial relationships between the input features. In all cases, the action coverage (for example, erase coverage) must be polygon coverage. The output coverage will contain the same feature class as the input coverage, and topology will be built.

4.2.2 PROXIMITY ANALYSIS

Using these operations, the characteristics of an area surrounding in a specified location are evaluated. This kind of analysis is called proximity analysis and is used whenever analysis is required to identify surrounding geographic features. The buffer operation will generate polygon feature types irrespective of geographic features and delineates spatial proximity.

4.2.3 MARKET ACCESS MODEL DESCRIPTION

Two types of accesses to market were marked for Papua New Guinea; they are (i) direct access to market and (ii) indirect access to market. Minor market, major market, capital and central market were considered as direct access to market and in the other hand telecommunication, airstrips and airports, major road network and major wharfs as indirect access to market. All the market access variables are used to build the market access layer for PNG. All the description for the market access variables are tabulated in the Table 2 & 3.

Table 2. Different market access variables and their description

Access	Mode of Access	Description
Direct access to market	Minor market	Village/roadside markets with settlement size of > 400 person
	Major market	Urban areas or townships e.g. Kainantu, Daru, Bukaua, Kwikila, Wabag. Market infrastructure available and depots for local trade settlement size of more than 1000 people excluding the capital and central market
	Capital and central market	Port Moresby, Lae, Kokopo, Goroka, Mt Hagen. Supermarkets
Indirect access to market	Mobile/telecommunication	Only Digicel network map was considered as a major telecommunication media
	Airstrips and airports	PNG Airlines (Airport) and Air Niugini map as point coverage
	Major road network	Foot track, minor road, major road, highway and boat way
	Major wharf	Major ports along the sea coast of PNG

4.2.4 MARKET ACCESSIBILITY FUNCTION

- i. Travel by foot: The average time taken for farmer to travel by foot is approx 15 minutes per km. Therefore it would take = < than an hour to travel < 4 km.
- ii. Travel by vehicle: The average speed to travel by vehicle under typical rural roads (unsealed) in PNG is 40 km/hr. A farmer will travel approx < 40 km in less than an hour.
- iii. Travel by boat: It takes 2 hrs by dinghy using a 75 horse power motor engine from Lae to Bukawa which covers a distance of about 45 km. It would take about < less than an hour to travel 22 km. This does not consider the distance to travel by paddling in a canoe.

Table 3. Travel time and distance from village to access market

Direct access to market	Mode of access	Travel time from village	Distance from village (Km)		
			By walk	By motor car	By boat
	Minor market	<1hour	<4	<40	<22
	Major market	< 2 hours	<8	<80	<44
	Capital and central market	<3 hours	<12	<120	<66
Indirect access to market	Mobile/telecommunication	<1hour	<4	<40	<22
	Airstrips and airports	< 2 hours	<8	<80	<44
	Major road network	< 2 hours	<8	<80	<44

4.2.5 ARCGIS METHODOLOGY

The spatial analysis and modeling tool of ArcGIS was used to perform different overlay analysis, proximity analysis, interpolation and mapping (Chart 1). ERDAS IMAGINE was used to mosaic, geo-reference and re-project of all the individual province level data sets. Geobook [1] data sets were used for this purpose. For similar reference system re-project and transformation were performed to all the layers for individual provinces. All the data sets (all province level data set) were mosaicked to prepare the country level data sets, like village, informal market, formal market, capital market, telecommunication, airstrips and airports, major road network and major wharfs layers. Proximity analysis was performed using village points to generate market access zone using seven market access parameters. Overlay analysis was performed between each market access zone and village point layer, to determine the market accessibility zone for each of them. The accessible villages were coded as 1 and rest of the villages as 2 for each case. Statistical analysis (SUM) was performed of all coded village according to different mode of market access. Final village point layer was generated with total market access code and was classified into three market accessible ranks, like 7 to 9 as good (1), 10 to 11 as moderate (2) and 12 to 14 as poor market access (3) (Figure 1). Spatial interpolation was performed to distribute of the village points rank depending on market access facility for whole country with 500m spatial resolution. Final market access layer used to generate the final map of market accessibility for Papua New Guinea in the national level scale 1:5,000,000 (Figure 2). Reference market accessibility map for Morobe Province was produced (50 m spatial resolution) in the scale of 1:500,000.

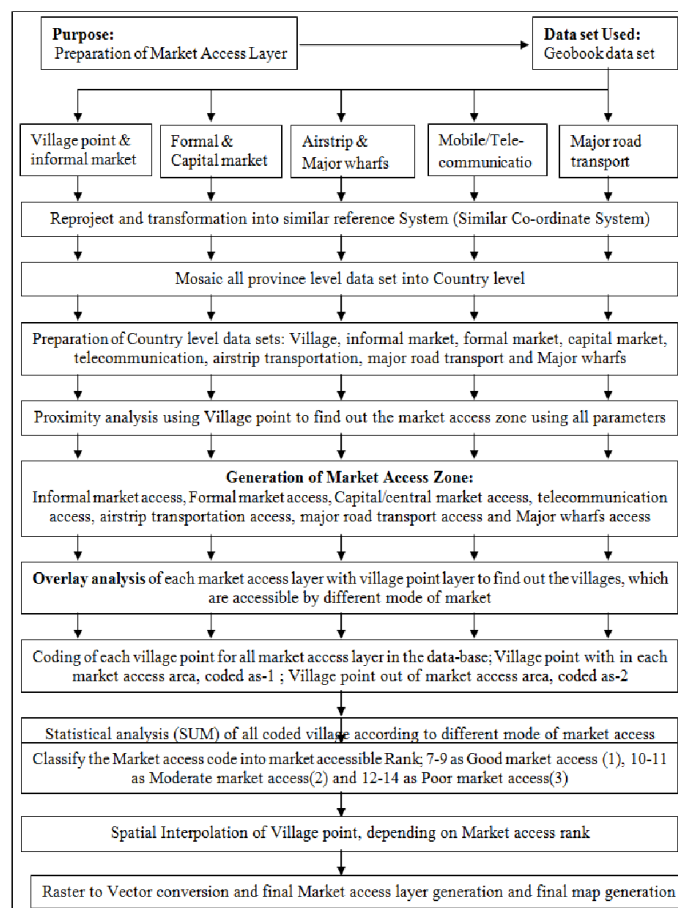


Chart 1. Methodological flow chart for market access analysis

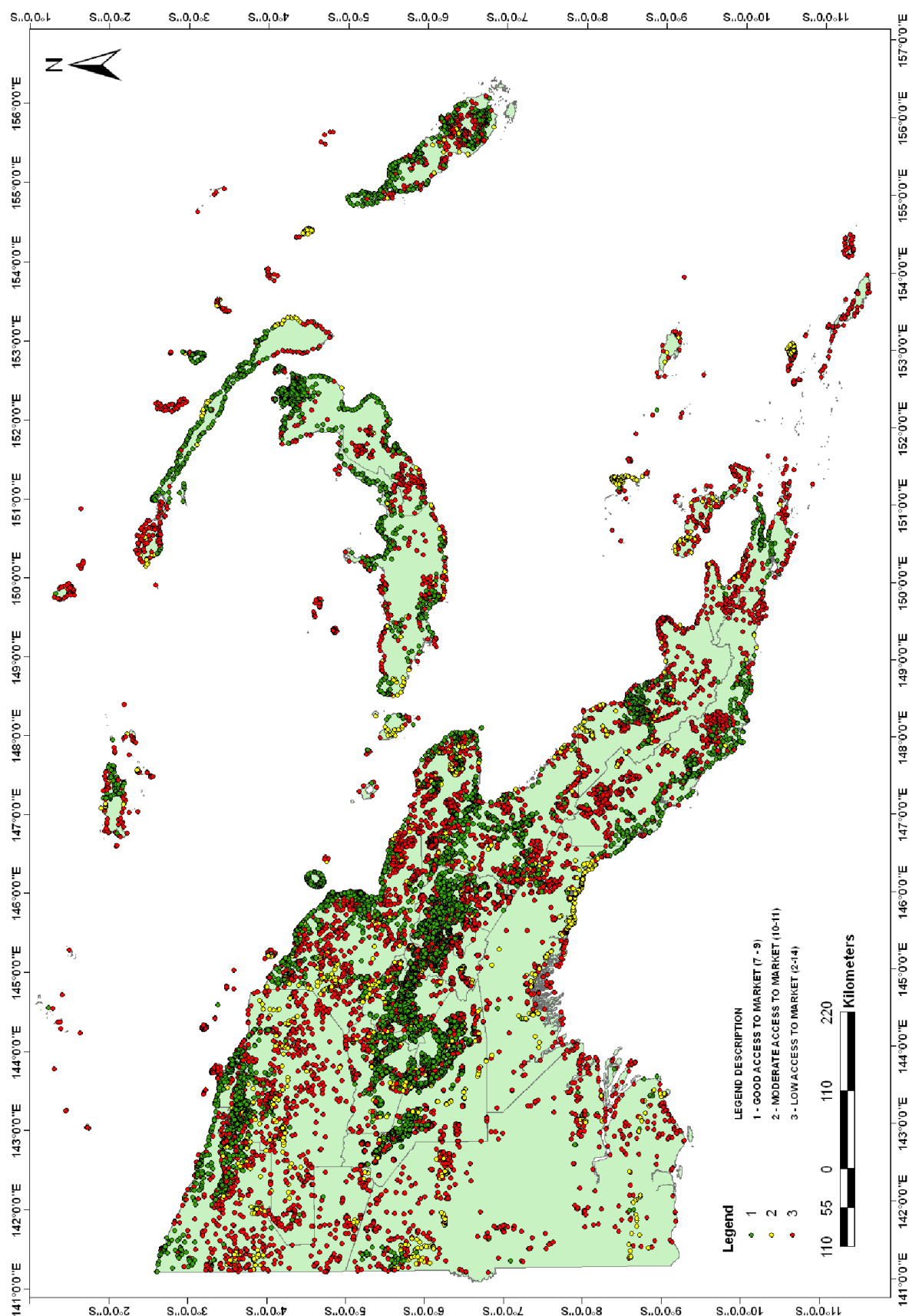


Fig. 1. Village points according to the rank of market accessibility of Papua New Guinea

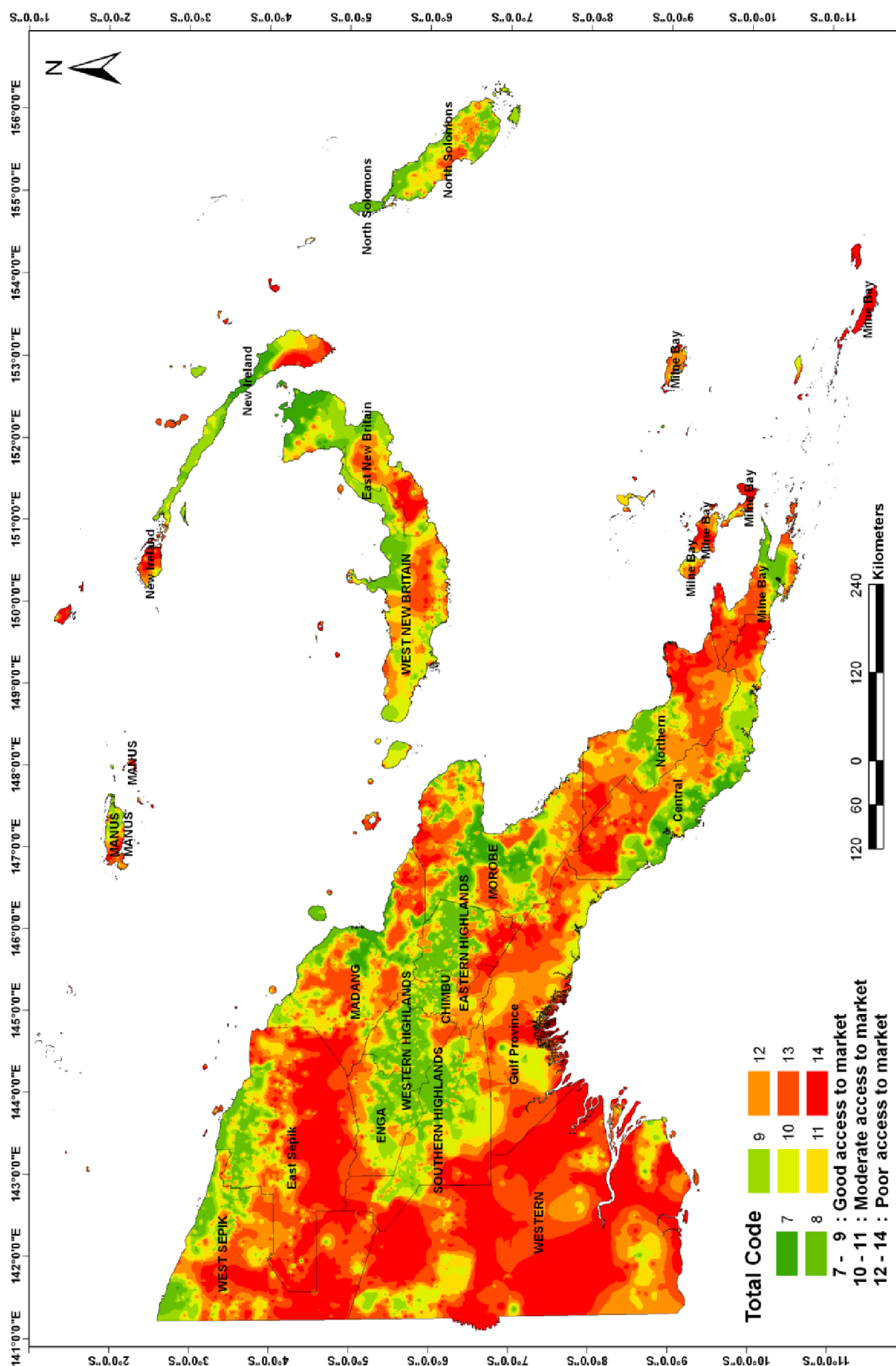


Fig. 2. Market accessibility zones in after calculating total code for each point of PNG

5 RESULTS AND DISCUSSION

Market accessibility analyses were evaluated at national level, province and district level. About 21850 numbers of villages were classified into three groups as good market accessibility (rank-1), moderate market accessibility (rank-2) and poor market accessibility (rank-3), displayed in Figure 1. Total 11637 numbers of villages (53.26 %) of Papua New Guinea were fall in good market accessibility group. 20.78% of land area of PNG fall in the rank one, 31.09 % in rank two and 48.12 % in rank 3. Province level market accessibility analyses were done for all 19 provinces of Papua New Guinea. The statistical analysis was done to find out the status of different market accessible zone under each province, shown in Table 4. 3.5 % land area (Papua New Guinea total land area as 100%) of Madang province came under good market accessibility (Rank 1). According to calculation of percentages of good market accessibility area in Papua New Guinea, Madang Province came in first followed by Morobe (2.65%), East Sepik (1.80%), North Solomon (1.70%), West New Britain (1.39%) etc. Western Highlands province having only 0.16% of goog suitability land area and ranked 19th in Papua New Guinea.

Table 4. Province level market accessibility analysis of Papua New Guinea

Province Name	Percentages of total area			Rank of Province
	Rank 1 (Good Accessibility)	Rank 2 (Moderate Accessibility)	Rank 3 (Poor Accessibility)	
Central	1.10	1.50	2.64	9
Chimbu	0.16	1.32	1.17	8
East New Britain	1.05	0.80	1.43	10
East Sepik	1.80	2.37	3.36	3
Eastern Highlands	0.42	2.42	1.86	15
Enga	0.41	1.53	1.71	16
Gulf Province	0.81	0.65	1.46	14
Madang	3.50	1.28	3.62	1
Manus	0.17	0.70	1.51	18
Milne Bay	0.90	2.12	4.06	12
Morobe	2.65	2.71	4.81	2
New Ireland	0.29	1.31	1.59	17
North Solomons	1.70	1.84	3.22	4
Northern	0.86	1.43	1.67	13
Southern Highlands	0.98	2.49	2.99	11
West New Britain	1.39	1.11	3.32	5
West Sepik	1.23	1.56	2.44	6
Western	1.21	1.61	3.72	7
Western Highlands	0.16	2.34	1.54	19
Total	20.78	31.09	48.12	

Rice crop suitability analysis was carried out for entire Papua New Guinea (*e.g.* [7]). Spatial multi-criteria decision-making approach is used with twelve geographical data sets, as input in the model, namely slope and altitude, soil texture, water holding capacity, soil depth, soil drainage, pH, exchange base saturation, nitrogen, potassium, phosphorus, temperature and rainfall. Erdas Imagine v-11 model builder/maker is used to build the key model for rice land suitability mapping. All selected provinces have been classified into five qualitative categories of rice land suitability. The final suitability output raster is classified into five categories of rice suitability. The result indicates that only fourteen percent (14%) land can be demarcated as 'high' and thirteen percent (13%) as 'moderate to high' suitability categories in the study area and the spatial expanse of all the five categories within the province are mapped and displayed (Figure 3). Zonal statistics algorithm is used to generate statistics for each suitability category that fall under each province based on final model output raster and province boundary feature (shown in Figure 4).

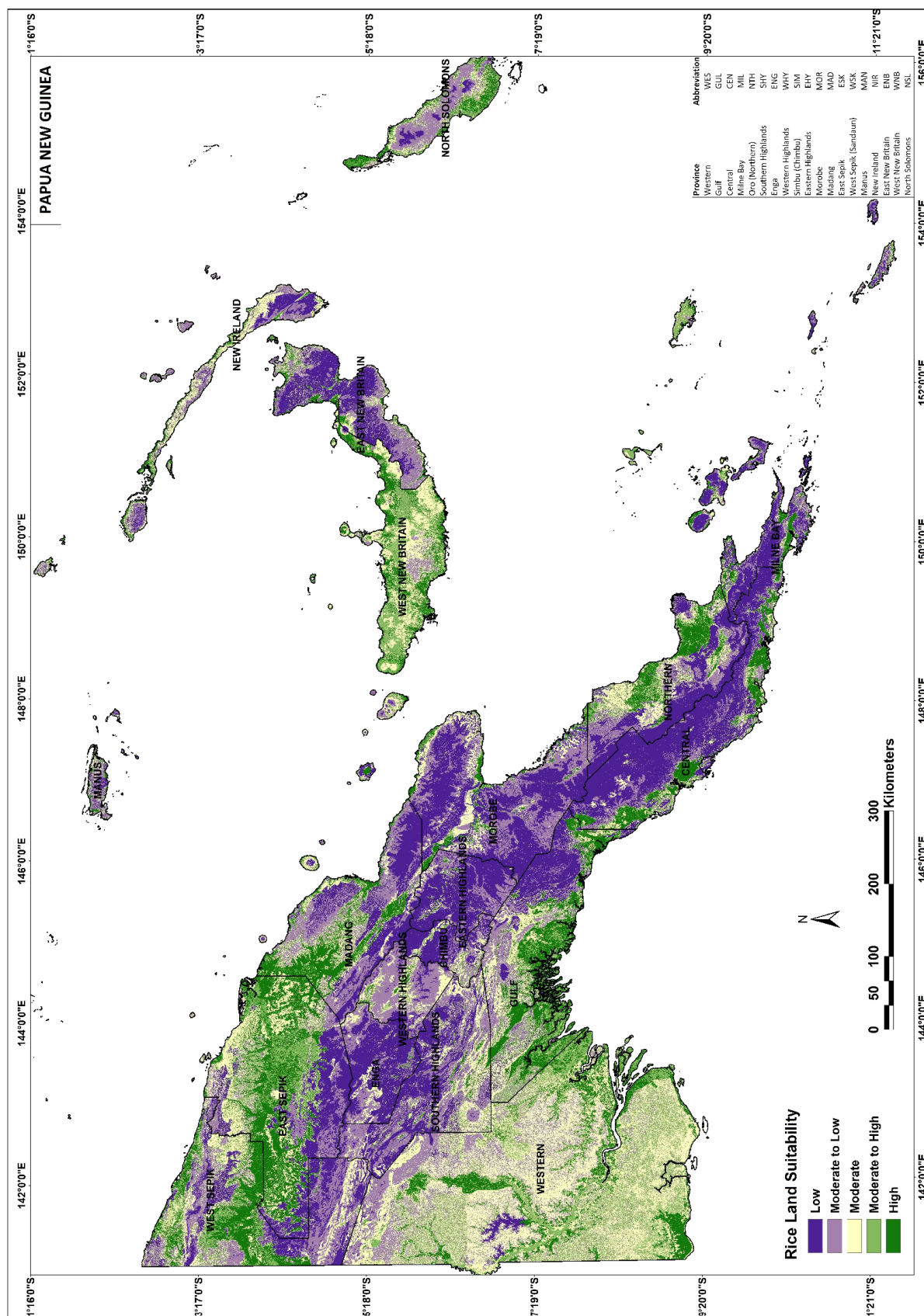


Fig. 4. Available suitable land for rice cultivation in Papua New Guinea

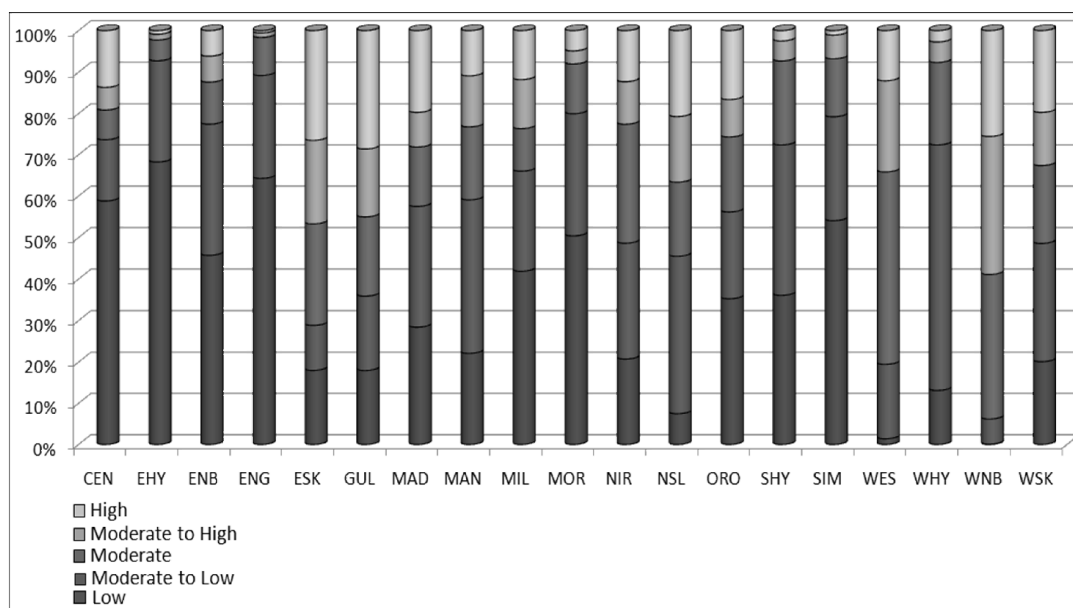


Fig. 3. Province wise availability of suitable land for rice in Papua New Guinea

6 CONCLUSION

The total study had been carried out for entire Papua New Guinea. Spatial interpolation (spline) was carried out to find out the accessibility zone of the country using the village points. In this case 500m spatial cell size (scale of 1:5000000) was chosen for interpolation process. In the province and district level 50m spatial cell size (scale of 1:500000) was considered to perform the spline interpolation. So the model in the ArcGIS can generate any scale of data set after supervising by the user. Village, informal market, formal market, capital market, telecommunication, airstrips and airports, major road network and major wharfs were choose as independent parameters to establish the market accessibility for each village of PNG and we got better result after cross checking in different places of the different provinces of the country.

Overlay analysis of good market accessibility zones and suitable agriculture land zones was performed for entire Papua New Guinea to show all the suitable places are suitable for rice cultivation, may or may not come under good market accessibility. The result shows (Table 6) around 2.8% of "high" (out of 14%), 2.06% of "Moderate to high" (out of 13%) and 3.38% of "moderate" (out of 24%) suitable rice land area fall under good market accessibility zone.

Table 6. Market accessibility vs Rice land suitability zone in Papua New Guinea

Rice Land Suitability		Market accessibility (% area)		
Suitability class	Suitable area (%)	Good	Moderate	Poor
Low	26	5.20	6.01	14.56
Moderate to Low	23	3.91	5.19	13.70
Moderate	24	3.38	5.57	14.15
Moderate to High	13	2.06	3.50	7.70
High	14	2.82	3.97	8.29

PNG's unique geography and infrastructure deficiencies, however, present a major challenge. Until as recently as the 1930s, parts of the New Guinea Highlands, which have supported thriving agricultural communities for thousands of years, remained almost completely isolated from the outside world. The foremost symbol of PNG's infrastructure ailment is its 700km Highlands Highway. Countless other problems exist in PNG at the micro level, such as simple access to vehicles to bring vegetables to market. The nation's large supermarkets literally run out of food during holiday periods. Better roads, bridges, and ports could solve many problems in PNG, but these require large investment, as well as a level of technical and managerial expertise the nation simply does not possess

ACKNOWLEDGEMENTS

Author expresses sincere gratitude to Papua New Guinea University of Technology & Department of Surveying and Land studies for providing Digital Image Interpretation laboratory facility to carry out the collaborating research work with National Agriculture Research Institute and Trukai Industries Limited. The authors are also grateful to the all the academic staff of GIS section and National Agriculture Research Institute for their valuable comments and suggestions.

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Taylor Approximation Method in Grey System Theory and Its Application to Predict the Number of Teachers and Students for Admission

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ABSTRACT: The purpose of this study is to use T-GM(1,1) and T-GM(1,n) to predict the number of teachers and students for admission in Vietnam. T-GM(1,1) and T-GM(1,n) are two prediction models based on Taylor approximation method in grey system theory to improve the predicted accuracy of GM(1,1) and GM(1,n). Two combined models can obtain the most optimal values of prediction by multi-times approximate calculation. In addition, researchers used the MATLAB software to build a MATLAB toolbox for two prediction models. These results of this study not only are conducted to serve as a reference for the educational administrators but also can assist the government in developing future policies regarding educational management. This is critical for improving the overall quality of teaching and learning and improving the quality of education across the country.

KEYWORDS: T-GM(1,1), T-GM(1,n), Taylor approximation method, grey system theory, MATLAB toolbox.

1 INTRODUCTION

The Vietnamese educational system nowadays comprises five levels: preschool education (early childhood education), primary education, secondary education (lower secondary education and upper secondary education), higher education and postgraduate education. In addition, vocational education and training provides educational opportunities for those secondary school leavers who are unable to enter higher education [1]. Formal education and training consist of twelve years of basic education. Basic education and training consist of five years of primary education, four years of lower secondary education, and three years of upper secondary education. Predicting the exact number of teachers and students for admission will provide the important information for educational administrators to proactively propose the appropriate policy and to build the educational development strategy in accordance with the new conditions [2].

Grey system theory established by Deng in 1982, it is a new methodology that focuses on the study of problems involving small samples and poor information [3, 4]. In grey system theory, the word “black” represents unknown information, while the word “white” represents the completely known information, and the word “grey” represents partially known and partially unknown information. Accordingly, white systems are the systems with completely known information, black systems are the systems with completely unknown information, and grey systems are the systems with partially known and partially unknown information, respectively [5-7]. It included five major parts that are grey prediction, grey relation, grey decision, grey programming, and grey control [8]. GM(m, n) denotes a grey model, where m is the order of the difference equation and n is the number of variables. Grey model has become an effective method to study uncertainty problems under discrete data and incomplete information [9]. In recent years, grey model has been successfully applied to many prediction fields as engineering, economics, medicine. The advantage of grey model is that it only needs a small amount of data and random sample data to calculate and give prediction results [10, 11].

However, many researchers have pointed that there were some problems occurred that the predicted accuracy of grey model was unsatisfied [6, 12, 13], the parameters of prediction model based on grey model were not the optimal

parameters, and the prediction precision of the model was not stable, they have performed a lot of researches for this to improve the predicted accuracy [9, 14-17]. In 2011, Li and co-workers proposed the T-GM(1,2) model, it was established based on Taylor approximation method to enhance the accuracy of prediction for GM(1,2) [18]. In July of 2014, Sheu and co-workers used Taylor approximation method in three grey prediction models (GM(1,1), GVM, and GM(2,1)) to predict the number of foreign students studying in Taiwan [2], and used the combination of GM(1,1) and Taylor approximation method to predict the academic achievement of student [19]. In this paper, researchers used Taylor approximation method in two grey prediction models (GM(1,1) and GM(1,n)) to predict the number of teachers and students for admission in Vietnam.

The remainder of this paper is organized as follows: Section 2 explains the basic theories, including GM(1,1) and GM(1,n), Taylor approximation method in grey system theory, and error analysis method; Building a MATLAB toolbox for two prediction models is introduced in Section 3; Results and discussion for two prediction models are described in Section 4; Finally, conclusions are presented in Section 5.

2 BASIC THEORIES

In this study, Taylor approximation method is applied in grey system theory that is based on Taylor approximation method of approximation optimization theory and grey models of grey system theory to improve the prediction accuracy of grey models. The following section describes basic theories of grey model (1, 1) (abbreviated as GM(1,1)), grey model (1, n) (abbreviated as GM(1,n)), Taylor approximation method in grey system theory, and error analysis.

2.1 GREY MODEL (1, 1)

Before using grey model, the initial data have to be tested based on (1) whether the initial data consistent with the prediction model. If the initial data have $m \geq 4$, $x^{(0)} \in R^+$, and

$$\left. \begin{aligned} \sigma^{(0)}(k) &\in \left(e^{-\frac{2}{m+1}}, e^{\frac{2}{m+1}} \right) \\ \sigma^{(0)}(k) &= \frac{x^{(0)}(k-1)}{x^{(0)}(k)} \end{aligned} \right\} \quad (1)$$

Where $k = 2, 3, \dots, m$; $\sigma^{(0)}(k)$ is called class ratio.

Assume that $x^{(0)}$ is the original sequence as follows.

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(m)) \quad (2)$$

Where m is the sequence length. $x^{(1)}$ is the 1-AGO sequence of $x^{(0)}$ as

$$x^{(1)} = (x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(m)) \quad (3)$$

Where $x^{(1)}(1) = x^{(0)}(1)$, and

$$x^{(1)}(k) = \sum_{i=1}^k x^{(0)}(i), \quad k = 1, 2, \dots, m \quad (4)$$

The GM(1,1) model [3] can be constructed by establishing a first order differential equation for $x^{(1)}(k)$ as

$$\frac{dx^{(1)}}{dt} + ax^{(1)} = b \quad (5)$$

Then, by least-square method, the coefficients a and b can be obtained as

$$\hat{a} = [a, b]^T = (B^T B)^{-1} B^T Y \quad (6)$$

$$\text{where } B = \begin{bmatrix} -0.5(x^{(1)}(1) + x^{(1)}(2)) & 1 \\ -0.5(x^{(1)}(2) + x^{(1)}(3)) & 1 \\ \vdots & \vdots \\ -0.5(x^{(1)}(m-1) + x^{(1)}(m)) & 1 \end{bmatrix} \quad (7)$$

$$Y = [x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(m)]^T \quad (8)$$

$$\hat{x}^{(1)}(k+1) = (x^{(0)}(1) - \frac{b}{a})e^{-ak} + \frac{b}{a} \quad (9)$$

The result obtained $\hat{x}^{(1)}$ from (9). Applying the inverse accumulated generation operation (IAGO). The predicted equation is [8]

$$\hat{x}^{(0)}(k+1) = (x^{(0)}(1) - \frac{b}{a})(1 - e^{-a})e^{-ak} \quad (10)$$

where $\hat{x}^{(0)}(1) = x^{(0)}(1)$, $k = 1, 2, \dots, m, \dots$.

$\hat{x}^{(0)}(1), \hat{x}^{(0)}(2), \dots, \hat{x}^{(0)}(m)$ are called the fitted values, and $\hat{x}^{(0)}(m+1), \hat{x}^{(0)}(m+2), \dots, \hat{x}^{(0)}(m+h)$ are called the predicted values.

2.2 GREY MODEL (1, N)

GM(1,n) describes the relationship between major sequence and influence sequence, in which the major sequence is defined as follows.

$$x_1^{(0)} = (x_1^{(0)}(1), x_1^{(0)}(2), \dots, x_1^{(0)}(m)) \quad (11)$$

where m is the sequence length. The influence sequence is

$$x_j^{(0)} = (x_j^{(0)}(1), x_j^{(0)}(2), \dots, x_j^{(0)}(m)), \quad j = 2, 3, \dots, n \quad (12)$$

The 1-AGO predicted sequence $x_1^{(1)}$ and associated sequence $x_2^{(1)}, x_3^{(1)}, \dots, x_n^{(1)}$ calculated by

$$x_i^{(1)} = \left(\sum_{k=1}^1 x_i^{(0)}(k), \sum_{k=1}^2 x_i^{(0)}(k), \dots, \sum_{k=1}^m x_i^{(0)}(k) \right) \quad (13)$$

where $i = 1, 2, 3, \dots, n$. Let $z_1^{(1)}$ is the average generation of adjacent data sequence of $x_1^{(1)}$, $z_1^{(1)}$ is called the background values and calculated by

$$z_1^{(1)}(k) = 0.5x_1^{(1)}(k) + 0.5x_1^{(1)}(k-1), \quad k \geq 2. \quad (14)$$

The grey differential equation of GM(1,n) is [18]

$$\frac{dx_1^{(1)}(k)}{dt} + ax_1^{(1)}(k) = b_2x_2^{(1)}(k) + b_3x_3^{(1)}(k) + \dots + b_nx_n^{(1)}(k) \quad (15)$$

where a and b_j are determined coefficients; $k = 1, 2, \dots, m$. According to GM(1,n) form, the constructed 1-AGO sequence is

$$x_1^{(0)}(k) + az_1^{(1)}(k) = \sum_{j=2}^n b_j x_j^{(1)}(k) \quad (16)$$

Then, by least-square method, the coefficients a and b_j can be obtained as

$$\hat{a} = [a, b_2, b_3, \dots, b_n]^T = (B^T \cdot B)^{-1} \cdot B^T \cdot Y \quad (17)$$

$$Y = [x_1^{(0)}(2), x_1^{(0)}(3), \dots, x_1^{(0)}(m)]^T \quad (18)$$

$$B = \begin{bmatrix} -z_1^{(1)}(2) & x_2^{(1)}(2) & \dots & x_n^{(1)}(2) \\ -z_1^{(1)}(3) & x_2^{(1)}(3) & \dots & x_n^{(1)}(3) \\ \vdots & \vdots & \ddots & \vdots \\ -z_1^{(1)}(m) & x_2^{(1)}(m) & \dots & x_n^{(1)}(m) \end{bmatrix} \quad (19)$$

From (16), the solution $x_1^{(0)}(k)$ is obtained by [18]

$$\hat{x}_1^{(0)}(k+1) = \sum_{j=2}^n \beta_j x_j^{(0)}(k+1) + (1-\alpha)x_1^{(0)}(k), \quad k=1,2,\dots,m. \quad (20)$$

where $\hat{x}_1^{(0)}(1) = x_1^{(0)}(1)$,

$$\alpha = \frac{a}{1+0.5a}, \quad (21)$$

$$\beta_j = \frac{b_j}{1+0.5a}, \quad j=2,3,\dots,n. \quad (22)$$

By (20), $\{\hat{x}_1^{(0)}(1), \hat{x}_1^{(0)}(2), \dots, \hat{x}_1^{(0)}(m)\}$ are called the fitted values, and $\{\hat{x}_1^{(0)}(m+1), \hat{x}_1^{(0)}(m+2), \dots, \hat{x}_1^{(0)}(m+h)\}$ are called the predicted values.

2.3 TAYLOR APPROXIMATION METHOD IN GREY SYSTEM THEORY

In this paper, Taylor approximation method is applied in grey system theory including Taylor approximation method in grey model (1, 1) (abbreviated as T-GM(1,1)) and Taylor approximation method in grey model (1, n) (abbreviated as T-GM(1,n)), they are described as follows [18].

Algorithm of T-GM(1,1) or T-GM(1,n)

Step 1: Initialization

a) *Setting the updated times K.* In this study, K=100 is used for T-GM(1,1) and T-GM(1,n).

b) *Setting objective function vector:*

$$G = [x_i^{(0)}(1), x_i^{(0)}(2), \dots, x_i^{(0)}(m)]^T \quad (23)$$

where $\{x_i^{(0)}, i=1,2,\dots,n\}$ are the measured data.

c) *Setting approximation function vector $F^{(K)}$:*

$$F^{(K)} = [\hat{x}_i^{(0)(K)}(1), \hat{x}_i^{(0)(K)}(2), \dots, \hat{x}_i^{(0)(K)}(m)]^T \quad (24)$$

where $\{\hat{x}_i^{(0)(K)}, i=1,2,\dots,n\}$ are K times generated predicted series of indirect measurement model based on GM(1,1) or GM(1,n). When K=0, $F^{(0)}$ is the predicted data series $\hat{x}_i^{(0)}$.

d) *Setting approximation parameters:*

$$\hat{a}^{(K)} = [a, b_j]^T, \quad j=1, 2, \dots, n \quad (25)$$

where $\hat{a}^{(K)}$ is the K-th time of generated parameter series, $\hat{a}^{(0)}$ is the initial series of coefficients a and b of GM(1,1) or coefficients α and β_j of GM(1,n).

Step 2: Updating the calculation of approximated function vector $F^{(K+1)}$ according to the first order Taylor development:

$$F^{(K+1)} = F^{(K)} + F_a^{(K)}[a^{(K+1)} - a^{(K)}] + F_{b_j}^{(K)}[b_j^{(K+1)} - b_j^{(K)}] \quad (26)$$

$$F_a^{(K)} = \frac{\partial F^{(K)}}{\partial a^{(K)}} \approx \frac{F^{(K)}(a^{(K)} + C_a^{(K)}) - F^{(K)}(a^{(K)})}{C_a^{(K)}} \quad (27)$$

$$F_{b_j}^{(K)} = \frac{\partial F^{(K)}}{\partial b_j^{(K)}} \approx \frac{F^{(K)}(b_j^{(K)} + C_{b_j}^{(K)}) - F^{(K)}(b_j^{(K)})}{C_{b_j}^{(K)}} \quad (28)$$

$C_a^{(K)} = \frac{a^{(K)}}{h}$, $C_{b_j}^{(K)} = \frac{b_j^{(K)}}{h}$. Coefficient h is called the step length.

In this study, $h=500$ is used for T-GM(1,1) and T-GM(1,n).

Step 3: Setting the evaluation function $Q^{(K)}$

$$Q^{(K)} = [F_D^{(K)} - F_a^{(K)}\eta_a^{(K)} - F_{b_j}^{(K)}\eta_{b_j}^{(K)}]^T \cdot [F_D^{(K)} - F_a^{(K)}\eta_a^{(K)} - F_{b_j}^{(K)}\eta_{b_j}^{(K)}] \quad (29)$$

$$F_D^{(K)} = G - F^{(K)} \quad (30)$$

$$\eta^{(K)} = \begin{bmatrix} \eta_a^{(K)} \\ \eta_{b_j}^{(K)} \end{bmatrix} = \begin{bmatrix} \eta_a^{(K+1)} - \eta_a^{(K)} \\ \eta_{b_j}^{(K+1)} - \eta_{b_j}^{(K)} \end{bmatrix} \quad (31)$$

Step 4: Detecting the stop criterion

If $Q^{(K)} \leq \varepsilon$ or $K=100$ for T-GM(1,1) and T-GM(1,n); stop; otherwise, go to Step 5. Where ε is the tolerance error.

Step 5: Updating the approximated parameters $\hat{a}^{(K)}$

$$\text{In order to minimize: } Q^{(K)} \rightarrow 0 \quad (32)$$

$$\text{let } \frac{\partial Q^{(K)}}{\partial \eta_a^{(K)}} = 0, \quad \frac{\partial Q^{(K)}}{\partial \eta_{b_j}^{(K)}} = 0 \quad (33)$$

The updated equation of parameters $\hat{a}^{(K)}$ can be obtained by

$$\hat{a}^{(K+1)} = \hat{a}^{(K)} + \frac{1}{H} [A^{(K)T} A^{(K)}]^{-1} A^{(K)T} F_D^{(K)} \quad (34)$$

$$A^{(K)} = [F_a^{(K)}, F_{b_j}^{(K)}] \quad (35)$$

H is adjustment coefficient. In this study, $H=20$ is used for T-GM(1,1) and T-GM(1,n).

Step 6: Increasing the updated times: $K=K+1$; go to Step 2.

End of algorithm

Using the optimization process, the parameters $\hat{a}^{(K)}$ are updated for K times, and the evaluation function $Q^{(K)}$ as the convergent error is reduced. When $K=100$, the researchers can find the optimal parameters and the convergent error is reduced to a minimum in this study. At this time, vector $F^{(K)}$ becomes the K -th predicted series $\hat{x}_i^{(0)(K)}$ as the result of approximated calculation.

2.4 ERROR ANALYSIS

In this paper, researchers have used mean absolute percentage error (MAPE), which can be calculated using the following (36) as the error analysis method [20-22]. If the MAPE is less than 10%, the prediction result will be accepted [21, 23, 24].

$$\text{MAPE} = \left(\frac{1}{n} \sum_{k=1}^n \left| \frac{x^{(0)}(k) - \hat{x}^{(0)}(k)}{x^{(0)}(k)} \right| \right) \times 100\% \quad (36)$$

3 BUILDING THE MATLAB TOOLBOX

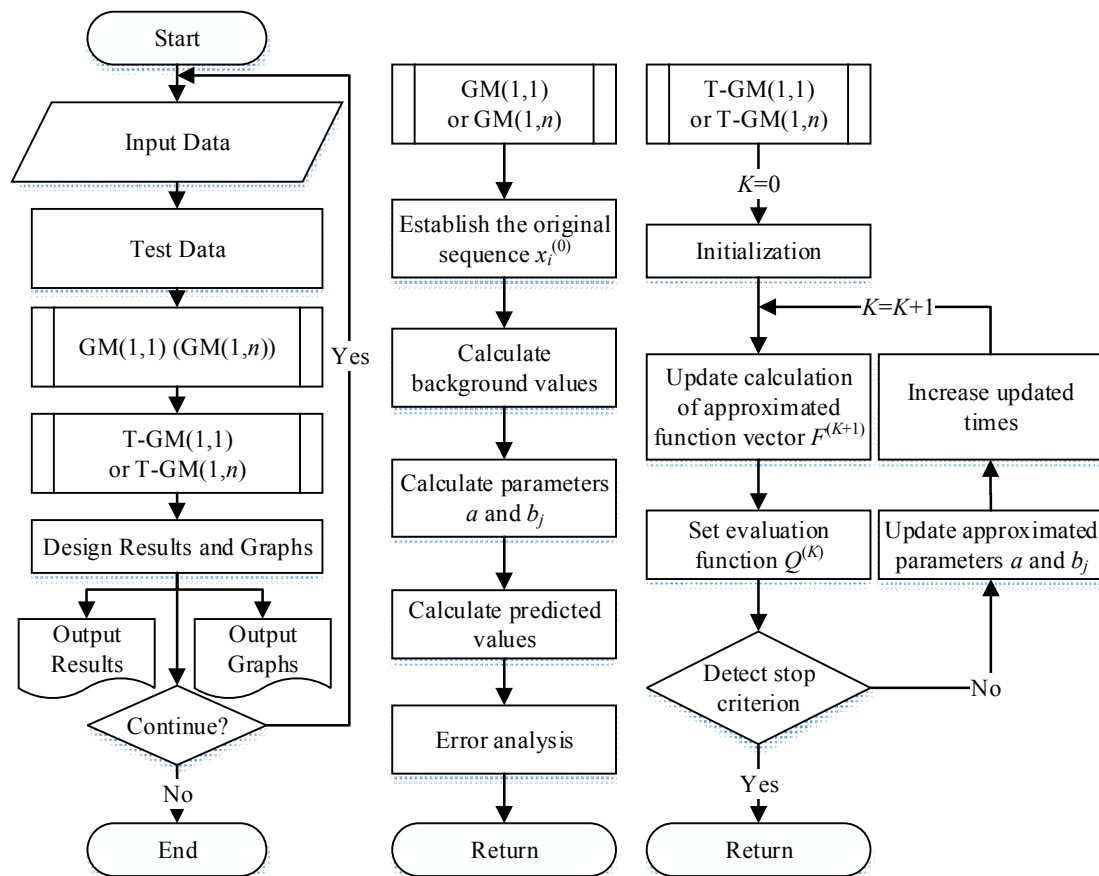


Fig. 1. The flowchart for two prediction models

This paper presents a sample program that is developed by MATLAB, including many scientific functions due to the provision of experimental environment on the computer, and then a reliable program can be developed. The program for two prediction models have been developed by the MATLAB R2012b software [25-29].

3.1 SOFTWARE SPECIFICATIONS AND REQUIREMENTS

- Windows XP, Windows 7 or upgrade versions.
- Screen resolution 1280×800.
- MATLAB R2012b version or upgrade versions.

3.2 THE PROGRAM FOR TWO PREDICTION MODELS

The operation of program for two prediction models is performed as in Fig. 1, and is specifically described by six basic steps as follows.

Step 1: Input data. Data are the number of teachers and students at all preschools, primary schools, lower secondary schools, and upper secondary schools from the 2003-2004 to the 2012-2013 academic year in Vietnam respectively. The data have to be numerical, and written in *.csv file or *.xlsx file.

Step 2: Test data input to select the prediction model.

Step 3: Using GM(1,1) to calculate parameters a and b , or using GM(1,n) to calculate parameters α and θ_j ; then calculate the values of prediction and error analysis.

Step 4: Using T-GM(1,1) to calculate parameters a and b , or using T-GM(1, n) to calculate parameters α and β_j ; then calculate the values of prediction and error analysis.

Step 5: Design the results and the graphs to display the results and the graphs on a graphical user interface visually. The user can save the results as an EXCEL file and the graphs as an image file (JPG).

Step 6: Continue or exit program. If the user inputs a new data, the program will continue and back to step 1, or else the program will be closed.

4 RESULTS AND DISCUSSION

4.1 EXPERIMENTAL DATA

In this paper, data are taken from the website of the Ministry of Education and Training of Vietnam. Data are the number of teachers and students at all preschools, primary schools, lower secondary schools, and upper secondary schools from the 2003-2004 to the 2012-2013 academic year in Vietnam respectively (Data are shown in the Table 1).

Table 1. The number of teachers and students for admission

Unit: Person

School Year	Preschool		Primary		Lower Secondary		Upper Secondary	
	Teachers	Students	Teachers	Students	Teachers	Students	Teachers	Students
2003-2004	150335	2588837	362627	8350191	280943	6612099	98714	2616207
2004-2005	155699	2754094	360624	7773484	295056	6670714	106586	2802101
2005-2006	160172	3024662	353608	7321739	306067	6458518	118327	2976872
2006-2007	163809	3147252	344521	7041312	310620	6218457	125460	3111280
2007-2008	172978	3195731	344853	6871795	312759	5858484	134246	3070023
2008-2009	183443	3305391	347840	6745016	313911	5515123	142432	2951889
2009-2010	195852	3409823	347840	6922624	313911	5214045	142432	2886090
2010-2011	211225	3599663	359039	7048493	312710	4968302	146789	2835025
2011-2012	229724	3873445	366045	7100950	311970	4926401	150133	2755210
2012-2013	244478	4148356	381432	7202767	315405	4869839	150915	2675320

(Data from the website of Ministry of Education and Training (Vietnam) <http://www.moet.gov.vn>)

4.2 RESULTS

Before using T-GM(1,1) and T-GM(1, n) to predict the number of teachers and students for admission in Vietnam, the initial data are tested based on (1). In this case $m = 10$, class ratio obtained $\sigma^{(0)}(k) \in [0.83, 1.20]$. Results of testing data showed that the initial data consistent with two prediction models (Results of testing data are shown in the Table 2).

Table 2. The results of testing data

Preschool	Teachers	$\sigma^{(0)}(k)$	0.97	0.97	0.98	0.95	0.94	0.94	0.93	0.92	0.94
	Students	$\sigma^{(0)}(k)$	0.94	0.91	0.96	0.98	0.97	0.97	0.95	0.93	0.93
Primary	Teachers	$\sigma^{(0)}(k)$	1.01	1.02	1.03	1.00	0.99	1.00	0.97	0.98	0.96
	Students	$\sigma^{(0)}(k)$	1.07	1.06	1.04	1.02	1.02	0.97	0.98	0.99	0.99
Lower Secondary	Teachers	$\sigma^{(0)}(k)$	0.95	0.96	0.99	0.99	1.00	1.00	1.00	1.00	0.99
	Students	$\sigma^{(0)}(k)$	0.99	1.03	1.04	1.06	1.06	1.06	1.05	1.01	1.01
Upper Secondary	Teachers	$\sigma^{(0)}(k)$	0.93	0.90	0.94	0.93	0.94	1.00	0.97	0.98	0.99
	Students	$\sigma^{(0)}(k)$	0.93	0.94	0.96	1.01	1.04	1.02	1.02	1.03	1.03

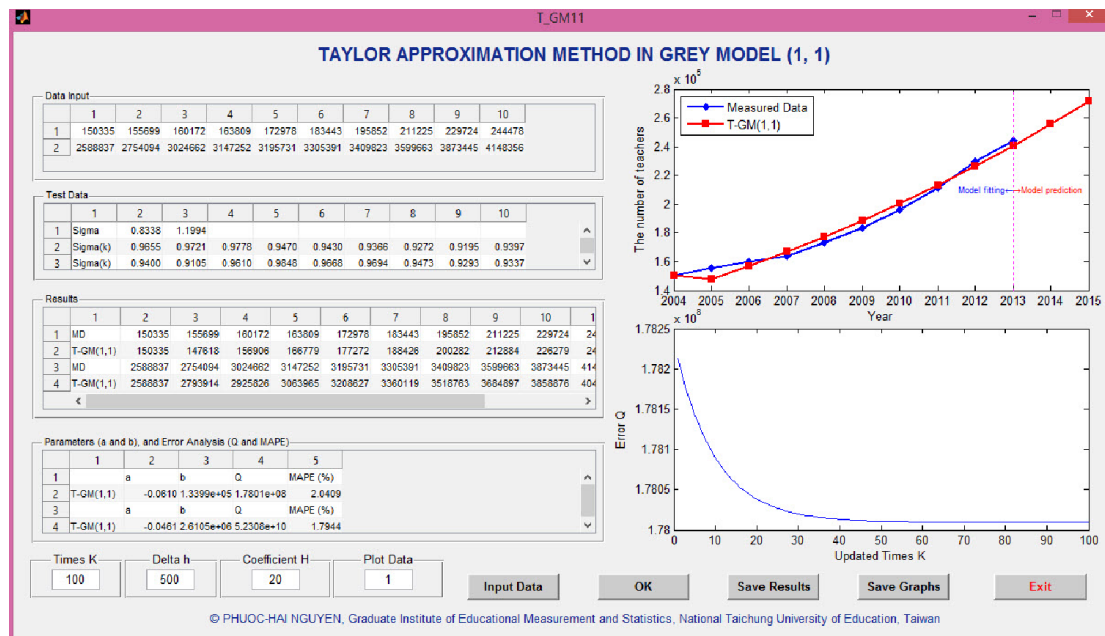


Fig. 2. The graphical user interface of the MATLAB toolbox for the T-GM(1,1) model

Table 3. The predicted results and the accuracy of the T-GM(1,1) model

Unit: Person

School Year	Preschool		Primary		Lower Secondary		Upper Secondary	
	Teachers	Students	Teachers	Students	Teachers	Students	Teachers	Students
2003-2004	150335	2588837	362627	8350191	280943	6612099	98714	2616207
2004-2005	147618	2793914	345881	7313716	303412	6692077	115262	3021324
2005-2006	156906	2925826	348417	7263028	305104	6399295	119820	2989212
2006-2007	166779	3063965	350971	7212691	306805	6119321	124558	2957441
2007-2008	177272	3208627	353544	7162703	308516	5851597	129483	2926007
2008-2009	188426	3360119	356135	7113061	310236	5595586	134602	2894908
2009-2010	200282	3518763	358746	7063763	311966	5350775	139925	2864139
2010-2011	212884	3684897	361376	7014807	313705	5116675	145457	2833697
2011-2012	226279	3858876	364025	6966190	315454	4892817	151209	2803579
2012-2013	240516	4041068	366694	6917910	317213	4678753	157188	2773781
2013-2014	255650	4231863	369382	6869965	318982	4474055	163403	2744300
2014-2015	271735	4431665	372090	6822352	320761	4278312	169864	2715132
MAPE (%)	2.04	1.79	2.05	2.72	0.95	1.46	2.67	2.60

The prediction results and the accuracy of the T-GM(1,1) model are shown in the Table 3. Calculation details for using the T-GM(1,1) model to predict the number of teachers and students at all preschools are described as follows. In this study, researchers used the data of the number of teachers and students for admission in 10 years to predict the next two years.

Establishing the original sequence for the number of teachers at all preschools:

$$x^{(0)} = (150335, 155699, 160172, \dots, 211225, 229724, 244478).$$

Using the T-GM(1,1) model to calculate parameters a and b , the result obtained $a = -0.0610$ and $b = 1.34E+05$; the predicted values $\hat{x}^{(0)} = (150335, 147618, 156906, \dots, 212884, 226279, 240516, 255650, 271735)$; and the predicted error of the T-GM(1,1) model: $Q = 1.78E+08$, $MAPE = 2.04\%$.

Establishing the original sequence for the number of students at all preschools:

$$x^{(0)} = (2588837, 2754094, 3024662, \dots, 3599663, 3873445, 4148356) .$$

Using the T-GM(1,1) model to calculate parameters a and b , the result obtained $a = -0.0461$ and $b = 2.61E+06$; the predicted values $\hat{x}^{(0)} = (2588837, 2793914, 2925826, \dots, 3684897, 3858876, 4041068, 4231863, 4431665)$; and the predicted error of the T-GM(1,1) model: $Q = 5.23E+10$, $MAPE = 1.79\%$.

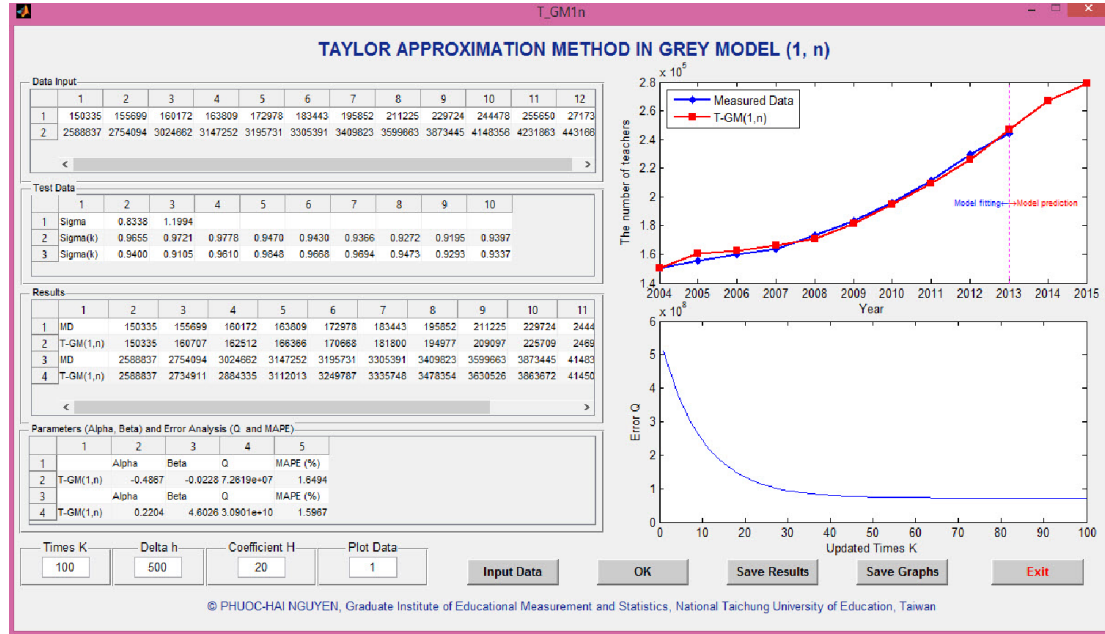


Fig. 3. The graphical user interface of the MATLAB toolbox for the T-GM(1,n) model

Table 4. The predicted results and the accuracy of the T-GM(1,n) model

Unit: Person

School Year	Preschool		Primary		Lower Secondary		Upper Secondary	
	Teachers	Students	Teachers	Students	Teachers	Students	Teachers	Students
2003-2004	150335	2588837	362627	8350191	280943	6612099	98714	2616207
2004-2005	160707	2734911	359043	7730416	293227	6459051	108124	2729950
2005-2006	162512	2884335	361899	7365043	304774	6509175	116339	2896486
2006-2007	166366	3112013	356492	7045011	313349	6289976	127534	3078771
2007-2008	170668	3249787	347195	6902611	315379	6044552	133305	3197228
2008-2009	181800	3335748	349109	6842778	315319	5678283	139851	3089211
2009-2010	194977	3478354	350722	6776986	314611	5329851	146320	2934251
2010-2011	209097	3630526	349232	6974650	313182	5025346	145893	2819253
2011-2012	225709	3863672	362541	7105967	311850	4776602	148961	2730251
2012-2013	246943	4145022	370050	7278135	310851	4731164	151160	2620407
2013-2014	266974	4410767	393129	7217462	311660	4670727	152408	2433388
2014-2015	279028	4549903	378704	7070264	313761	4267585	162874	2481329
MAPE (%)	1.65	1.60	1.92	1.34	0.80	2.10	1.87	3.35

The prediction results and the accuracy of the T-GM(1,n) model are shown in the Table 4. Calculation details for the using the T-GM(1,n) model to predict the number of teachers and students at all preschools are described as follows. In this study, researchers used data of the number of teachers and students for admission in 10 years and the predicted results of T-GM(1,1) for the next two years.

Establishing the original sequence for the number of teachers and students at all preschools:

$$x_1^{(0)} = (150335, 155699, 160172, \dots, 211225, 229724, 244478,)$$

$$x_2^{(0)} = (2588837, 2754094, 3024662, \dots, 3599663, 3873445, 4148356)$$

Using the T-GM(1,2) model to calculate the parameters α and θ_j , the result obtained $\alpha = -0.4867$ and $\theta_j = -0.0228$; the predicted values for the number of teachers at all preschools:

$\hat{x}_1^{(0)} = (150335, 160707, 162512, \dots, 209097, 225709, 246943, 266974, 279028)$; and the predicted error of the T-GM(1,2) model: $Q = 7.26E + 07$, MAPE = 1.65%.

Using the T-GM(1,2) model to calculate the parameters α and θ_j , the result obtained $\alpha = 0.224$ and $\theta_j = 4.6026$; the predicted values for the number of students at all preschools:

$\hat{x}_2^{(0)} = (2588837, 2734911, 2884335, \dots, 3630526, 3863672, 4145022, 4410767, 4549903)$; and the predicted error of the T-GM(1,2) model: $Q = 3.09E + 10$, MAPE = 1.60%.

4.3 DISCUSSION

The prediction results of T-GM(1,1) and T-GM(1,n) for the number of teachers and students for admission in Vietnam indicated that Taylor approximation method in grey system theory is a good alternative for optimizing parameters of two prediction models in this study. The experimental results also showed that the maximum value of MAPE for T-GM(1,1) and T-GM(1,n) is only equal to 2.72%, and the minimum value of MAPE for T-GM(1,1) and T-GM(1,n) is equal to 0.80% (Results are shown in the Table 3 and the Table 4). These results showed that the predicted accuracy of T-GM(1,1) and T-GM(1,n) is very good for predicting the number of teachers and students for admission in Vietnam. In addition, these results indicated that the MATLAB toolbox can help to process data quickly, accurately, which displays the results and the graphs on a graphical user interface visually. These results are not only conducted to serve as a reference for the educational administrators in Vietnam but also can assist the government in developing future policies regarding educational management. In the era of scientific and technological revolution nowadays, education and training are becoming the main motive force for the developmental acceleration and considered as a determining factor for the success or failure of a nation in international competitions and for the success of each individual in his life. The predicted data are required reliable and high accuracy to contribute to the success in the educational development of the country.

5 CONCLUSION

Based on the findings from this study, some conclusions and suggestions are as follows:

This study has successfully used Taylor approximation method in grey system theory (T-GM(1,1) and T-GM(1,n)) to predict the number of teachers and students for admission in Vietnam. The prediction results will provide the important information for educational administrators to proactively propose the appropriate policy and to build the educational development strategy in accordance with the new conditions.

This study has successfully developed a MATLAB toolbox for two prediction models based on Taylor approximation method in grey system theory. This toolbox has many advantages such as: easy to use, time-saving, accurate and clearly visual output. Especially, the user can save the results as an EXCEL file and the graphs as an image file (JPG).

Two prediction models are not only used to predict the number of teachers and students for admission in Vietnam but also can be suggested to use in many fields such as education, industry, economics, and medicine.

To sum up, two prediction models are actually useful for the predicted problems of uncertainty systems when the number of data is not enough for mathematical statistics, and the MATLAB toolbox not only helps user to process data quickly and accurately but also displays results and graphs on a graphical user interface visually.

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Backyard Poultry in Balochistan

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ABSTRACT: The term backyard poultry production designates chickens reared on small scale at household level. The first chicken was lured from the rain forests of Southwest Asia over 3,000 years ago. Since then chickens have been kept for meat and eggs throughout the world. In Balochistan province of Pakistan nearly all rural families keep a small flock of poultry to have a steady supply of fresh eggs for household consumption and to sell surplus at the local farmers market. Household level poultry production is mostly owned by women and managed by women and children. The profits are usually low as mostly *Desi* type chickens are reared with low egg and meat production. For increase in production and household income rearing of improved backyard poultry breeds is of utmost importance. During past 50 years through genetic research many high producing chicken breeds have been developed world over. These new breeds are well adapted to different climates and can be reared in both intensive and free range systems. The present study was conducted in the rural areas of five districts of Balochistan, where majority of people are dependent on livestock and poultry. The main objective of this research was to investigate economic status of rural poultry in the study area. Compilation of study data concluded that backyard poultry farming is commonly practiced in our rural area, mainly for family consumption and as a small income generating unit. The average number of birds kept is 12. Information from 200 females was obtained during the year 2013-14 to investigate status of backyard chicken in 5 district of Balochistan. Training status of the farmers and vaccination schedule affected egg production and mortality in backyard chickens. Average egg production reported per bird/per year has been 140.

KEYWORDS: Backyard, poultry, RIR, Fayomi, Balochistan.

1 INTRODUCTION

The poultry sector is an integral component of Pakistan's economy. The share of poultry industry in agriculture and livestock sector is 5.76% and 10.4%, respectively. In spite of developed commercial poultry system, backyard poultry still occupies significant position in the rural areas of the Pakistan [1]. The term backyard chicken designates rearing of chicks on small scale (10-12 birds) [2]. Backyard poultry rising is common in rural communities and a valued resource that provides food and income for subsistence farmers. The surplus birds and eggs are sold in the village or nearby market and the cash earned are utilized in household economy. This practice is common in about 2/3rd of rural families in our country mostly for family consumption and as a small income generating unit [3]. Furthermore, it is an ideal activity for women as livestock and poultry keeping are done traditionally by female members of the household. Keeping in view the very low cost of producing rural poultry, the net return from rural poultry could be several times more than that of birds produced on commercial scale. Contribution of rural poultry to household economy could be further enhanced through genetic improvement of the rural birds, in addition to their feeding, management and health status [4].

Balochistan is developing province of Pakistan and people of the rural area are mostly dependent for meat on rural poultry. Poultry is maintained in Balochistan rural area in small fragments. Majority of the inhabitants of Balochistan rural

area are farmer so people are dependent on livestock and poultry. Poultry production is one of the significant source of income because of rapid turnover and higher returns. The present study is therefore planned to investigate economic status of rural poultry in Balochistan. The importance of relative factors will also come up with certain recommendations for better returns. Also, the study will be much useful for devising strategies for optimum productivity from the backyard chicken production in the study area with the following objectives.

2 MATERIALS AND METHODS

2.1 SAMPLING OF THE STUDY AREA

A total of 200 farmers were selected to investigate production status of household chicken in five district of Balochistan during the year 2013-14. In each district, five villages were randomly selected and in each village 10 farmers were randomly interviewed. Information regarding area location, family size, flock size, training received by the farmers, academic qualification of females involved in chicken production, type of birds maintained, eggs produced and mortality among birds were collected. After collection of the data it was transferred into tally sheets and then punched into computer. Statistical Package for the Social Science (SPSS) was used for further analysis.

2.2 UNIVERSE OF THE STUDY

The study was conducted in Zhob, Quetta, Mastung, Loralai and Killasaifulla districts of US Assisted Agricultural Development project for Balochistan Border Areas (USABBA) being executed by FAO of the United Nations. Agriculture is the main occupation in the study area. Most of the farm families are small land owners. They grow crops as well as keep livestock and poultry. Main crops are wheat, maize and green grams while livestock includes cows, buffaloes, sheep, goats and domestic poultry bird. Horticultural crops like apple, grapes, cherry, pomegranate, apricot, plums are also grown in the study area.

Strengthening of backyard poultry production has exclusively been a women empowerment endower where each household was given one set of improvised high yielding birds. These birds aged between 12 - 14 weeks and were given on 25% cost share. Before delivery of birds' village level trainings on poultry management and chicken health care were conducted. Moreover for sustainable availability of replacement stock local made prototype egg incubators was designed and introduced on cost share. Literate community female activists were given training on operation and maintenance of these egg incubators.

2.3 SOURCE OF DATA

To collect data an interview schedule was designed to cover all relevant aspects of the study. The data were collected through interview schedule from the male respondents directly, while the female respondents were interviewed by a guided male member of the household, to whom each and every question was made clear.

3 RESULT

3.1 ROLE OF POULTRY IN THE FIVE DISTRICT OF BALOCHISTAN

In the study area due to small land holdings farmers keep poultry to supplement their family income. Generally they keep chickens to sell poultry products and earn additional income for their families. Thus poultry contributes towards the improvement of socio-economic conditions of the people. Generally they keep 10-12 birds primarily for their family consumption in the form of eggs as a food. While the additional is sold to earn cash income.

3.2 TYPES OF BIRDS GIVEN IN BALOCHISTAN

The average number of birds given to household was 12 in the study area. The main types of birds given to the communities were RIR, Fayomi and RIR cross Fayomi respectively as shown in Table-1.

Table-1: Types of birds

Types	Pullets Birds (F)	Pullets Birds (M)
RIR	10	2
Fayomi	10	2
RIR cross Fayomi	10	2

3.3 PRODUCTION OF EGGS BREED WISE PER YEAR

Table-2 shows the production of eggs breed wise per bird annually. The production rate of Fayomi was 120 eggs per year, followed by RIR type which was 140 eggs per year and 160 eggs per year was produced by RIR cross Fayomi.

Table-2: Productions of eggs breed wise per year

Breed Types	Annual egg per year
RIR	140
Fayomi	120
RIR cross Fayomi	160

3.4 MORTALITY BREEDS WISE PER YEAR

Table-3 shows the mortality breed wise per year. The lowest mortality rate was that of RIR cross Fayomi 2%, Fayomi was 4% and RIR was 3% mortality rate. The overall mortality rate of all the breeds was 3%. Chicks were less vulnerable to mortality. The low mortality rate shows that the respondents used proper vaccination and the housing facility for poultry was sound.

Table-3: Mortality breeds wise per year

Breed Types	Mortality/year
RIR	3%
Fayomi	4%
RIR cross Fayomi	2%

4 CONCLUSION

Proper health care of chickens coupled with capacity building of farming communities in poultry management skills and profitable marketing of surplus produce along with introduction of improved poultry breeds, ensuring sustainable availability of replacement stock are suggested as key factors for better backyard chicken productivity in study districts of Balochistan.

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Importance de l'innovation dans le secteur de la poterie – cas de la cité d'El Oulja au Maroc

[Importance of innovation on the field of pottery – case of El Oulja, Morocco]

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ABSTRACT: The City of El Oulja is known for the concentration of craft trades, including pottery which is the most represented in terms of number of production units. Pottery contributes to the growth of the craft sector and reflects the wealth of the latter. It also has the potential for unprecedented development. This study is the result of a survey of potters settled in the city of El Oulja. It analyzes the existence, and the need of innovation, a factor that may contribute to the evolution of pottery. In El Oulja the use of innovation remains weak because of the resistance of potters to change due to the traditional nature of the activity. Thus, the establishment of a localized production system in this city would represent many advantages and benefits through to the ease and efficiency of the flow of knowledge within it.

KEYWORDS: Artisan, creativity, product, clustering, impact.

RESUME: La Cité d'El Oulja, connue pour la concentration des métiers de l'artisanat, notamment la poterie qui est l'activité la plus représentée en termes de nombre d'unités de production et contribuant grandement à la croissance du secteur de l'artisanat, reflète la richesse de cette activité et présente un potentiel de développement sans précédent. Le présent travail est le fruit d'une enquête effectuée auprès des potiers installés dans la cité d'El Oulja. Il nous permet d'analyser l'existence et le besoin de l'innovation, facteur qui peut contribuer à l'évolution de l'artisanat. Aujourd'hui, le recours à l'innovation dans les unités de poterie d'El Oulja reste faible à cause de la résistance des potiers au changement vu le caractère traditionnel de l'activité. Dans ce sens, la constitution d'un système productif localisé dans cette cité présenterait nombre d'atouts et d'avantages grâce à la facilité et l'efficacité de la circulation du savoir en son sein.

MOTS-CLEFS: Artisan, créativité, produit, regroupement, impact.

1 INTRODUCTION

Le secteur de l'artisanat est l'un des secteurs les plus importants de l'économie marocaine, il emploie 2,3 millions d'artisans, soit 20% de la population active du Maroc, dont 48% exercent dans l'artisanat d'art et de production [1]. Conscient des atouts que représente l'innovation, le ministère de l'artisanat a toujours eu pour objectif d'améliorer le processus de production de l'artisanat, grâce à un rapprochement avec le design et à l'association entre innovation et intelligence manuelle, ainsi que de promouvoir l'innovation auprès des artisans afin de mieux répondre aux attentes et aux évolutions des marchés locaux et internationaux [2].

D'ailleurs, l'innovation peut être définie comme la mise en œuvre d'un produit ou d'un procédé nouveau ou sensiblement amélioré, d'une nouvelle méthode de commercialisation ou d'une méthode organisationnelle dans les pratiques de l'entreprise, l'organisation du lieu de travail ou les relations extérieures [3], ce qui représente le quotidien de l'artisan. L'entreprise artisanale peut faire preuve d'un vrai potentiel d'innovation grâce à la transmission continue du savoir-faire, à la tradition, au contact avec le client, etc. Les artisans intègrent alors les évolutions des techniques et des matériaux, voire créent des nouvelles techniques, ce qui donne une consistance particulière à l'innovation artisanale [4].

La Cité d'El Oulja, caractérisée par la concentration de plusieurs unités de production opérant dans le secteur de l'artisanat, notamment dans la poterie, se montre favorable à la constitution d'un Système Productif Localisé (SPL), que l'on peut définir comme la spécialisation d'entreprises autour d'un produit ou d'un métier, dans le but d'assurer l'évolution des petites entreprises d'organismes peu structurés et traditionnels à des petites entreprises organisées qui peuvent, ensemble, répondre aux défis de la mondialisation et aux changements technologiques constants, et anticiper les évolutions, et stimuler l'innovation grâce aux interactions que ce concept assure et promet [5], d'où l'objectif de ce travail.

2 MATERIEL ET METHODES

Le quartier d'El Oulja a été créé dans le cadre du plan quinquennal 1973-1977. Il est financé par le Fonds spécial de développement régional, sur une superficie de près de 10 ha, étendue à 13 ha. Parler d'El Oulja situé à quelques kilomètres de Rabat. Les artisans installés dans cette cité sont répartis entre les métiers de la poterie, de la vannerie, du bois et du fer.

L'enquête, de type prospectif transversal, menée entre le mois de juin et le mois d'octobre 2013, a porté sur les 48 unités de production actives implantées dans les 2 complexes d'El Oulja. Nous avons visé les propriétaires (Maâllam) de chaque unité de production, vu son rôle de superviseur de toutes les fonctions de l'unité productive, pouvant répondre à tout types de questions.

Le questionnaire de l'enquête, demande outre les informations relatives aux unités de production et leurs situations économiques, les caractéristiques épidémiologiques individuelles propres à chaque interviewé (âge, sexe, etc.). Les données recueillies sont saisies sur un support EXCEL, et analysées via le logiciel d'analyse statistique SPSS (*Statistical Package for the Social Sciences*).

Les tests représentés dans cette étude se résument à :

- L'Analyse des Correspondances Multiples ;
- Le test χ^2 qui permet de mesurer l'indépendance de deux caractères différents et dont l'observation est synthétisée sous la forme d'un tableau de contingence ;
- La carte de contrôle qui est un outil statistique d'enregistrement et de visualisation graphique des résultats de contrôles réalisés sur des échantillons. Cet outil compare l'étendue des variations produites par le processus et l'intervalle de tolérance établie, dans le but de vérifier si les variations produites par un processus sont hors contrôle ou sous contrôle en comparant.

3 RESULTATS

La Cité d'El Oulja, connue pour ses activités artisanales (Poterie, vannerie, Fer, etc.), est devenue une destination touristique importante grâce à la variabilité des produits qu'elle offre et à la spécificité de son architecture. Néanmoins, nous nous sommes focalisés dans cette étude sur le métier de la poterie en raison de l'importance de ce dernier en termes de production, de nombre d'unités installées dans La cité et de chiffre d'affaire généré.

Nous signalons que la Cité d'El Oulja connaît, dès son réaménagement en 1980, un succès important auprès de clients locaux et internationaux, et devient un centre d'attraction de touristes de partout dans le monde [3]. Selon la direction de

l'artisanat de Salé (2014), le nombre d'unités de poterie installées dans cette zone qui emploie aujourd'hui 9600 artisans [6] n'a cessé d'augmenter, passant de 18 unités (au moment de la création) à 93 unités aujourd'hui, auxquelles ont été rajoutées par la suite 24 autres unités de vannerie, jadis, éparpillées entre Rabat et Salé.

Les Maâllam (propriétaires) des unités de production d'El Oulja sont de plus en plus conscients de l'importance de la créativité et de l'innovation, et de leur impact sur leur activité ainsi que sur l'évolution de leurs revenus, commencent à faire recours à la formation afin d'améliorer leur techniques de production et aux nouvelles technologies en vue de faciliter le travail et gagner le temps. Nous nous concentrons dans cette étude sur le rapport entre ces unités de production et l'innovation dans le but de déceler les avantages ou inconvénients que peut présenter ce dernier.

3.1 TENDANCE À L'INNOVATION

L'innovation peut concerner le produit, le procédé, la commercialisation ou l'organisation [3]. Nous nous sommes focalisés ici sur l'innovation de produit. La figure 1 indique que les unités de production produisent en moyenne 2 ± 0.144 produits dont 75% produisent entre 1 et 2 produits, et uniquement 8% en produisent 4. Il est à noter que 54% des unités ne produisent pas les mêmes types de produits. Nous constatons alors que l'offre de produit est très réduite dans le cas des potiers d'El Oulja.

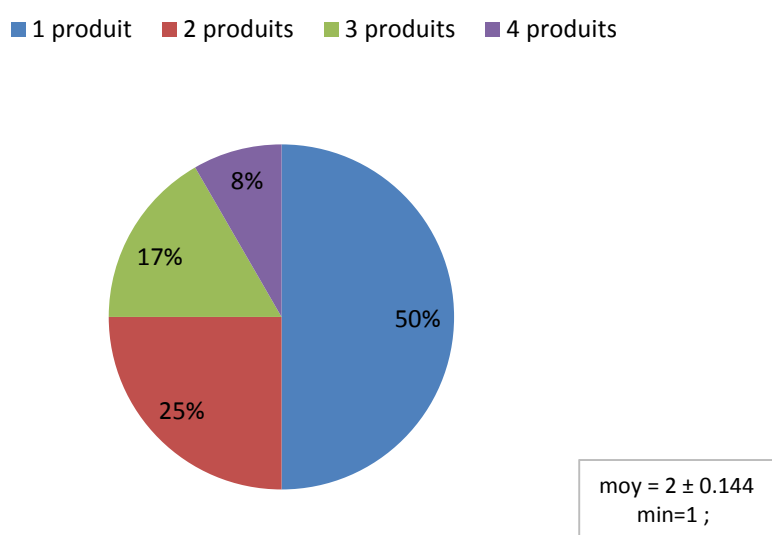


Fig.1. Répartition du nombre de types de produits fabriqués par les unités de poterie

En sachant que cette question est à choix multiple, nous notons que 65% des unités innove dans la décoration de leurs produits, dont 13,7% produisent aussi nouveaux modèles et 15,7% créent aussi des nouvelles formes (Fig.2.a). Par ailleurs, les artisans n'apportent pas souvent ces changements à leur production, et gardent ainsi les mêmes formes et décoration pendant longtemps.

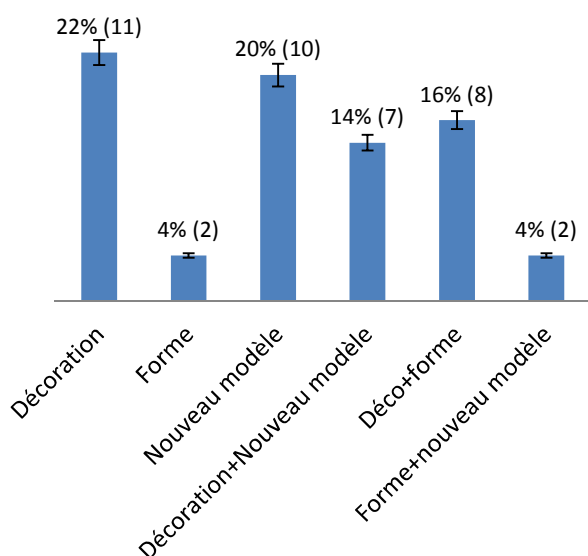


Fig.2.a. Illustration des types d'innovation au niveau des unités de production de poterie d'El Oulja

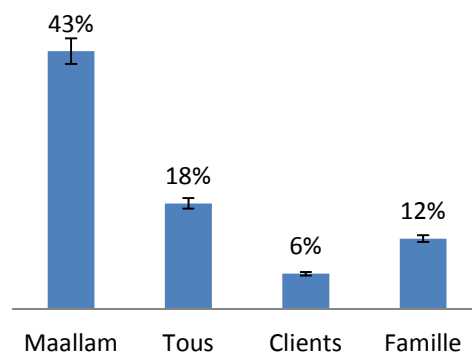


Fig.2.b. Illustration des types d'innovateurs au sein des unités de production de poterie d'El Oulja

La qualité des prestations est souvent affectée par la relation entre artisans et clients, mais aussi par la compétence des artisans, ce qui fait du savoir-faire artisanal un pilier de l'innovation parce qu'il est fait de traditions et de gestes techniques solides et maîtrisés [7]. De là, nous nous sommes intéressé au rôle de chaque individu, contribuant à la productivité de l'unité de production, dans l'innovation. Dans la Cité d'El Oulja, nous constatons alors que 43% (Fig.2.b) des unités où la personne qui innove est le Maallam, alors que dans 18% de ces unités, tous les employés s'impliquent dans le processus d'innovation. En outre, 5,9% attestent que ce sont les clients qui proposent les idées d'innovation.

Ces résultats nous montrent que pour la plupart des unités de production de poterie installées à El Oulja, c'est le Maallam seul qui détient le pouvoir de concevoir des nouveaux modèles et/ou formes, ce qui traduit une hiérarchie assez rude au sein de l'unité de production, et peut affecter la nature du transfert du savoir-faire, gardé très souvent secret de métier de peur de se retrouver copié par les concurrents. Il s'agit là d'une mentalité ancrée dans le système socio-économique marocain, et notamment dans les activités de l'artisanat.

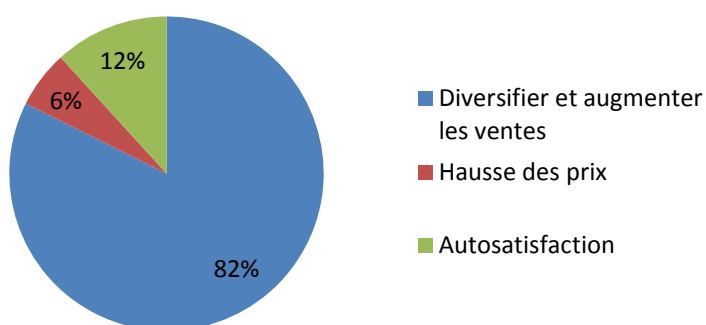


Fig.3. Répartition des unités selon la raison du recours à l'innovation

Nous observons que les buts liés à la raison du recours à l'innovation varient d'un artisan à un autre. En effet, 82% des artisans attestent qu'ils innovent pour diversifier leur production (Fig.3) dans le but suprême de générer le plus de gains à travers la hausse de leurs ventes. Réaliser une marge plus importante reste ainsi la vraie motivation derrière les actions

entreprises par les artisans. En effet, seulement 12% des interviewés affirment innover pour s'auto-satisfaire vu qu'ils exercent le métier de poterie par amour et non uniquement pour le gain matériel que ce dernier peut rapporter. D'autre part, près de 15% des enquêtés confirment utiliser des fours à gaz, la majorité des unités utilisant alors un four traditionnel, dont les coûts sont minimes par rapport au four à gaz qui restent polluants et désavantagés en termes de gain du temps et de capacité de production par rapport aux fours à gaz.

3.2 L'ANALYSE DES CORRESPONDANCES MULTIPLES

L'Analyse des Correspondances Multiples (ACM) est une analyse factorielle appliquée sur trois variables qualitatives ou plus. Il s'agit alors d'une AFC conduite à partir d'un tableau disjonctif complet (individus en lignes, variables et modalités en colonnes) ou d'un tableau de Burt [7]. Il est à noter que ce dernier est une présentation de tous les tableaux de contingence des variables prises deux à deux et réunis en une seule matrice. Dans cette étude, l'analyse des correspondances multiples nous a permis de relever la constitution de trois groupes distincts d'unités de production (Fig.4).

La 1^{ère} concentration (groupe1) comprend les unités de production où l'innovateur est le Maâllam qui produit de nouveaux modèles et améliore la décoration en vue de diversifier la production et d'augmenter la marge de bénéfice. Les interviewés qui constituent ce groupe, attestent que le changement est bien accueilli.

Par ailleurs le groupe 2 comprend des enquêtés optant pour l'innovation, mais cette innovation concerne uniquement la forme des produits en vue d'augmenter les prix. Pour ce groupe, les changements effectués ne sont pas bien accueillis dans le métier (que cela soit au sein de l'entreprise, parmi les artisans ou bien au niveau local).

Le troisième groupe est caractérisé par des enquêtés qui innoveront par le changement de la forme, la décoration et/ou la création de nouveaux modèles. L'innovateur ici peut être toute personne active dans l'unité cas de Maâllam, Mataâllam (s'il y'en a plusieurs) ou membre de famille (cas d'unité qui présente deux ou trois frères qui dirigent l'unité, père fils, ...). L'innovation dans ce cas a pour but d'augmenter le chiffre d'affaire (hausse des ventes). Notons aussi que les changements sont bien accueillis dans le métier, mais ce type d'unité souffre de copiage (plagiat). Enfin, cette analyse nous révèle que tous les artisans potier installés dans El Oulja innoveront.

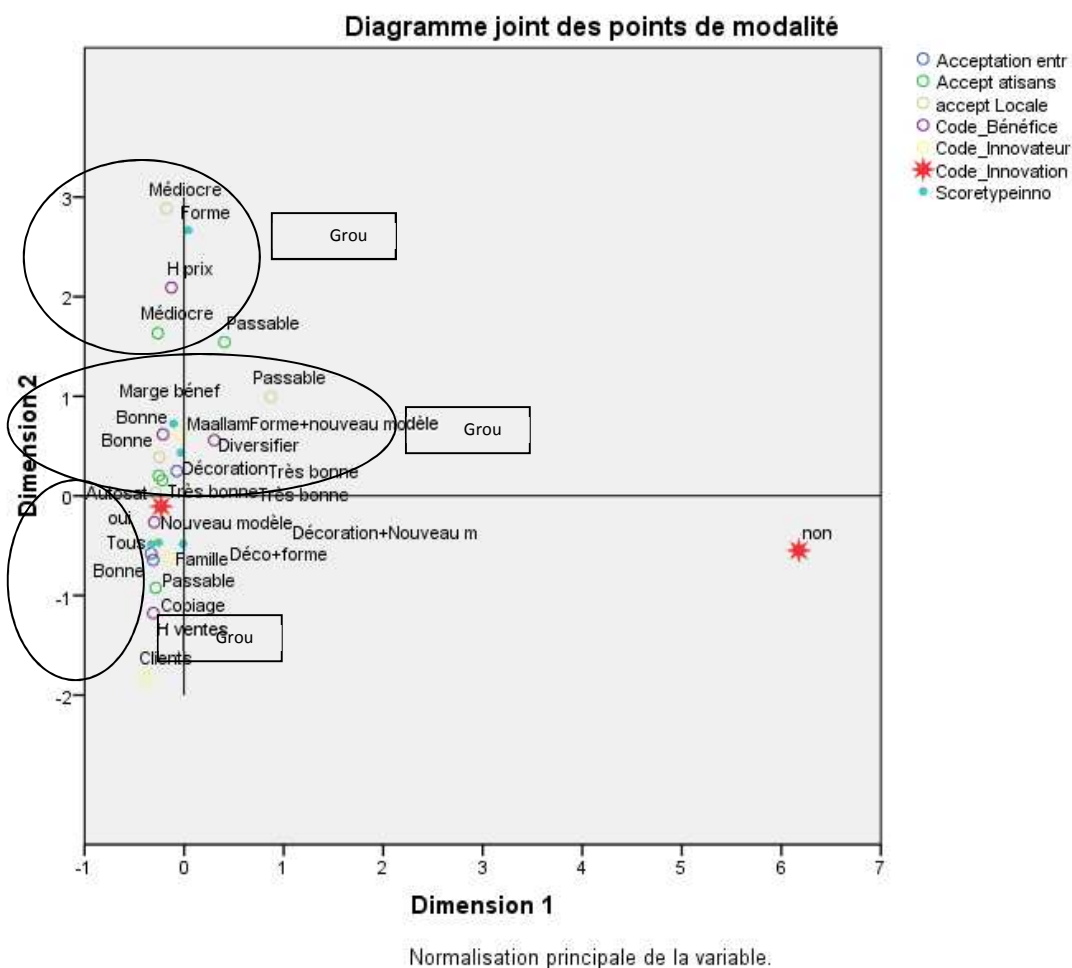


Fig.4. Projection des variables étudiées dans l'ACM

A la lumière de ces résultats, nous concluons que presque tous les enquêtés sont pour l'innovation, et notamment pour le changement des modèles vu l'impact que ce dernier peut avoir sur le revenu. Aussi, il est à préciser que 29% des Maâllam sont analphabètes, 27% ont achevé une année ou plus en primaire contre 12% des Maâllam se sont inscrits en université (Fig.5). De même, il nous paraît important d'indiquer que 46% des interviewés ont affirmé avoir effectué une formation professionnelle contre 54% n'ayant jamais effectué de formation professionnelle, dont 58% qui comptent en effectuer une ou plus dans le futur.

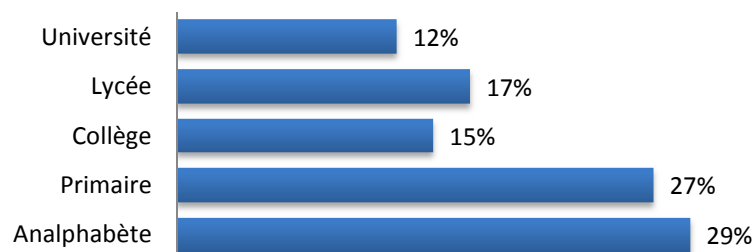


Fig.5. Niveau de scolarité des Maâllam

De ce fait, la majorité des enquêtés sont pour l'innovation, et notamment pour le changement des modèles vu l'impact que ce dernier peut avoir sur le revenu.

Le chiffre d'affaire moyen réalisé par le groupe 1 (226.327,27±64.781,295) est plus important que celui réalisé par le groupe 2 (192.533,33±41.350,28), malgré que le chiffre d'affaire varie entre un minimum de 9.600Dh et un maximum de 600.000Dhs pour le groupe 1 contre un minimum de 20.000Dh et un maximum de 600.000Dh pour le groupe 2 (Fig.6). Cependant, l'analyse de variance à un seul critère de classification "effet groupe" ne montre aucune différence significative [$F(1 ; 24) = 0,212 ; p = 0,649 > 0,05$].

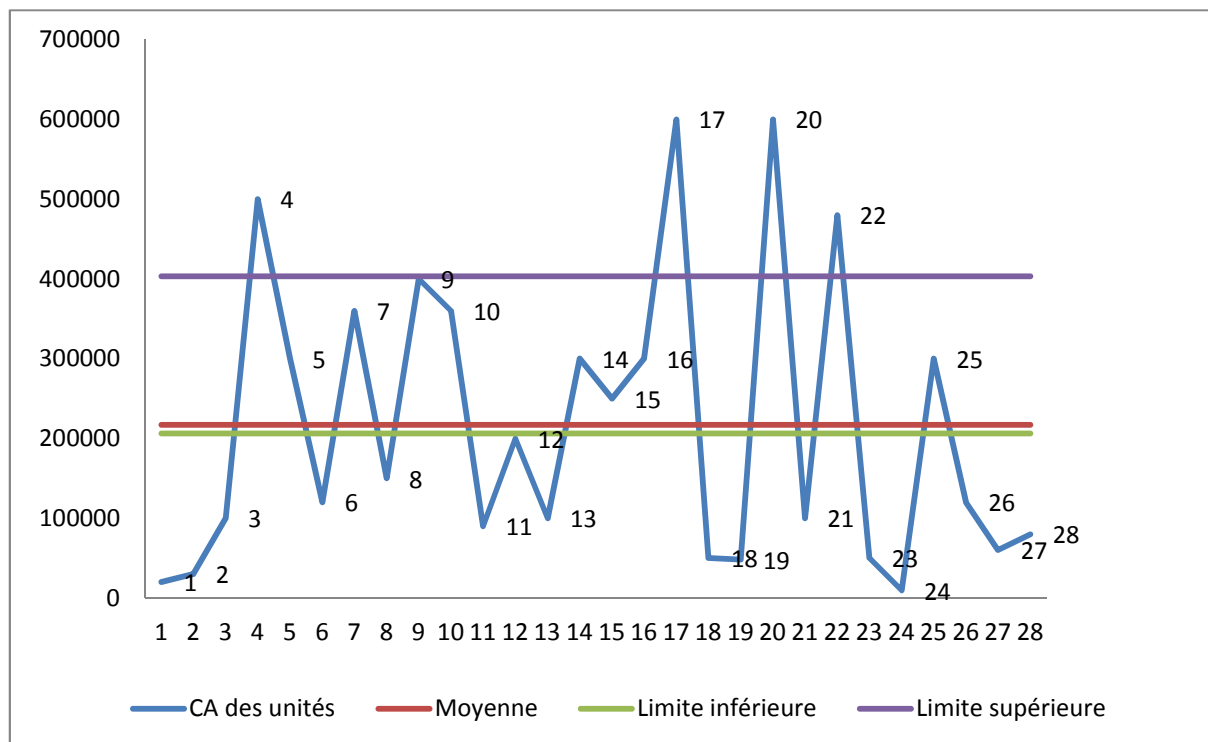


Fig.6. Représentation de la carte de contrôle des chiffres d'affaires des unités de production de poterie

Nous avons stratifié le chiffre d'affaire en trois catégories. La première classe comprend les unités à chiffre d'affaire inférieur à 206400Dh, la deuxième classe comprend les unités dont le chiffre d'affaire varie entre 206400 et 402300Dh, puis la troisième classe comprend les unités dont le chiffre d'affaire dépasse 402300Dh.

Il reste à noter que le chiffre moyen de toutes les unités est de 217.057,14Dh. La courbe de contrôle montre que 43% des unités ont un chiffre d'affaire supérieur à la moyenne, dont 33.3% réalisent un chiffre d'affaire inférieur à 206.400Dh, et 16.7% réalisent un chiffre d'affaire variant entre 206.400 et 402.300Dh. Notons aussi que 8.3% des unités (4 unités) réalisent un chiffre d'affaire supérieur à 402.300Dh.

Afin de chercher une liaison éventuelle entre le chiffre d'affaire et l'innovation, nous avons eu recours au test d'indépendance Chi2. Les résultats montrent que les deux variables ne sont pas liées à une erreur de 5% ($\chi^2 = 5,385 ; ddl = 2 ; p = 0,068$), cependant, la probabilité d'erreur qui pourrait expliquer une certaine liaison entre les variables sera de 0,068 (le coefficient de liaison entre une variable catégorielle (Chiffre d'affaire) et une variable nominale (innovation) est de 0,402). De ce fait, nous concluons que le recours à l'innovation peut avoir un impact positif sur le revenu de l'unité de production.

3.3 TENDANCES AU REGROUPEMENT

Les unités de production d'El Oulja sont regroupées spatialement, il reste à savoir si les artisans sont favorables au regroupement et à l'établissement d'échanges intenses entre ces unités. Les systèmes productifs que forment ces dernières gagnent ainsi en vitalité et en efficacité. La figure ci-dessous montre que 83% des enquêtés ont affirmé se regrouper avec d'autres unités dans la Cité d'El Oulja contre 16,7% qui ne considèrent pas la nécessité du regroupement. De même, 57% des enquêtés qui ne sont pas favorables au regroupement attestent qu'il n'existe pas d'harmonie entre les unités de production, contre 43% qui préfèrent travailler seuls. D'autre part, 33% des enquêtés étant favorables au regroupement attestent s'être

regroupés autour d'une association artisanale, 25% se sont regroupés dans le but de trouver des aides en matière première, contre 10% dans le but d'organiser le métier de la poterie et 10% pour améliorer leur situation économique (Fig.7).

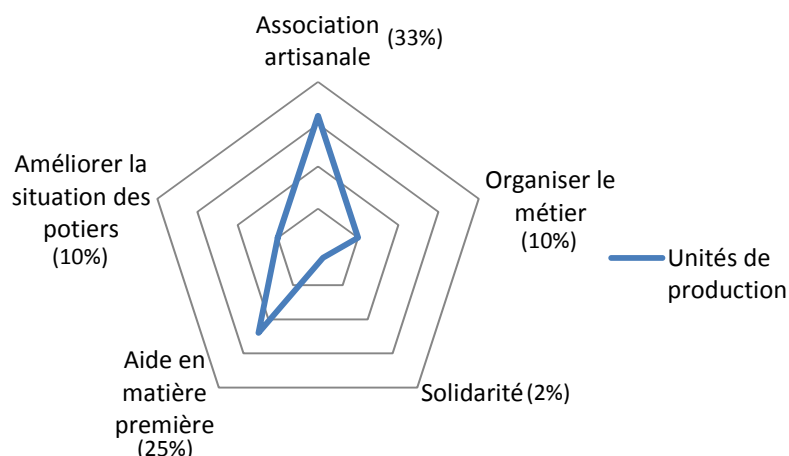


Fig.7. Répartition des Maâllam selon la nature de regroupement des unités de poterie à El Oulja

Notons que les potiers tendent de plus en plus vers le regroupement. En effet, sur les Maâllam ayant répondu à notre question liée à la tendance au regroupement, 54% attestent que le regroupement a commencé il y a moins de 5 ans, alors que 16% disent que les unités de production ont tendance à se regrouper depuis plus de 5ans.

4 DISCUSSION

L'innovation concerne l'ensemble de l'entreprise dans sa dynamique de développement. Elle doit être vécue comme une démarche vitale et incontournable qui s'intègre dans toute stratégie d'entreprise fondée sur la mobilité, l'anticipation et l'ouverture de nouveaux challenges. Le but principal de cet atout qu'est l'innovation est de répondre aux exigences du marché national, et de fidéliser les clients ainsi que d'en attirer de nouveaux, mais aussi pour répondre aux exigences du marché international qui impose le plus souvent des contraintes nouvelles où la clé de succès est de se doter d'atouts originaux permettant aux unités de production de se démarquer de la concurrence [8].

Les potiers de la Cité d'El Oulja apprennent le métier par le transfert du savoir de Maâllam à Mataâllam (particulièrement de père en fils), et négligent ainsi la formation professionnelle qu'ils jugent inadaptée à leurs besoins (matière première, techniques de production, gestion du four, etc.). Cette dernière s'avère dépassée par les attentes du marché national et international. Nos artisans affirment même détenir un savoir plus important que celui appris à travers la formation grâce à l'expérience acquise durant de longues années d'exercice. Néanmoins, il reste important de préciser qu'une grande partie des Maâllam sont analphabète, ce qui représente un vrai obstacle à la formation.

Dans son rapport de synthèse ayant concerné une étude d'analyse du potentiel du secteur cuir au Maroc (2003), le cabinet Transec propose la formation de stylistes et la stimulation de créateurs audacieux pouvant explorer des terrains d'innovation inédits dans le but d'atténuer l'impact du modèle hiérarchique, souvent en vigueur dans les sociétés de taille modeste pour la plupart d'entre elles, qui ne facilite pas la délégation de pouvoir et l'éclosion de nouveaux talents, ce qui représente un obstacle à l'innovation. Les compétences opérationnelles, souvent acquises sur le tas, ne font pas l'objet de véritables transmissions hors du cadre familial, ne favorisant pas l'arrivée d'idées neuves ou l'ouverture à de nouvelles technologies et méthodes de gestion [9].

Dans le même contexte, l'atelier de M. *Umar Abduh Karîmî* au Yemen [10] connaît une décroissance importante, en raison du manque de création et d'innovation, ce qui constitue une limite handicapante vis-à-vis de la pérennité de son entreprise. Ce manque de créativité et d'innovation est observé au niveau de la transmission du savoir faire qui reste familial à « *Hays* », zone réputée pour l'activité de la poterie. De plus, les potiers au Yemen ne font pas recours à des formations professionnelles à cause du caractère pénible et peu rentable de ce métier, leur savoir-faire se transmet de génération en génération (sauf pour les brûle-encens où il y a le plus de variations), ce qui est le cas des potières de « *Hasanat* », qui quittent de plus en plus ce métier [10].

Par ailleurs, la Maison de l'Artisan avait procédé avec succès en 1994 à un test chez les potiers de Salé. Elle avait proposé de nouveaux dessins de poteries traditionnelles aux rares artisans consentants. Malgré la résistance au changement ressentie au début auprès des rares artisans ayant participé à cette action, ces derniers ont été encouragés par l'affluence de la clientèle, et ont été même copiés par les voisins. Face à ce succès, la démarche a été structurée et des collections ont été créées pour être copiées. Les potiers ont effectué des formations afin de l'intelligence manuelle et spirituelle qu'ils détiennent, et la gestion rationnelle et la créativité [2]. Cette démarche nous démontre le besoin d'orientation et d'encadrement qu'ont les potiers de l'Oulja.

En outre, le secteur des meubles d'art au Vietnam a connu une évolution remarquable au fil des années en termes de tendance à l'innovation grâce à l'organisation de ce secteur et à la formation des artisans [11]. Autrefois, comme pour toutes les activités artisanales dans le monde, la diffusion de savoir-faire était très limitée, les techniques de production et ses modèles étaient des secrets de famille, mais le besoin croissant de main-d'œuvre pour assurer les commandes a rendu indispensable la diffusion de savoir-faire aux villageois des alentours.

Comme dans le secteur de la poterie dans la Cité d'El Oulja, l'investissement dans les équipements lié au secteur des meubles d'art au Vietnam est très faible (les machines servant à sécher le bois, peindre les meubles ou scier) puisque les coûts liés sont élevés au regard de la capacité d'investissement de la plupart des entreprises. Ainsi, seule une partie des entreprises les plus importantes a pu mécaniser certaines étapes du processus de production et utilise des scies électriques, des rabots, des tourneuses, des foreuses. Celles-ci peuvent accroître les rendements, répondre plus rapidement aux grosses commandes et améliorer la standardisation de la production [11]. De même, les équipements utilisés dans les unités de production de cuir sont mal adaptés, d'où le recours au travail manuel qui pourrait être intelligemment remplacé pour certaines opérations par des actions mécaniques efficaces sur le plan de la qualité et de la rapidité (installation de garnitures en relief en maroquinerie de bureau par exemple), ce qui améliorerait productivité et qualité [9].

La notion de système productif localisé (SPL) vient en faveur de l'innovation, où les acteurs publics et privés sont interpellés, constituant un milieu ambiant et permettant une bonne maîtrise du métier ainsi qu'une bonne connaissance des marchés. Un SPL est une organisation intelligente vivante dont la force est faite par le branchement sur, entre autres, la recherche innovation et sur le système éducatif [12]. C'est pourquoi le monde connaît depuis des décennies la multiplication de modèles de réseaux d'innovation territoriaux représentés par les districts industriels italiens, les clusters de Porter, les milieux innovateurs, etc. C'est dans cette perspective que les grappes de croissances ont été créées en 2008 par l'État sénégalais à travers sa stratégie de croissance accélérée avec comme objectifs principaux la stimulation du développement et la réduction de la pauvreté à travers l'accélération de la croissance économique et la création d'emplois massifs [13].

En outre, la promotion de l'innovation en réseau permet de développer des instruments de dynamiques territoriales devenus aujourd'hui indispensables à la compétitivité des entreprises via les interactions des acteurs permettant d'atteindre les objectifs de performance et de compétitivité escomptés. De ce fait, il est important d'observer les interactions entre les unités de production dont la qualité influence fortement la performance de ces dernières [13], d'où l'intérêt du regroupement des unités de production de poterie dans la Cité de l'Oulja dans le but de stimuler le transfert du savoir et d'agrandir l'apprentissage qui se veut comme clé de succès de toute activité artisanale à travers le monde.

5 CONCLUSION

L'innovation est aujourd'hui un facteur important au développement et à l'évolution de toute entreprise de quelque taille soit-elle, d'où l'utilité de ce travail qui essaie de mesurer l'intérêt que porte les potiers de la cité d'El Oulja à ce sujet. Nous constatons alors que ces derniers produisent le plus souvent les mêmes articles, et apportent rarement des modifications à leur production, ce qui peut être expliqué par le mode de formation qui se fait généralement sur le tas. Cette situation peut s'améliorer dans le cas de l'encouragement de la construction d'une industrie motivée par les intérêts communs aux artisans.

Cette proposition peut être intéressante dans le cadre de la constitution d'un SPL favorisant l'innovation grâce au transfert fluide de l'information entre les différents acteurs ainsi qu'à la contribution du secteur public, qui s'avère importante quant à la définition de stratégies claires et soutenues. De ce fait, la constitution d'un SPL, où les relations de proximité exercent un rôle déterminant dans la mise en œuvre des processus d'apprentissage et d'interaction entre les acteurs, en particulier au niveau local. Le message stratégique qui en découle est que face à la mondialisation, la proximité devient un atout incontestable de la stratégie d'entreprise, et une clé d'ouverture des unités de production (étant des firmes de petite taille) sur l'international.

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La gestion des déchets d'activités de soins à risque infectieux : collecte, entreposage et traitement, dans la région de Gharb au Maroc

[The management of waste arising from care activities involving infectious risks: collection, storage and treatment of the Gharb region in Morocco]

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ABSTRACT: Objective. – This study aims to participate to the improvement of the management of waste arising from care activities involving infectious risks, which is currently a real health and environmental concern, especially in the collection, storage, transportation and disposal of this type of waste.

Workers and methods. – This is a descriptive, exploratory and cross-sectional study was carried during 2011 in the regional hospital EL IDRISSE of the Gharb region in Morocco on 170 health-care workers from 275, with anonymous questionnaire. Other methods have been used such as grids observations and interviews with the managers of waste arising from care activities involving infectious risks.

Results. – The frequency of the internal collection is an essential role in the proper movement of procedures for the management of infectious and highly infectious waste especially for storage time, this frequency is well respected in the hospital studied, 78.8% of nursing staff report that infectious waste is collected once a day. Approximately 11% of these buildings are identified and separated, the rest were inside the services. No local intermediate storage satisfied the standards of hygiene and safety; the Storage rooms are 49.64% treatment rooms, toilets 32.12%. The establishment has a local central storage. However local compliance with regulatory standards is not respected in its entirety. Only 41.9% of nursing personnel know how to handle potentially infectious waste to his hospital, among them 23.9% et 19.4%, respectively, know the exact mode of treatment used in the hospital of the waste care activities infectious risks soft and of the sharp objects.

Conclusion. – The management system of solid and liquid infectious and highly infectious waste is a major concern for health staff and people. The lack of organization and human and financial resources make the challenge of the application of the national policy on the management of infectious waste particularly difficult for the hospital studied. This study supported the implementation of an adequate organizational plan based on regular assessment and coordination between those responsible.

KEYWORDS: infectious waste; collection; storage, disposal; Morocco.

RESUME: Objectifs. – Cette étude a pour objectifs de participer à l'amélioration de la gestion des déchets d'activités de soins à risques infectieux, qui constituent un problème sanitaire et environnemental, notamment au niveau du collecte, entreposage, transports et élimination de ce type des déchets.

Personnels et méthodes. – il s'agit d'une étude descriptive, exploratoire et transversale qui s'est déroulée durant l'année 2011 dans l'hôpital régional EL IDRISSI de la région de Gharb au Maroc. Après d'un échantillon représentatif de 170 soignants parmi 275 à l'aide d'un questionnaire anonymisé. D'autre méthodes ont été utilisées tel que les grilles d'observations et les entretiens avec les responsables de la gestion des déchets d'activités de soins à risques infectieux.

Résultats. – La fréquence de la collecte interne est un rôle primordial dans la bonne circulation des procédures de la gestion des déchets infectieux et hautement infectieux surtout pour la durée d'entreposage, cette fréquence est bien respectée dans l'hôpital étudié, 78,8% des infirmiers déclarent que les déchets infectieux sont collectées une fois par jour. Environ les 11% de ces locaux, sont identifiés et séparés le reste se trouvaient à l'intérieur des services. Aucun local d'entreposage intermédiaire ne répondait aux normes d'hygiène et de sécurité, Les locaux d'entreposage les plus utilisés sont les salles de soins 49,64%, les toilettes 32,12%. L'établissement dispose d'un local d'entreposage central. Toutefois la conformité du local aux normes réglementaires, n'est pas respectée dans sa globalité. Seulement 41,9% des personnels infirmiers connaissent le mode de traitement des déchets à risques infectieux au sien de l'hôpital parmi eux 23,9%, 19,4%, respectivement, savent le mode de traitement exact utilisé dans l'hôpital pour les déchets d'activités de soins à risques infectieux mous et les objets piquants, coupants et tranchants.

Conclusion. – Le système de gestion des déchets infectieux et hautement infectieux solide et liquide constitue une préoccupation majeure pour le personnel de santé et les populations. Le manque d'organisation et des moyens humains et financiers rendent le défi de l'application de la politique nationale de la gestion des déchets infectieux particulièrement ardu pour l'hôpital étudié. Cette étude a appuyé la mise en œuvre d'un plan organisationnel adéquat basé sur l'évaluation régulière et la coordination entre les différents responsables.

MOTS-CLEFS: Déchet infectieux ; collecte ; entreposage ; traitement; Maroc.

1 INTRODUCTION

La gestion des déchets de soins prend de plus en plus d'importance dans le domaine de la santé. Cet intérêt se rapporte d'une part à l'importance du risque lié à la production des déchets d'activités de soins (la Croissance démographique, le Développement économique et l'amélioration du niveau de vie), et d'autre part aux nuisances que peut engendrer une technique de traitement de ces déchets pour la santé de l'homme et pour l'environnement.

Dans les pays en développement, un danger supplémentaire se surajoute, celui de la fouille des décharges et du tri manuel des déchets récupérés à la sortie des établissements de soins. De même les méthodes de gestion des déchets de soins peuvent elles-mêmes entraîner un risque pour la santé, si les différentes étapes du processus de gestion ne sont pas menées correctement.

Au Maroc, les autorités compétente s'est engagés à mettre en œuvre des actions visant la prévention et la protection de l'hygiène dans les établissements de soins, notamment à travers un système de gestion des déchets générés par les établissements de soins, dont l'objectif premier est d'éviter la transmission accidentelle des maladies et d'améliorer la qualité de soins.

Ce travail permet de mettre le point sur les différents types des déchets d'activités de soins ainsi que les méthodes de gestion de ces derniers, en se basant sur l'entreposage, la collecte et les modes de traitement et d'élimination.

Les déchets d'activités de soins à risques infectieux, comprennent tous les déchets issus des activités de diagnostic, de suivi, de traitements préventifs, curatifs et palliatifs dans le domaine de la médecine humaine et vétérinaire [1]. Ils sont produits par les établissements de santé humaine, d'hygiène vétérinaire, de recherche et d'enseignement médical, les laboratoires d'essais ou de recherche clinique et les établissements de production ou d'essai de vaccin [2].

Les différentes étapes de la gestion des DASRI sont [3] :

- Le tri et conditionnement : opération effectuée au lieu de génération des déchets et à travers laquelle chaque catégorie de déchets est mise dans un sac ou conteneur qui lui convient et orienté vers une filière précise ; Le conditionnement : destiné à contenir les déchets hospitaliers. Il constitue une barrière physique contre les micro-organismes pathogènes qu'il contiennent ;

- La collecte : c'est le trajet depuis le lieu de génération des déchets ou les zones de stockage intermédiaire des déchets jusqu'à la zone de stockage central.
- Le stockage : les locaux pour le stockage intermédiaire au sein de l'unité de soins et pour le stockage central doivent être désignés au sein de l'établissement ;
- Le transport : doit s'effectuer dans des conteneurs séparés portant une étiquette imperméable et à écriture indélébile indiquant la mention « déchets infectieux » et présente le symbole international du risque biologique ;
- Traitement et élimination : les DASRI sont traités, éliminés selon des procédures appropriées et reconnues en la matière (incinération désinfection par micro-ondes, thermique et chimique, enfouissement.) ;

2 POPULATION ET MÉTHODES

2.1 POPULATION

Cette étude s'est effectuée au niveau de l'hôpital EL IDRISSE de Kénitra en 2011, vu sa renommée et son histoire qui font de cet établissement un CHR et un pilote national dans la gestion des déchets infectieux hospitaliers, sa proximité de l'IFCS de Kénitra et vu aussi la production importante de ses services en matière des déchets d'activités de soins à risques infectieux. L'échantillonnage dans cette étude est non probabiliste à choix raisonné pour les infirmiers chefs et les responsables d'hygiène et de gestion des déchets, et il est probabiliste pour les infirmiers soignants, d'une taille de 170 infirmiers. En termes de pourcentage, La taille de l'échantillon à l'étude représente donc 61,82 % de l'effectif total des personnels infirmiers des unités de soins (population étudiée), avec un taux de participation de 94,12%.

Dans le but d'apporter des réponses aux questions de recherche préconçues, l'étude est orientée vers la description et l'exploration. Il s'agit d'une étude descriptive exploratoire basée sur l'évaluation des connaissances, pratiques et attitudes concernant la gestion des déchets infectieux notamment la collecte, l'entreposage et le traitement des DASRI dans une tentative de dégager les facteurs qui ont action sur l'amélioration du mode de gestion de ce type des déchets. On utilisera un devis descriptif qui est le plus adapté à ce genre de recherche.

2.2 MÉTHODES

2.2.1 SOURCES ET MÉTHODES DE COLLECTE DE DONNÉES

Afin d'accumuler différents points de vue pour investiguer les aspects convergents, l'étude a fait appel à une variété de sources de données :

- L'observation directe ; elle nous a permis d'apprécier le processus et les résultats immédiats de la gestion des déchets à risque (mode de tri, conditionnement). L'observation a été réalisée à l'aide d'une grille d'observation.
- Les entretiens semi-directifs ; ont été réalisés avec des responsables d'hygiène, les infirmiers chefs et certains intervenants dans la gestion des déchets d'activités de soins à risques infectieux, dans le respect de la confidentialité après information des intéressés sur l'objectif de notre étude.
- La compulsions de certains documents ; tels les documents qui sont en rapport avec les actions menées par les différents intervenants concernant le processus de la gestion des déchets d'activités de soins à risques infectieux.
- Un questionnaire destiné aux personnels soignants ; les infirmiers chefs des unités de soins et les infirmiers qui constituent la catégorie la plus contactée avec les DASRI.

2.2.2 TRAITEMENT ET ANALYSE DES RESULTATS

Les questionnaires récupérés soit directement par nos soins soit par l'intermédiaire des infirmiers chefs des unités de soins et les grilles d'observations sont analysées à l'aide de l'outil informatique (SPSS), et sont présentés sous forme de tableaux et de graphiques, suivis d'une discussion. Les résultats des entretiens et d'observations sont aussi présentés et discutés, puis une synthèse générale des résultats de ces outils va essayer de dégager les facteurs influant la gestion (Collecte, Entreposage et Traitement) des déchets à risques infectieux, en vue de participer davantage à l'amélioration du système de gestion au niveau de l'hôpital EL IDRISSE.

Les variables qualitatives ont été exprimées en pourcentages. On a utilisé dans l'analyse bivariée, le test χ^2 et coefficient V de Cramer et coefficient alpha, pour étudier la dépendance des profils sociodémographiques et professionnelles et mesurer

leur intensité d'association avec le mode de tri et de conditionnement des déchets infectieux. Le test était considéré comme significatif lorsque $p < 0,05$.

Dans un deuxième temps, les distributions des variables entre eux ont été prises en compte simultanément pour déterminer les relations et l'association entre la gestion des DASRI et chacun des facteurs l'influençant, tout en tenant compte de l'effet simultané des autres facteurs dites signalétiques. Celle-ci a été réalisée à l'aide d'une Analyse Factoriels Multiple (ACM). Les résultats ont été exprimés en termes de corrélation entre les variables et la discrimination des axes.

Tableau 1 : Caractéristiques de la population étudiée

		Infirmier diplômé d'état (n=114) n (%)	Infirmier auxiliaire; Croissant rouge (n=46) n (%)	Total (n=160) n (%)
Age (ans)	[20-30]	17 (14,91)	08 (17,39)	25 (15,6)
	[31-40]	23 (20,17)	02 (4,35)	25 (15,6)
	[41-50]	37 (32,46)	24 (52,17)	61 (38,1)
	> 51	37 (32,46)	12 (26,09)	49 (30,6)
Sexe	Féminin	75 (65,79)	41 (89,13)	116 (72,5)
	Masculin	39 (34,21)	05 (10,87)	44 (27,5)
Poste d'affectation	Blocs opératoires	52 (45,61)	21 (45,65)	73 (45,6)
	Services d'hospitalisations	34 (29,82)	24 (52,17)	58 (36,2)
	Services d'analyses	28 (24,56)	01 (2,17)	29 (18,1)
Ancienneté dans le poste (ans)	< 5 ans	31 (27,19)	10 (21,74)	41 (25,6)
	[5-10]	25 (21,93)	05 (10,87)	30 (18,2)
	[11-15]	19 (16,67)	14 (30,43)	33 (20,6)
	[16-20]	08 (7,02)	05 (10,87)	13 (8,1)
	> 20 ans	31 (27,19)	12 (26,09)	43 (26,9)

3 RÉSULTATS

3.1 CARACTÉRISTIQUES SOCIODÉMOGRAPHIQUES ET PROFESSIONNELLES (TABLEAU 1)

La distribution des Infirmiers par la tranche d'âge libre quatre classes, l'âge de 41 ans et plus représente 68,7 % du total de l'échantillon, avec un âge moyen au environ de 43 ans. La population étudiée, dont 72,5% de sexe féminin, comprenait 71,25% des infirmiers diplômés d'état et 28,75% des infirmiers auxiliaires et des membres de croissant rouge. Les personnels de soins qui ont moins de 5 ans (25,6%) et plus de 20 ans (26,9%) d'expérience sont les plus dominants dans l'échantillon avec une ancienneté professionnelle moyenne au environ de 15 ans.

3.2 EVALUATION DES ATTITUDES ET PRATIQUES

3.2.1 LA COLLECTE DES DASRI

La collecte interne des déchets d'activité de soins à risque infectieux se fait par un agent de service désigné à cette tâche soutenu par deux autres agents, l'absence d'un protocole écrit pour la collecte ainsi que le manque de formation de ces agents dans les domaines d'hygiène des mains et de la prévention contre les accidents exposants au sang rend cette fonction très dangereux pour ces agents et entraîne une mauvaise gestion des procédures qui suit la collecte interne tel que l'entreposage centrale et le traitement. En plus de ces difficultés, l'étude a signalée l'absence des poubelles adéquates pour la collecte (le symbole et le code couleur «matière infectieuse») jugés par 60% des infirmiers ainsi que la mauvaise désinfection des ces poubelles jugés par 73,1% des infirmiers.

La fréquence de la collecte interne est un rôle primordial dans la bonne circulation des procédures de la gestion des DASRI surtout pour la durée d'entreposage, cette fréquence est bien respectée dans l'hôpital étudié, 78,8% des infirmiers déclarent que les DASRI sont collectées une fois par jour.

Tableau 2 : Fréquence d'évacuation des DASRI de service

	Fréquence	Pourcentage (%)	Pourcentage Cumulée (%)
1 FOIS/JOUR	126	78,8	78,8
2 FOIS/JOUR	16	10,0	88,8
2FOIS/SEMAINE	1	0,6	89,4
1FOIS/SEMAINE	17	10,6	100,0
Total	160	100,0	

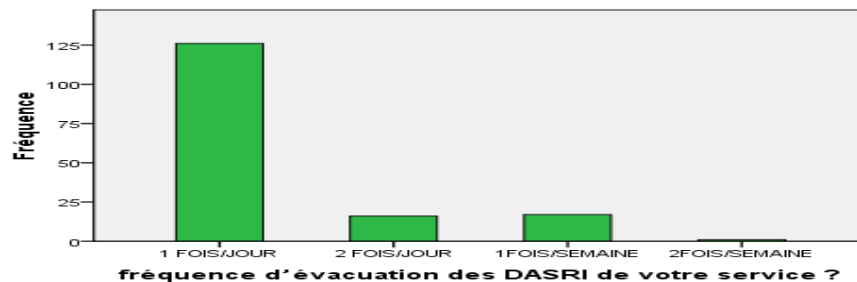


Fig. 1 : Fréquence d'évacuation des DASRI de service

3.2.2 L'ENTREPOSAGE

3.2.2.1 L'ENTREPOSAGE INTERMÉDIAIRE

Le local d'entreposage intermédiaire a une fonction de stockage temporaire de déchets préalablement conditionnés pour une ou plusieurs unités de soins, dans des conditions conformes à la réglementation et aux protocoles internes ; c'est un point de collecte à l'intérieur de l'établissement qui peut également être utilisé pour l'entreposage des produits souillés, du linge sale, des déchets ménagers et assimilés. La localisation dans la mesure du possible, à l'extérieur de l'unité de soins et à proximité du circuit d'évacuation (monte-charge, ascenseur...).

Tous les services observés possédaient ce local, Environ les 11% de ces locaux, sont identifiés et séparés le reste se trouvaient à l'intérieur des services. Aucun local d'entreposage intermédiaire ne répondait aux normes d'hygiène et de sécurité, C'est-à-dire fermé, identifié, ventilé, nettoyé et désinfecté régulièrement.

Environ 86% des personnels déclarent que les DASRI sont stockés dans un local accessible aux malades et à leurs familles. En cas du manque de structure bien identifiée et spécialisée pour l'entreposage intermédiaire, les DASRI sont stockés dans d'autres lieux tels que les toilettes, les douches, les couloirs et les salles de soins.

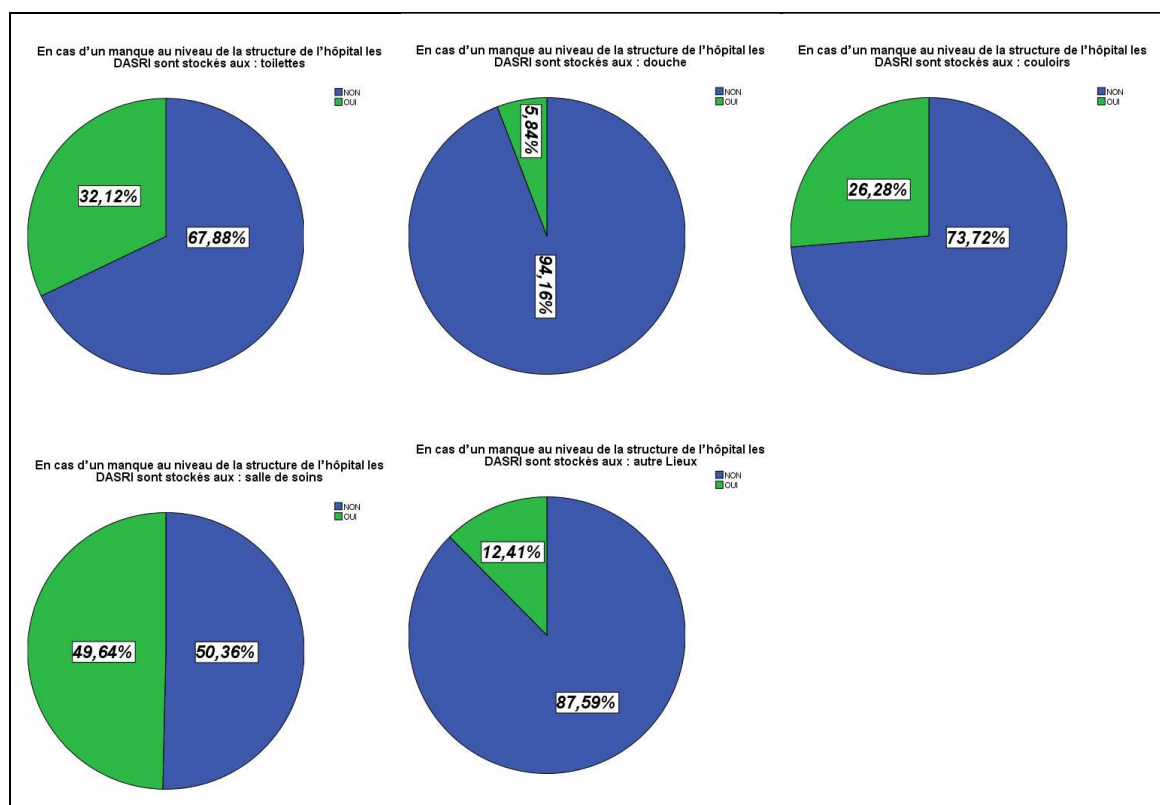


Fig. 2 : Lieux de stockage intermédiaire des DASRI au sien de l'hôpital

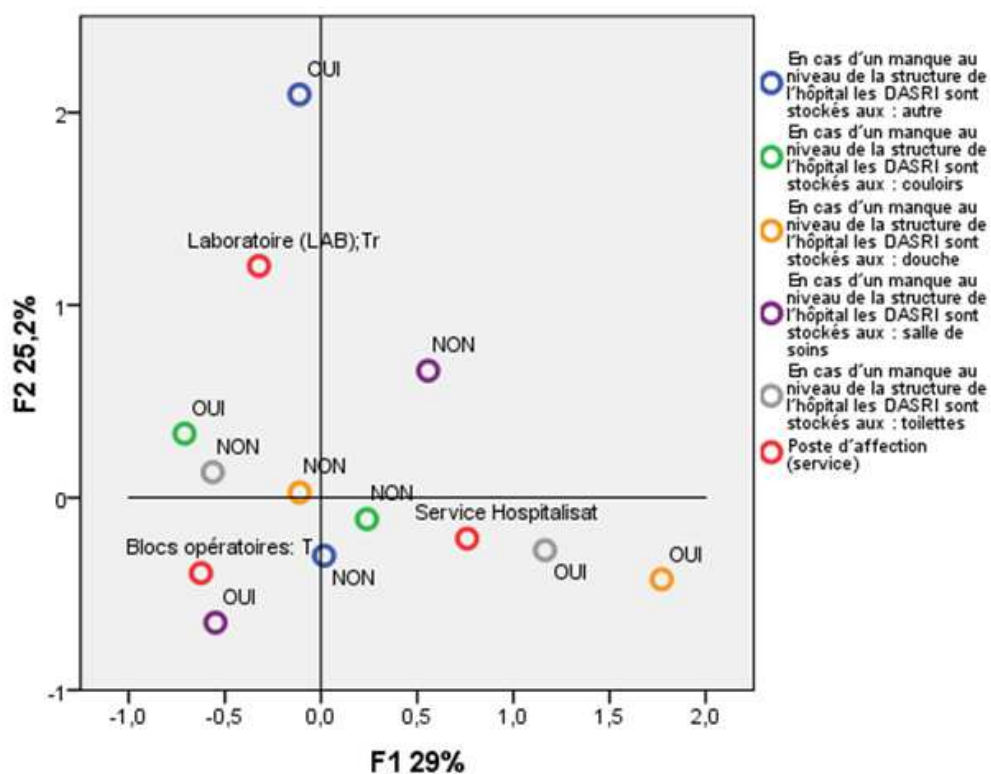


Fig.3. Graphe des modalités actives et supplémentaires sur le plan principal de l'ACM.

Tableau 4 : Les mesures de discrimination

	Dimension	
	F1	F2
Poste d'affectation (service)	0,409	0,368
En cas d'un manque au niveau de la structure de l'hôpital les DASRI sont stockés aux : toilettes	0,656	0,036
En cas d'un manque au niveau de la structure de l'hôpital les DASRI sont stockés aux : douche	0,198	0,011
En cas d'un manque au niveau de la structure de l'hôpital les DASRI sont stockés aux : couloirs	0,170	0,037
En cas d'un manque au niveau de la structure de l'hôpital les DASRI sont stockés aux : salle de soins	0,306	0,428
En cas d'un manque au niveau de la structure de l'hôpital les DASRI sont stockés aux : autre	0,002	0,631

- Les locaux d'entreposages les plus utilisés sont les salles de soins 49,64%, les toilettes 32,12% et les couloirs 26,28%.
- Le stockage dans les salles de soin est souvent utilisé par les services des blocs opératoires (66%), tandis que les services d'hospitalisation utilisent les toilettes (50%) comme lieux d'entreposage.

3.2.2.2 L'ENTREPOSAGE CENTRAL

Il s'agit du local où sont entreposés les conteneurs pleins avant le traitement ou l'enlèvement. La localisation doit être en retrait des zones d'activités hospitalières et à distance des fenêtres et des prises d'air (ex : système de traitement d'air) et facilement accessible par les véhicules de transport.

L'établissement dispose d'un local d'entreposage central. Toutefois la conformité du local aux normes réglementaires, n'est pas respectée dans sa globalité.

Tableau 5 : Etat général du local et critères normés

Critères Normés respectés	Critères Normés non respectés
- Local bien identifié. - Le local est réservé uniquement à l'entreposage. - Le local possède une porte à fermeture sécurisée. - Le lieu est en retrait de la zone hospitalière. - L'accès est facile pour les véhicules. - La présence d'un d'agent responsable. - L'assurance d'un passage facile des MRC (Matériel recevant conteneur). - présence d'un point d'eau et une évacuation des eaux. - La présence d'un poste d'hygiène à proximité du local. - La durée de stockage maximal est 24 heures sauf les week-ends.	- local non réfrigéré dans le cas de conditions climatiques particulières. - manque de ventilation correcte. - Le revêtement des murs et des sols n'est pas adapté au nettoyage et à la désinfection. - Le nettoyage est rare. - L'absence de la conduite affichée des Accident exposant au sang et du protocole interne d'entretien. - La traçabilité est absente.

3.2.3 TRAITEMENT IN SITU DE L'HOPITAL

Seulement 41,9% des personnels infirmiers connaissent le mode de traitement des DASRI au sien de l'hôpital. Les DASRI mous et les déchets piquants coupants et tranchants (OPCT) sont traités en sien de l'établissement par le mode de broyage-désinfection, tandis que les déchets anatomique non aisément identifiable et placentas sont éliminés par le mode d'enfouissement. Parmi les infirmiers déclarant la connaissance du mode de traitement des DASRI, seuls 23,9%, 19,4%, 10,4%

et 13,4% respectivement, savent le mode de traitement exact utilisé dans l'hôpital pour les DASRI mous, les OPCT, les déchets anatomiques et placentas.

4 DISCUSSION

Le Maroc a connu l'introduction de la notion de déchet dangereux et la gestion de ce type de déchet avec la loi 28-00 sur l'élimination des déchets de 2006, en le soumettant à un système d'autorisation préalable à tous les stades de la gestion : collecte, transport, stockage et élimination. En plus de cette loi le gouvernement a publié Le Décret 2-09-139 du 18 juin 2009 relatif à la gestion des déchets médicaux et pharmaceutiques. Ce texte définit différentes catégories de déchets médicaux et pharmaceutiques et définit les modalités de tri, conditionnement, collecte, transport et élimination de ces derniers. La gestion des déchets dangereux est l'un des problèmes les plus importants dans les établissements médicaux.

Le traitement des DASRI se fait par le mode de broyage-désinfection après l'installation d'un broyeur-désinfecteur au sein de l'établissement en date du 24/01/2005, d'une capacité de 36 à 40 Kg/h. L'établissement étudié était considérée comme pilote dans l'opération de la gestion des déchets hospitaliers qui a débutée en 2007.

4.1 CARACTÉRISTIQUES DE LA POPULATION

Le taux de 94,12% de participation du personnel de soins dans notre enquête et ce de 90 % dans les entretiens avec les responsables concernés d'hygiène et de la gestion des déchets hospitaliers a témoigné de ses angoisses et de son volonté de collaborer au développement du secteur de la santé et à l'amélioration des conditions de travail. D'autre taux ont été rapportés dans des enquêtes menés dans des études similaires : 93% [4], 65,3% dans cinq hôpitaux sénégalais [2], 68,1% in Japon [5], d'autre taux plus faible 32% à Paris en France [6].

La population étudiée était relativement âgée, essentiellement de sexe féminin 72,5% avec une ancienneté importante.

4.2 EVALUATION DES ATTITUDES ET PRATIQUES

4.2.1 COLLECTE DES DASRI GUIDE

Entre le moment où le déchet est produit et le moment où il est effectivement incinéré ou désinfecté, la durée maximale autorisée est différente selon la quantité de DASRI produite. Cette durée inclut donc l'entreposage, l'éventuel regroupement, le transport et l'incinération ou la désinfection. Il appartient à l'établissement d'obtenir contractuellement les engagements nécessaires lui permettant de respecter les délais suivants :

Tableau 6 : Délais d'élimination selon la quantité générée [7]

Quantité produite	Délais
supérieure à 100 kg / semaine	72 heures
entre 5 kg / mois et 100 kg / semaine	7 jours

Ce délai est bien respecté dans l'hôpital El Idrissi, sauf pour les collecteurs des déchets piquants et dans tous les cas, le volume du collecteur doit être adapté à la quantité de déchets produits pour garantir une évacuation aussi fréquemment que l'imposent les contraintes d'hygiène. La durée d'utilisation de l'emballage (entre son ouverture et sa fermeture) doit faire l'objet d'une concertation interne associant les personnels des services de soins, le CLIN et l'équipe opérationnelle d'hygiène. Pour les mini-collecteurs et les boîtes à aiguilles, les délais réglementaires d'élimination doivent être entendus entre la fermeture définitive de l'emballage et son incinération ou son prétraitement par désinfection [7]. Toutefois les normes de la collecte sont moins appréciées et qui nécessite un effort organisationnel (manque de formation et de matériels) pour s'adapter aux normes de collecte et transport des DASRI.

4.2.2 L'ENTREPOSAGE INTERMÉDIAIRE ET CENTRAL

Chaque lieu d'entreposage doit répondre à des normes et des règlements qui lui rendent un lieu apte pour le stockage des déchets à risque infectieux. Le problème majeur de l'entreposage intermédiaire c'est le local qui apparaît non conforme dans la plupart des services, ce local dont l'emplacement n'a pas toujours été prévu dans les bâtiments existants, est néanmoins très souvent indispensable (contrainte architecturale) [7].

Cette enquête a pu faire ressortir l'indisponibilité dans la majorité des cas, des locaux d'entreposage intermédiaire identifiés des DASRI (89%), ce taux était de 67% [8] et de 73,3% [9]; Entreposés souvent à l'intérieur des services, les DASRI occupent différents endroits inappropriés ; couloirs, sanitaires, salles de soins, qui ne répondent à aucune norme, offrant ainsi une image peu valorisante des représentations des déchets dans un univers, en principe, rassurant où de nombreuses techniques guérissent ou sauvent des vies. Ces lieux de stockage intermédiaire représentent donc avant tout, des lieux à risque mal isolés du milieu environnant, situés sur le passage des malades, du public visiteur et même au niveau des sanitaires (32,12%) c'est-à-dire proches des malades. Comme ils sont également proches des personnels soignants lorsqu'ils se trouvent dans les salles de soins (49,64%), ces taux étaient respectivement de 32,12% et 37% dans autre étude similaire [8].

De ce fait, la mise en place de vrais locaux d'entreposage intermédiaire des DASRI, doit répondre aux normes d'hygiène et de sécurité, de jour comme de nuit, y compris les jours fériés : il est à noter que la continuité des activités dans les établissements de santé engendre une production permanente qui doit faire l'objet d'une prise en charge sécurisée, particulièrement à l'intérieur des services ; ceci représente, à notre sens, un des défis pour une gestion optimale des DASRI.

Le local d'entreposage central était bien identifié et séparés mais nécessite plus d'effort pour le rendre normé et conforme au règlement.

La durée de stockage des DASRI dans les locaux de regroupement avant leur enlèvement ne doit pas dépasser 24 heures pour les hôpitaux possédant un traitement in situ et 48 heures pour les hôpitaux qui n'en possèdent pas [8]. Au Maroc cette durée est fixée à 24 heures dans les deux locaux d'entreposage compte tenu des températures modérées généralement enregistrées au niveau de notre pays [3], [10]. Dans notre enquête, cette durée est bien respectée dans l'hôpital étudié.

4.2.3 TRAITEMENT IN SITU

Le traitement des déchets d'activité de soins à risque infectieux se fait à l'intérieur de l'hôpital par le mode broyage-désinfection. Le procédé consiste à broyer, puis à stériliser les déchets d'activités de soins à risque infectieux par vapeur d'eau. Le broyage et la stérilisation se font dans une même enceinte fermée et compacte, sans manipulation intermédiaire des déchets.

Le déroulement du processus :

- Les déchets contaminés sont introduits dans la chambre supérieure de la machine munie d'un broyeur à haute résistance. Les déchets sont broyés et acheminés vers la chambre inférieure.
- Après broyage, les déchets sont chauffés « à cœur » par vapeur d'eau jusqu'à une température de 138 ° C, et la pression augmente jusqu'à 3,8 bars.
- La stérilisation est obtenue en maintenant un palier de 138 ° C au cœur des déchets pendant 10 minutes.
- Après refroidissement, les résidus obtenus rejoignent la filière des déchets ménagers. Les déchets sont à la fois neutralisés, et leur volume est réduit de 80 % ;
- Le procédé, entièrement automatique, se déroule selon un cycle moyen de 30 à 60 minutes, suivant la capacité du modèle.

Les déchets anatomiques non aisément identifiable et placentas sont mal gérés et son mode d'élimination reste instable, mais en général c'est l'enfouissement à cause de la référence religieuse du pays.

Les personnels infirmiers ont un mal connaissance du mode de traitement des DASRI in situ de l'établissement malgré la présence de l'installation de traitement dans l'hôpital, cela est dû au manque de formation et au partage de l'information [2], [5], [11], [12].

En cas de prétraitement par désinfection, les déchets prétraités doivent être éliminés (via la filière des déchets ménagers et assimilés) régulièrement et conformément aux règles d'hygiène.

5 RECOMMANDATIONS

A la lumière de cette étude nous recommandons :

- la mise en œuvre de programmes et plans de la gestion de ce type des déchets, basés sur l'augmentation du nombre de responsables, l'amélioration du système budgétaire et la motivation des personnels adaptés, réalisable et régulièrement évalués [5], [12].

- Une formation continue et adaptée des professionnels de la santé pour assurer un changement durable des comportements à risque et l'instauration d'une culture de la prévention des risques professionnels [2], [11], [12].
- Une sensibilisation des responsables de l'hôpital étudié pour une application effective de la législation sur la gestion des déchets médicaux et pharmaceutiques [13].

6 CONCLUSION

Le système de gestion des déchets DASRI solide et liquide constitue une préoccupation majeure pour le personnel de santé et les populations, la difficulté de ce système de gestion réside dans sa pérennité. En conclusion, cette étude a souligné le besoin de la mise en œuvre d'un plan organisationnel adéquat basé sur l'évaluation régulière et la coordination entre les différents responsables malgré les contraintes d'architecture et de rappels d'information des professionnels de santé sur les règles de la gestion à travers de la formation continue, la sensibilisation des personnels.

Le manque d'organisation et des moyens humains et financiers rendent le défi de l'application de la politique nationale de la gestion des déchets infectieux particulièrement difficile pour l'hôpital étudié [4], [11].

REMERCIEMENTS

Les auteurs souhaitent remercier les correspondants des services d'hygiène et ceux du comité de lutte contre les infections nosocomiales qui font que ce réseau demeure actif, ainsi que les infirmiers des services de l'hôpital qui prodiguent inlassablement chaque jour des soins de qualité à leurs patients.

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Psychopathology and Self Esteem among Students of University of Karachi

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ABSTRACT: A number of studies evidenced the psychological problems being faced by university students. However, little work has done in Pakistan with respect to psychological problems faced by university students and its impact on their self-esteem. On the basis of literature review it was hypothesized that 1) There would be a significant inverse relationship between symptoms of psychopathology and self-esteem. 2) There will be a difference between symptoms of psychopathology among men and women university students. Sample of 400 participants had been taken from major representative departments of Humanities, Sciences, and Social Sciences, Management and administrative sciences of University of Karachi, while using Systematic Random Sampling. Consent form was got signed from every participant. Interview sheet and General Health Questionnaire: GHQ-28 and Rosenberg Self-Esteem Scale (RSES) was administered on each participant. Result analysis revealed that a correlation between symptoms of psychopathology and self-esteem is negatively associated and significant at 0.01alpha level. However, no gender difference found in the symptoms of psychopathology.

KEYWORDS: Psychological problems, Self-Esteem, Gender difference, Systematic random sampling, inverse relationship.

1 INTRODUCTION

Students face many situations in university life that may result in psychological problems. Meeting deadlines of assignments, performing well in presentations and examination. In addition University life needs a lot of collaboration and group work which can also create stress for students who are socially uncomfortable and cannot make friends easily. The pressure and adjustments that come with university life can often be overwhelming for students. We all go through from different challenges in our daily life but when challenges of life become overwhelming and it slow down our ability to do our work than it creates distress and prone us to develop psychological problems.

Adjustment to a new environment is a challenging task. Shift of students from school atmosphere to university atmosphere can create a psychological, academic and social upset to students. There is enormous diversity in educational system: the students have to adjust with different methods of teaching, new academic necessities, formation of relationship with other students and with teacher (Hussien and Hussien 2006). Mikolajczyk, Brzoska and Maier, et al. (2010), mentioned Students face number of stressors for instance academic overwork, pressure to do well, achieve better than peers, short of spare time and less time to spend with their dear ones. Furthermore, they are pressured about the future and in few areas of the world students face serious financial issues.

Those students who don't cope up well with stressors end up with psychopathology. Psychopathology [from psycho + pathology] is defined as pathology of the mental illnesses or as the study of the causes and nature of mental illnesses. Psycho comes from the Greek — *psyche* — meaning breath, blast of life, soul. This term is already documented in Greek words as

psicagogo and many others. The prefix patho comes to us from the Greek *pathos* which means 'sickness, passion, and feeling' (Cunha, 1997) .

Literature shows that psychological problems are prevalent among university students. Study conducted by Yadeta Dessie, Jemal Ebrahim, Tades (2013) to measure mental distress among students. Cross-sectional design was used for the study. Four hundred and thirteen students were approached for the study. Participants were selected while utilizing Simple random sampling technique. Mental distress was measured with the help of Self-Reporting Questionnaire-20 (SRQ-20). Results showed significant mental distress among students. 21.6% students were found to be mentally distressed. Diagnosable mental problems among university students are alarming. As estimated by Berman et al in 2000, shared that a noticeable percentage (37%) of Americans which fall in the age range of fifteen and twenty four years, most of them are college going students having diagnosable mental problems. These disorder having mild to chronic phases, list of disorders includes depression, anxiety, schizophrenia, and bipolar disorder, and it presents with different frequencies at different campus.

Psychological problems especially depression, anxiety, somatic symptoms are quite prevalent among students. González, Landero &, García-Campayo (2009) conducted a study to measure somatic symptoms, depression and anxiety in which convenience sample of 506 psychology students were taken from two universities in Monterrey, in the state of Nuevo León, Mexico. In order to find out somatic symptoms, the Patient Health Questionnaire (PHQ) was used; for depression, the Beck Depression Inventory; (BDI). Finding shows that, 129 (25.5%) showed somatic symptoms that range from medium intensity to severe. The severity of somatic symptoms correlated well with anxiety and depression levels. Most reported problem was somatic symptoms and the most frequent complaints were: headache, menstrual pain, pain in back, feeling exhausted and having staying asleep.

One of the major components of personality development is self-esteem. Self-esteem is a necessary human need that is fundamental for healthy psychological development. It helps the person to deal better with the stressors. Self-esteem plays a vital role in one's personality development. It is a major pillar in construction of one's personality. It indicates how much a person gives significance and worth to him or her. Person with good self esteem take positive attitude towards self and others that in turn protect them developing pathologies. According to Blascovich and Tomaka (1991), Self esteem is most popular and frequently used notion in the field of psychology. It tells about person's own sense of regard, or the degree, to which a person gives value, approves, appreciates, prizes or likes him or herself. Self esteem is commonly thought-out the evaluative construct of the self concept, a broader depiction of the self that includes cognitive and behavioral aspects as well as evaluative or effective ones.

Rosenberg and Owen (2001) propose the explanation of low self-esteem people. Individuals who are having low self-esteem are more disturbed by failure and be inclined to amplify situations as being negative. For example, they frequently infer non critical remarks as critical. They are more probable to go through social anxiety and low intensity of interpersonal confidence. This makes social contact with others hard as they feel uncomfortable, withdrawn, conspicuous, and unable to adequately express them while communicating with others (p. 409). Moreover, low self-esteem persons likely to be pessimistic regarding people and groups surrounded by society.

Self-esteem is an essential feature of understanding individuals, low self esteem develop psychological problem. Self esteem has been associated with a variety of mental health issues. Low self-esteem has been linked with a greater intensity of psychiatric problem, including depression and anxiety, and it has been well thought-out as a susceptibility factor in the growth of depression and psychosis (Wittkowski, 2006).

Low self esteem develops proneness towards psychopathology. Research was conducted by Garaigordobil, Pérez, and Mozaz (2008), to find out the characteristics of self-concept, self-esteem and its impact on psychopathological symptoms with reference to age and gender. In order to conduct this study representative sample was taken from the Basque Country. The sample comprised of 1,579 participants, age range from 12 to 65, there were 732 males participants (46.4%) and 847 were females (53.6%) participants. In order to find out psychopathological symptoms, self-concept and self-esteem, three questionnaires were administered. The findings of the analyses established noteworthy inverse relationships between self-concept/self-esteem and symptoms of psychopathology.

Talaei, Fayyazi and Rezaei (2009), conducted study on students of Ferdowsi University of Mashhad.1200 participants responded on Eynseck self-esteem scale, Beck Depression Inventory and Cassidy social support scale. Finding shows 1.8% of the participants reported low levels of self-esteem, 6.3% reported moderate levels and 91.9% reported high levels of self-esteem. Results showed levels of self esteem were negatively associated with frequency of depression and social support.

Zeigler-Hill (2011) reviewed the literature that pays attention to the interconnections between self-esteem and psychopathology. Self-esteem is closely connected with psychopathology. High self-esteem appears to precede as a source

that shield people from negative experiences. Individuals with low self esteem, on the other hand, may be more likely to experience different forms of psychopathology because they are short of these sources.

Gender difference is also evident in psychological problems. Rate of prevalence of psychological problems among university students is quite high especially among female students. A cross-sectional study was carried out by Jadoon, Yaqoob, Raza. et al at Nishtar Medical College, Multan. Participants were approached from medical college, the questionnaire was administered on 815 students who didn't report any physical illness and had spent more than less months at the college. Result showed high occurrence of anxiety and depression. Analysis found that 43.89% of students gone through from anxiety and depression. Anxiety and depression was also found elevated in female students as contrast to male students.

Furthermore study was conducted by Bitsika, Sharpley and Melhem (2010), in order to find out difference in psychopathology among male and female students of university population. Anxiety and depression inventory were administered on 200 male and female university students from private university in Australia. Results showed that female students were more likely than males to account symptomatology related with pain and exhaustion, sleeping and digestive issues, psychomotor shakeup, bewilderment, and glumness.

2 METHOD

Sample:

The present research has approved by The Board of Advanced Studies and Research (BASR). Sample has been collected from student population of University of Karachi while using Systematic Random Sampling. The sample of present study had been taken from representative departments of University of Karachi including: Humanities, Sciences, Social Sciences and Management and administrative sciences. The sample is consisting of 400 students including gender, male participants and female participants.

Measurement

Consent Form;

Consent was obtained from every participant. Consent form is illustrating the nature of the study and the need to do the study, ensuring confidentiality of participant. Participant's right to withdraw and their right to get to know about research findings have been mentioned. E-mail address was mention through which participants can contact and get to know about their results. Participants' were asked to put their initial on consent form if they are willing to participate in the study.

Demographic Sheet;

Demographic sheet is consists of questions including, Name (Optional), Age, Gender, Education (year of study), Department, Income level and Spoken language.

General Health Questionnaire-28: GHQ;

The General Health Questionnaire (GHQ) assesses present mental health. It was development by Goldberg in the 1978. General Health Questionnaire (GHQ) is a screening measure it indicates risk for the development of psychiatric disorder. It is widely used in different purpose for instance assessment, research, and in different cultures. It has been translated in 38 languages.

The General Health Questionnaire (GHQ) consists of 28 statements. Administration of General Health Questionnaire (GHQ) require participant to judge his/her psychological state with given statements. In order to answer every statement, four options are on hand (1-not at all, 2-no more than usual, 3-rather more than usual, 4- much more than usual). Likert scoring method (0, 1, 2, and 3) is followed in the present research, lowest score on the scale is 0 and highest is 84, the higher number indicates higher level of mental distress. General Health Questionnaire (GHQ) measures four areas; Items 1-7 measure somatic symptoms, item 8-14 measure anxiety/insomnia, item 15-21 measure social dysfunction, item 22-28 measure severe depression.

Rosenberg Self-Esteem Scale (RSES);

Rosenberg Self-Esteem Scale developed by Rosenberg, 1965. In general it evaluates thoughts of self-worth. It consists of ten items and four response category (Strongly Agree, Agree, Disagree and Strongly Disagree). Scores are calculated as follows: For items 1, 2, 4, 6, and 7: values are assigned as, for Strongly Agree=3, Agree=2, Disagree =1and Strongly Disagree=0. Items 3, 5, 8, 9, and 10 are reversed items, values are assigned as for Strongly Agree=0, Agree=1, Disagree =2 and

Strongly Disagree=3. Total score obtained by adding all the values. The higher score the better the self-esteem. The scale score ranges from 0-30. Scores between 15 and 25 are under the normal range; scores less than 15 indicate low self-esteem.

Procedure

In order to carry out present research, sample of 400 participants, age range 18years and above, were taken from representative departments of University of Karachi including: Humanities, Sciences, Social Sciences and Management and Administrative Sciences while using Systematic Random Sampling.

First of all authorities of the departments were approached in order to take the permission for data collection. After getting permission and formal introduction to the participants, participants were asked to read the informed consent in which participants were ensured that the information they provided will be kept confidential, and their results will only be used for research purposes. Participants were asked that if they are willing to participate than sign the inform consent and proceed. Along with Consent Form, Demographic sheet, General Health Questionnaire: GHQ 28 (assess somatic symptoms, anxiety and insomnia, social dysfunction and severe depression) and Rosenberg self-esteem scale. Participants were asked to respond on each scale.

3 RESULTS

Table I – Descriptive Statistics of General Health Questionnaire and Rosenberg Self Esteem Scale Descriptive Statistics

	Mean	Std. Deviation	N
General Health Questionnaire	27.8475	12.73419	400
Rosenberg Self Esteem Scale	18.9875	3.94350	400

Table I: illustrates the descriptive values of General Health Questionnaire and Self esteem.

Table II – Descriptive Statistics of Subscales of General Health Questionnaire

Subscales	Mean	Std. Deviation	N
Somatic Symptoms	6.792	4.433	400
Anxiety Symptoms	6.485	4.709	400
Social Dysfunction	9.322	3.570	400
Depression Symptoms	5.280	4.609	400

Table III – Correlation between General Health Questionnaire and Self Esteem Correlations

		SE_total
GHQ (Total)	Pearson Correlation	-.478**
	Sig. (1-tailed)	.000
	N	400
**. Correlation is significant at the 0.01 level (1-tailed).		

Table III: illustrates the inverse correlation between General Health Questionnaire and Self Esteem

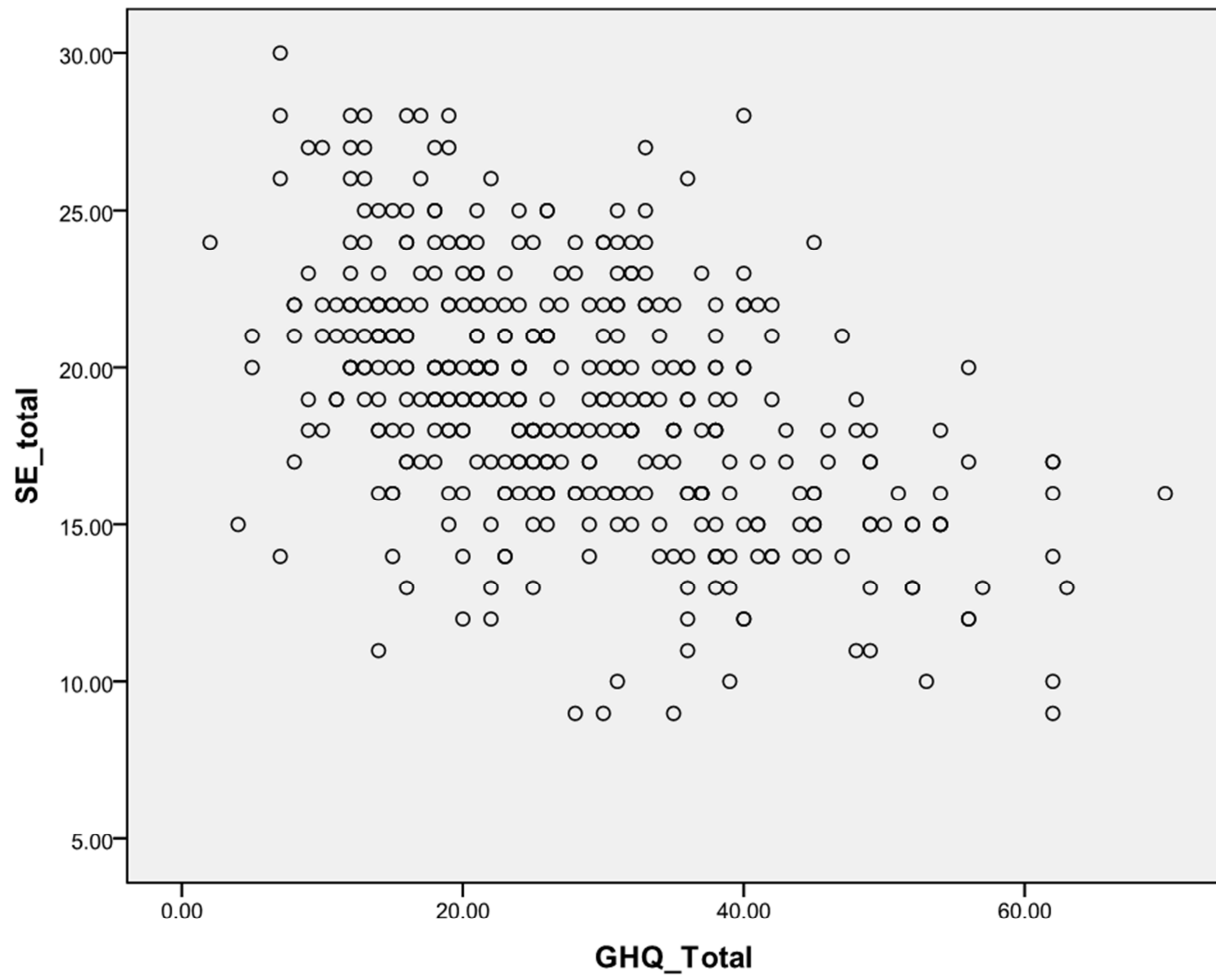


Figure I: Correlation between General Health Questionnaire and Self Esteem

Graph shows negative correlation between GHQ (General Health Questionnaire) and Self Esteem

Table IV: Difference In the symptoms of psychopathology with reference to gender through t-test.

Table IV: illustrates the difference in the symptoms of psychopathology with reference to gender

Groups	N	Mean	Std. Deviation	T- Value	df	Sig	Mean Difference	Standard Error Difference	Confidence interval of the Difference
Male	162	27.012	11.99689	-1.083	398	.280	-1.40362	1.29677	Lower -3.95
Female	238	28.416	13.20718						Upper 1.14575

$p > 0.05$

Table IV indicates the t-test value for male and female sub groups of the sample in the context of Symptoms of psychopathology. The calculated t value is -1.083 at 0.280 (significance level). Therefore p is greater than 0.05 that indicates that there is no significant gender difference in symptoms of psychopathology in the given sample.

4 DISCUSSION

University students consist of population with problems and worries that is unlike from other age and profession crowd. Challenges faced by students at times becomes exciting, interesting and empowering but at the other hand can also be stressful, anxiety producing and may prompt different forms of psychological problems. In university life many students first time encounter co-education system, and teaching style is also different from college one. Some students find difficult to adjust in university environment and end up with psychological problems.

University students are renowned as a population group experiencing problems that can make a payment to psychological disorders (Eisenberg, Gollust, Golberstein 2007). Impaired Subjective wellbeing also impacts on a person's ability to function and thus predicts subsequent work disability among healthy adults (Koivumaa-Honkanen, Koskenvuo, Honkanen et al. 2004).

Present study is conducted to see the relationship between symptoms of psychopathology and self esteem among students of University of Karachi. The study is comprised of two hypotheses, for the first, (i) *"There will be a significant inverse relationship between symptoms of psychopathology and self-esteem among university students"*, has been established as our result supports it as symptoms of psychopathology increase then self esteem will go down. Mean value of General Health Questionnaire is found 27.84 with the standard deviation of 12.73 (see table I) mean values of subscales Somatic Symptoms, Anxiety Symptoms, Social Dysfunction, and Depression Symptoms were found respectively 6.792, 6.485, 9.322 and 5.280 (see table II). Mean value of Rosenberg Self Esteem Scale was found 18.98 with the standard deviation of 3.94 (see table I). Result shows significant inverse correlation between symptoms of psychopathology and self esteem - 0.47 which is significant at the 0.01 level (Refer table III). Findings are consistent with the literature; presence of symptoms of psychopathology makes self esteem low.

Self-esteem plays a vital role in one's personality development. It is a major pillar in construction of one's personality. It indicates how much a person gives significance and worth to him or her. Person with good self esteem take positive attitude towards self and others that in turn protect them developing pathologies.

Self-esteem has been defined by Silverstone (1992), as "the sense of contentment and self-acceptance that stems from a person's appraisal of their own worth, significance, attractiveness, competence and ability to satisfy their aspirations". Features of low self-esteem are uncertainty, depression, poor body image, characteristic of low self-esteem are negative frame of mind and depression, insecurity, pitiable body image, feelings of insufficiency, social and personal withdrawal, poor adjustment, and unrealistically high targets to achieve (Steinhausen 1993). Numbers of studies have given evidence regarding self-esteem and its inverse relationship with psychological problems among university students. Low self-esteem is correlated with numeral negative results, such as depression (Silverstone, and Salsali, 2003).

Presence Aarif and Mishra (2009) designed cross sectional study to evaluate the mental health and self esteem of four hundred medical students. GHQ-28 (General Health Questionnaire) and Rosenberg self esteem scale was administered on participants. Prevalence of psychiatric morbidity was found 29.75%. Social dysfunction was found 56%. Anxiety and insomnia was evident in 31%. Depression and somatic symptoms were found 20% and 30% respectively. Low self esteem was reported by 18% of students. Strong negative relationship found between psychiatric morbidity and self esteem ($r = -0.431$, $p = 0.000$).

Another study conducted by Abdullah et al. (2013) examined the quality of mental health of students of Ardabil University of Medical Science their educational years 2009-2010. Study was conducted on 383 students, who were belonging to different educational fields. Students responded on general health (GHQ28), and Rosenberg self-esteem questionnaire. Results indicated that the average score of GHQ28 for the university students is $\bar{x} = 16.08$, social dysfunction with an average ($\bar{x} = 6.98$) found close to cut-off line. In scale of social dysfunction, more scores crossed the cut-off line. On self esteem scale total average score of students was $\bar{x} = 32.25$. Significant negative relationship found between scores of GHQ and Rosenberg self-esteem scale ($r = -0.547$, significance level = 0.01).

Sowislo (2013) examined 18 studies relationship between anxiety and self-esteem and an added 77 studies on depression and self-esteem by Meta analyzing. She looked at the susceptibility factors and evaluated the impact they had on each other. She found that reduction in self-esteem were predictive of raise in depression. Furthermore she found that the correlation was more mutual, with both self-esteem and anxiety negatively disturbing each other alike.

The second hypothesis of this study is (ii) *"There will be a significant difference between symptoms of psychopathology among men and women"*. Result shows no significant difference in the symptoms of symptoms of psychopathology among men and women (Refer table IV). There are number of reasons behind as same challenges are likely to face both genders and same opportunity is available for both.

Our findings are consistent with the researches below. Chen et al. (2013) examined prevalence of depression among Chinese students. Multi-stage stratified sampling was used to select students. Result shows that Moderate depression is prevalent among university students and no statistical significant difference found in the occurrence of depression with reference to gender.

Study was conducted on Kenyan university students 923 University of Nairobi students (525 male and 365 female) were taken as a sample. Centre for Epidemiological Studies Short Depression Scale (CES - D 10) was used to measure depressive symptoms. The mean age of participant was 23 years. Results of Logistic regression showed that those students who used tobacco, occupied with binge drinking and had an older age were likely to be more depressed. No difference was found with respect to gender (Othieno, Okoth, Peltzer et al 2014).

Quince et al (2012) conducted a longitudinal study. Participants were from 2007 and 2010. Sample was comprised of Cambridge (UK) medical course students 1112 students (Year 1) the Core Science component as well as 542 students (Year 4) joining the Clinical component. Participants were followed-up annually. Subscale of the Hospital Anxiety and Depression Scale (HADS-D) was administered on each participant. Finding shows prevalence of depression ranged aimed 5.7% and 10.6% among students all Core Science and aimed 2.7% and 8.2% among students of Clinical. There was no difference found between men and women participants in median HADS-D scores.

Prevalence of psychological distress, depression and anxiety was examined among nursing students in Greece. Sample was comprised of 170 students (34 males, 136 females). Three measures General Health Questionnaire (GHQ), the Beck Depression Inventory II (BDI-II) and the State-Trait Anxiety Inventory (STAI) was administered on each participant. No difference was observed in stress and depression with reference to gender. Most of the students scored relatively high on the GHQ signifying increased psychiatric morbidity. 52.4% of students suffered from depressive symptoms (34.7% mild, 12.9% moderate and 4.7% severe) (Papazisis., Tsiga, Papanikolaou, Vlasidis. et al., 2008).

Khan, Mahmood, Badshah and Jamal, (2006), conducted cross-sectional research on Public Sector University. Mean age of students was 21.3 years. A self administered questionnaire Aga Khan University Anxiety and Depression Scale (AKUADS) was given to the students. Prevalence of anxiety and depression found 70% among students which is reasonably high. No gender difference was found in depression and anxiety.

5 CONCLUSION

This study investigated the symptoms of psychopathology among and its relationship with self-esteem students of University of Karachi. From the analyses, significant inverse relationship found between psychopathology and self-esteem. Finding shows that self-esteem of the majority students falls in normal range. No significant gender difference was observed in the level of Psychopathology.

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Carcinosarcome utérin associé au traitement par le Tamoxifène et révélé par des algies pelviennes chroniques: A propos d'un cas et revue de la littérature

[Uterine Carcinosarcome associated with tamoxifen therapy and revealed by chronic pelvic pain: A case report and review of the literature]

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ABSTRACT: Carcinosarcomas are rare uterine cancers and carry poor prognosis. Although these tumours usually arise de novo, some cases developed under tamoxifen therapy have been reported. We report a case of uterine carcinosarcoma occurring in a postmenopausal patient benefiting from tamoxifen therapy as adjuvant treatment of breast cancer.

KEYWORDS: Carcinosarcomas, Uterus, Tamoxifen.

RESUME: Les carcinosarcomes sont des cancers rares de l'utérus et leur pronostic est péjoratif. Si ces tumeurs sont le plus souvent primitives, il a été rapporté un certain nombre de cas survenant après une hormonothérapie par tamoxifène. Les auteurs rapportent un cas de carcinosarcome utérin survenue chez une patiente ménopausée ayant eu une hormonothérapie antiestrogénique dans le cadre du traitement adjuvant d'un cancer du sein.

MOTS-CLEFS: Carcinosarcomes, Utérus, Tamoxifène.

1 INTRODUCTION

Le tamoxifène est utilisé depuis une trentaine d'années pour son intérêt adjuvant dans le traitement du cancer du sein. On lui reconnaît cependant, des effets délétères, notamment au niveau de l'endomètre [1], [2]. En effet, cet antiestrogène de synthèse est désormais reconnu pour favoriser l'adénocarcinome de l'endomètre [3], [4]. Cependant, à côté des formes histologiques endométrioïdes habituelles, certains auteurs ont rapporté d'autres formes histologiques plus agressives, en particulier carcinosarcomateuses, encore appelées tumeurs mixtes mullériennes malignes (TMMM). Nous rapportons un cas de carcinosarcome utérin développé chez une patiente ayant eu une hormonothérapie par tamoxifène. Après avoir exposé notre observation, nous effectuerons une revue de la littérature concernant les autres cas rapportés de carcinosarcomes associés à l'utilisation du tamoxifène et nous discuterons de l'étiopathogénie de cette association.

2 OBSERVATION

Il s'agissait d'une patiente âgée de 75 ans. Pour antécédent, elle avait présenté un cancer du sein T4N0M0 à l'âge de 65ans, pour lequel elle a eu une intervention de Patey du sein gauche. Le type histologique était un carcinome canalaire infiltrant de grade II. Une hormonothérapie antiestrogénique par tamoxifène, à la dose de 20mg/j, a été indiquée du fait de la positivité des récepteurs hormonaux. Après cinq ans de prise régulière de ce traitement, la patiente consultait pour algies pelviennes chroniques évoluant depuis plus de six mois. L'examen physique a retrouvé un utérus hypertrophique et mobile. L'échographie pelvienne a confirmé cette hypertrophie utérine suspecte avec la présence d'une volumineuse image intracavitaire faisant 11/8cm. Une TDM thoraco-abdomino-pelvienne avait révélé un volumineux processus lésionnel mesurant 11/8 cm envahissant le myomètre avec présence d'une hématométrie de plus de 10 cm de grand axe au niveau cervico-isthmique (Fig 1). Les ovaires ne présentaient pas d'anomalies et on notait la présence d'adénopathies iliaques bilatérales sans épanchement péritonéal associé. L'étage thoracique et abdominal étaient sans particularité. Une hystéroscopie diagnostique avec curetage biopsique de l'endomètre était décidée mais lors de sa réalisation, le col de l'utérus était infranchissable malgré plusieurs tentatives. Une colpohystérectomie élargie avec lymphadénéctomie pelvienne par voie laparotomique était alors décidée. L'exploration chirurgicale a retrouvé un utérus hypertrophique avec la présence d'une tumeur endométriale mesurant 11/8 cm (Fig 3). Il n'a pas été retrouvé d'autres lésions macroscopiques suspectes et la palpation des axes ganglionnaires n'a pas retrouvé d'adénomégalie suspecte. L'analyse histologique avait retrouvé une tumeur ulcéro-bourgeonnante friable occupant toute la cavité utérine et déformant l'utérus comportant des zones nécrotico-hémorragiques mesurant 11x8x5cm. Cette tumeur infiltrait la moitié supérieure de la paroi utérine (Fig 2). Les coupes analysées montraient une prolifération tumorale par place nécrosée à double composante épithéliale et mésenchymateuse. Des embols vasculaires étaient également présents. La prolifération était limitée à la moitié supérieure de la paroi utérine, les paramètres et les annexes n'étaient pas infiltrés. Le diagnostic définitif était celui d'un carcinosarcome endométrial. Le curage lymphatique pelvien était positif. La patiente a enfin eu une radiothérapie externe pelvienne et quinze mois après le traitement initial, elle a été en situation de rémission complète.



Fig. 1. TDM Pelvienne : Coupe Sagittale montrant un processus lésionnel envahissant le myomètre avec hématométrie

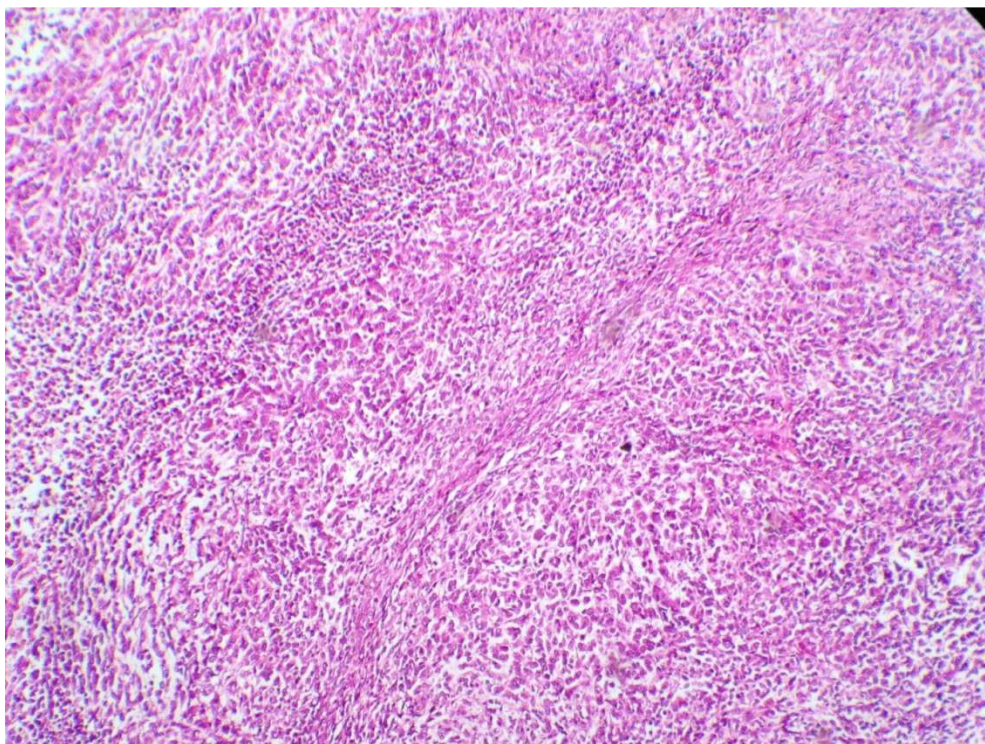


Fig. 2. HE: GX25: *prolifération tumorale a double composante maligne épithéliale et conjonctive*



Fig. 3. *Image opératoire montrant le processus lésionnel utérin*

3 DISCUSSION

Les carcinosarcomes ou tumeurs mixtes mullériennes malignes (TMMM) sont des cancers rares de l'utérus. En effet, ces tumeurs représentent moins de 5 % de l'ensemble des tumeurs malignes du corps utérin [5],[6]. D'un point de vue histopathologique, ces tumeurs sont caractérisées par la présence d'une double différenciation maligne : l'une épithéliale (carcinomateuse) et l'autre mésenchymateuse (sarcomateuse). Ces tumeurs surviennent avec prédilection chez la patiente ménopausée. Elles paraissent le plus souvent primitives et se révèlent le plus fréquemment par des hémorragies génitales

[5,6]. Chez notre patiente, ce sont des algies pelviennes chroniques qui ont révélé le diagnostic. Le tamoxifène, antiestrogène triphényléthylénique de synthèse a une place depuis plus de 25 ans dans le traitement adjuvant du cancer du sein. Cependant, son analogie structurale avec le diéthylstilbestrol lui permet d'exercer une activité antagoniste/agoniste variable. La prédominance d'un effet proestrogénique paradoxal au niveau endométrial est à l'origine de diverses pathologies endométriales telles que le polype, l'hyperplasie et l'adénocarcinome [1],[2]. Les premiers cas d'adénocarcinome endométrial apparus sous tamoxifène ont été rapportés en 1985 par Killackey et al. [7] et depuis cette association a été étudiée. Ainsi, le tamoxifène est désormais reconnu comme facteur de risque de l'adénocarcinome de l'endomètre [3],[4]. À l'inverse, les données épidémiologiques sont actuellement insuffisantes pour établir un lien de causalité entre le tamoxifène et le risque de carcinosarcome, étant donné la rareté de ces tumeurs. Le premier cas de carcinosarcome utérin développé sous tamoxifène a été rapporté en 1988, par Hardell [8]. Les mécanismes moléculaires de l'effet oncogène du tamoxifène ne sont pas encore clairement établis. Cependant, il est probable que les lésions débutent au niveau du stroma endométrial. En effet, en raison de probables interactions entre le stroma et l'épithélium dans la régulation hormonale de la croissance cellulaire endométriale, des mécanismes modulés par des facteurs de croissance autocrines et paracrines, présentes au niveau des cellules stromales adjacentes, sont probablement impliqués dans la pathogénie du cancer endométrial [9]. Compte tenu de l'origine vraisemblablement monoclonale, notamment épithéliale, des carcinosarcomes [5],[6], l'effet oncogène du tamoxifène concernant ces dernières est semble-t-il identique à celui impliqué dans la pathogénèse de l'adénocarcinome. Contrairement aux adénocarcinomes de type endométrioïde, le pronostic des carcinosarcomes utérins est péjoratif avec une probabilité de survie à cinq ans de l'ordre de 30 %, tous stades confondus [5],[6]. Les facteurs pronostiques rapportés dans la littérature sont l'âge, le stade tumoral et le degré d'invasion myométriale [5],[6]. Le traitement de ces tumeurs repose essentiellement sur la chirurgie et le traitement chirurgical de référence, en cas de suspicion de carcinosarcome, consiste en une hystérectomie totale avec une annexectomie bilatérale [5],[6],[10],[11]. La voie laparotomique doit être privilégiée afin d'éviter tout morcellement lié à une extraction par voie vaginale [10]. La lymphadénectomie pelvienne doit être systématique en cas de carcinosarcome, compte tenu de la fréquence de l'extension lymphatique. Ainsi, dans la série de Podczaski et al., comportant 52 patientes ayant eu une tumeur a priori de stade I, il a été noté une extension extra-utérine dans 39 % des cas [12]. Ces extensions ont été le plus souvent ganglionnaires ou péritonéales [10]. L'indication des traitements adjuvants reste encore discutée dans les TMMM. La radiothérapie semble avoir un bénéfice en termes de diminution du risque de récurrence locale sans avoir de bénéfice en termes de survie [5],[6],[7]. À ce jour, une seule étude contrôlée randomisée a été menée par le groupe gynécologique de l'EORTC : groupe radiothérapie versus groupe observation à propos de 224 carcinosarcomes utérins de stade I et II traités chirurgicalement [13]. Les résultats indiquent une amélioration du contrôle local dans le groupe radiothérapie uniquement dans le sous-type des carcinosarcomes mais pas d'amélioration de la survie, quel que soit le sous-type histologique. La plupart des auteurs s'accordent à reconnaître une place systématique à l'irradiation pelvienne afin d'assurer le contrôle local [5],[6]. Comme la radiothérapie, la place de la chimiothérapie adjuvante reste discutée dans les TMMM [5],[6],[11]. L'étude randomisée du groupe d'oncologie gynécologique a évalué l'efficacité de la chimiothérapie (cisplatine-ifosfamide) après chirurgie initiale versus radiothérapie pelvienne après chirurgie initiale chez 232 patientes atteintes de carcinosarcomes utérins classés en stade I à IV de la Figo [14]. Les auteurs n'ont pas retrouvé de différence statistique significative entre les deux groupes concernant le taux de récurrence et le taux de survie. Enfin, il n'existe pas, à l'heure actuelle, de consensus sur les modalités de surveillance des patientes non-hystérectomisées et traitées par le tamoxifène. Cependant, la plupart des auteurs s'accordent à reconnaître que la surveillance échographique de ces patientes ne doit pas être systématique sauf en cas de facteurs de risque particuliers de cancer de l'endomètre, en cas de sténose cervicale et chez les femmes non ménopausées chez qui les métrorragies ne peuvent pas jouer leur rôle de signal d'alarme [15],[16].

4 CONCLUSION

Contrairement aux adénocarcinomes de l'endomètre où les études épidémiologiques ont clairement établi la relation de causalité avec le tamoxifène, tel n'est pas le cas avec les carcinosarcomes, compte tenu de la rareté de ces tumeurs. Cependant, le nombre croissant de cas rapportés dans la littérature de carcinosarcomes développés après une hormonothérapie antiestrogénique, notamment lorsque la prescription a été prolongée, suggère la possibilité d'une telle relation causale.

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A first attempt at seagrass repartitioning in the Moroccan coasts

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ABSTRACT: Seagrasses play a prominent ecological role and support the productivity on which many communities of marine animals feed and reproduce but, unlike their macroalgae and microalgae counterparts, their diversity and extent have never been rigorously documented in Moroccan coasts. In this study we compiled and analyzed the available bibliographic data (Physical and chemical requirements) relating to seagrasses, followed by determination of physico-chemical characteristics of six selected coastal environments in Moroccan coasts. Comparison between seagrass species requirements and selected coastal environment conditions allowed us to distinguish four seagrass species (*Zostera noltii*, *Zostera marina*, *Cymodocea nodosa*, *Posidonia oceanica*) which can shelter these study areas. This paper provides baseline data for further work on ecological study and long term monitoring; and a first step to create a seagrass check-list in Moroccan coasts.

KEYWORDS: Seagrass requirements, Moroccan Mediterranean Sea, Moroccan Atlantic Ocean.

1 INTRODUCTION

Seagrasses are continental flowering plants which, at the end of the Secondary (some 120 million years ago), returned to the marine environment. They constitute an ecological group formed by a small number of families and species [1]. Today, seagrasses give rise to dense formations called 'meadows', met with in practically all the coastal areas of the world [2] except Antarctica [3].

Seagrass meadows rank among the most productive ecosystems on Earth [4], [5] and thus, forms an ecologically critical habitat throughout much of the world's coastal oceans [6].

All seagrasses share a set of characteristics [1], such as:

- They are able to live totally emerged (e.g. absence of stomata within the foliar tissues);
- They have an effective system for fixing themselves to the sediment;
- They are adapted to life in a salty environment;
- They have a hydrophilous pollination system (pollen transported by water);
- They are able to successfully compete with other marine vegetation (e.g. algae).

Seagrass habitats are an important component of the marine environment, acting as ecological engineers [7] and providing numerous ecological services [8], including sediment stabilization, nutrient transformation, primary production, feeding, nursery habitat for both recreationally and commercially important fish and shellfish species [9], [10].

Increased coastal development, leading to high nutrient and sediment inputs, has altered water quality, which is a critical component in supporting healthy seagrass populations [11]. Several studies have indicated that seagrass habitat is declining in over 40 locations worldwide [3], [9], [10].

It is generally acknowledged that in order for sound management of resources to exist, there needs to be an inventory and a baseline of those resources [12]. While these exist for other marine species in Moroccan coasts such as macroalgae and microalgae flora, there is currently no reliable baseline available for seagrass habitats. Hence, this paper aims to evaluate the coastal environments which are propitious for the development of seagrass species. This will provide essential baseline information for further complex ecological study.

2 METHODS

2.1 STUDY SITES

Morocco has a coast extending over 3,446 km, with a Mediterranean facade of close to 600 km and an Atlantic one of about 2,850 km (Ministère de l'Agriculture et du Développement Rural, 2003).

Owing to its position both on the Atlantic Ocean and the Mediterranean Sea, Morocco is characterized by paralic coastal environments (estuaries and lagoons mainly) that serve important biological functions to several species, including development, reproduction and feeding.

The choice of study areas is based on the ecological value of the sites (SIBE'S, Ramsar sites), the surface area, the economic value and the degree of anthropogenic pressure on the environment. Thus, six areas were selected in this study including bays and lagoons (Bay of Dakhla, lagoon of Khnifiss, Merja Zerga lagoon, Cape of Three Forks, lagoon Complex Sidi Moussa-Oualidia, lagoon of Nador) (figure 1).



Fig.1. Location map of the 6 lagoons selected for evaluating the presence of seagrasses in Moroccan coasts

2.2 LITERATURE DATA

This preliminary study of seagrass in Moroccan coasts is based essentially on literature review. Initial efforts are focused on the acquisition of a source information point, which is compiled into spreadsheets and diagrams. The following steps have been performed: 1) Identifying seagrass species in Atlantic and Mediteranean Bioregion, 2) Summarize the physico-chemical

seagrass conditions, 3) Determine the physico-chemical characteristics of study areas, and 4) Determine the regions propitious of seagrass developpement, by comparing the physico-chemical conditions of those regions and the optimum conditions required for seagrass developpement.

3 RESULTS AND DISCUSSION

3.1 SEAGRASS IN ATLANTIC AND MEDITERRANEAN BIOREGIONS

Seven species of seagrass have been signalled in the Mediterranean [2], [13], [14]. They are *Cymodocea nodosa*, *Halophila stipulacea*, *Posidonia oceanica*, *Ruppia cirrhosa*, *Ruppia maritima*, *Zostera marina* and *Zostera noltii*. Of these, *Cymodocea nodosa* is the most common species. The second most abundant species in this region is *Posidonia oceanica*, a seagrass endemic to the Mediterranean Sea. The *Zostera* genus (*Z. marina*, *Z. noltii*) are less common. The introduced species *H. stipulacea*, which essentially remains confined to the eastern part of the Mediterranean [15]. Missaoui et al., 2006 [16] have signaled the presence of *H. Stipulacea* in Tunisia. Finally, in certain euryhaline lagoons, we notice the development of *Ruppia* genus (*R. cirrhosa* and *R. maritima*), which can develop even in the estuaries and graus (RAC/SPA's report, 2000).

According to Short et al., 2007 [14] five species of seagrass have been observed in th Atlantic, *Cymodocea nodosa*, *Halodule wrightii*, *Ruppia maritima*, *Zostera marina* and *Zostera noltii*. Distribution studies of seagrass in this bioregion are patchy and more data needs to be collected to determine the extent of coverage and abundance of these species.

In this study, we will focus on the most frequent species in the Mediterranean and Atlantic according to Duarte (2001) [17], they are *Posidonia oceanica*, *Cymodocea nodosa*, *Zostera marina* and *Zostera noltii*.

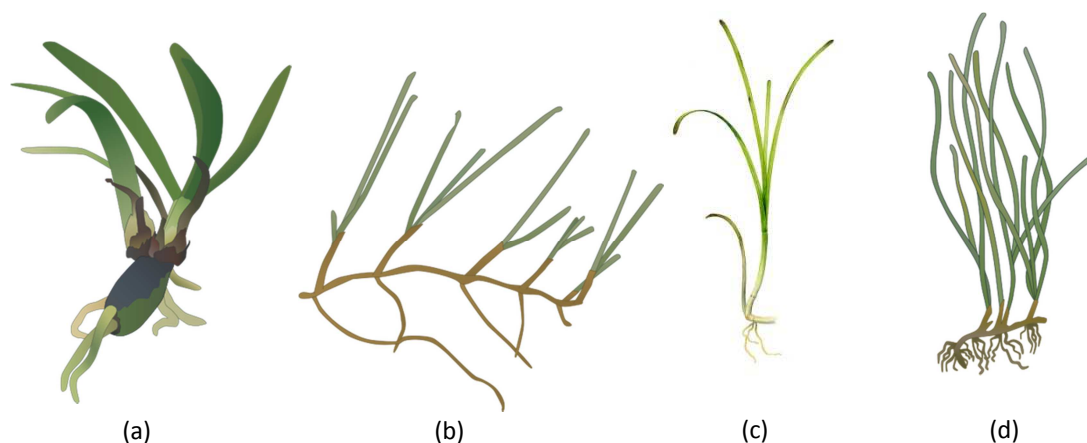


Fig. 2. Schematic illustrations of seagrass species selected: (a) *Posidonia oceanica*, (b) *Cymodocea nodosa*, (c) *Zostera marina*, (d) *Zostera noltii* (source of the single schemes: <http://ian.umces.edu/symbols/>).

3.2 ECOLOGICAL FEATURES OF SELECTED SEAGRASS SPECIES

Seagrass distribution along coastal areas is dependent on a number of environmental factors. They can be summarized in:

- Physical factors (substrate, temperature),
- Chemical factors (salinity),
- Hydrodynamic factors (agitation of water),
- Biotic factors (competition with other species).

Table 1. The optimum physico-chemical conditions required for the four selected seagrass species

	Seagrass species			
	<i>Posidonia oceanica</i>	<i>Cymodocea nodosa</i>	<i>Zostera marina</i>	<i>Zostera noltii</i>
Systems	Marine	Marine	Marine	Freshwater, marine
Conservation status UICN	Least concern (LC) ¹⁸	Least concern (LC) ¹⁹	Least concern (LC) ²⁰	Least concern (LC) ²¹
Population trend	Decreasing	Stable	Decreasing	Decreasing
Abiotic factors				
Bathymetry	From shallow subtidal waters to 50-60m ²²	From shallow subtidal areas to very deep waters 50-60m ²²	Intertidal-subtidal area (3-7m in Atlantic, Up to 10m in Mediterranean) ²²	Intertidal and subtidal area Restricted (up to 4m) ²²
Physical exposure	Bear turbid water ²²	Sheltered biotopes ²²	Tolerates heavy hydrodynamic stress ²²	Tide presence, Bear relatively turbid water ²²
Substratum	Silt, fine sand, average and coarse sand, rocks ²²	Gravel, mud rich in organic matter ²²	Coarse sand to silt rich in organic matter ²²	Fairly coarse sediments rich in organic matter ²²
Temperature (°C)	9-29 ^{22, 23}	10-30 ²²	Eurythermic (0-30) ²²	Eurythermic ²²
Salinity (PSU)	Stenohaline (34-38) ²²	26-44 ²²	Euryhaline (5-36) ²²	Euryhaline (9-32) ²²
Biotic factors				
Competition	<i>Caulerpa Taxifolia</i> ²²	<i>Z. noltii</i> , <i>P. oceanica</i> ²²	<i>Mytilus edulis</i> ²²	<i>Ruppia spp</i> , <i>Z. marina</i> , <i>C. nodosa</i> ²²
Grazing	<i>Sarpa salpa</i> <i>Paracentrotus lividus</i> ²²	<i>Paracentrotus lividus</i> <i>Sarpa salpa</i> ²²	<i>Cygnus olor</i> <i>Idotea chelipes</i> ²²	<i>Branta bernicla</i> <i>Anas platyrhynchos</i> ²²

3.3 PHYSICO-CHEMICAL CONDITIONS OF SLECTED COASTAL AREAS

To assess seagrass distribution in the Moroccan coasts, we selected six lagoonal sites: Dakhla bay, Khnifiss lagoon, Three-forks Cap, Sidi Moussa-Oualidia complex lagoon, Moulay Bouselham lagoon, Nador lagoon. All of these regions have an ecological, biological and economical role (Ramsar sites, SIBE's). Physico-chemical conditions of study zones are presented in Table 2.

3.4 STUDY AREAS PROPITIOUS OF SEAGRASS DEVELOPPEMENT

By comparing the conditions in the Moroccan coastal ecosystems and the optimal growth required by the four species treated, we can deduce: The physicochemical characteristics of the six coastal areas addressed in this study are conducive to the development of *Posidonia oceanica*, *Zostera marina*, *Zostera noltii* and *Cymodocea nodosa*. Table 3 highlights the areas likely to harbor the four species studied in the selected Moroccan coastal sites.

Posidonia oceanica: is endemic strict Mediterranean, it is a characteristic of the subtidal floor (depth of a few tens of centimeters to 30 to 40 m). This species tolerates temperature and hydrodynamics variations and prefers salinity between 36 and 39 PSU. We did not encounter it in the lagoons or the open estuaries [1].

Cymodocea nodosa: is found mainly in the Mediterranean (Three forks cap) often at the upper limit of *P.oceanica* seagrass beds in the Mediterranean marine ecosystem. Its presence is also likely in the Atlantic precisely at the Bay of Ad-Dakhla. It can be also be found associated with *Zostera noltii* to form a Joint Herbarium [1]. With an optimal salinity, temperature and an adequate average hydrodynamic low, these sites may be deemed conducive to its development.

Zostera noltii: *Zostera sp* are part of the estuarine vegetation. In general, the presence of *Zostera noltii*, will be conditioned by salinity and hydrodynamics since it does not tolerate areas of high tides. By cons, we can find it in the center of the Merja Zerga. It can also occur at the level of sand and mudflats of Merja. Ad-Dakhla bay is a sheltered area, and despite its significant salinity, *Zostera noltii* can be found in the eastern part. Regarding the lagoon of Nador, we can have *Zostera noltii* in the containment area which is regularly flooded. We also note at this bay, a large value of O₂ dissolved in the water fund, which may indicate the presence of dense vegetation including seagrass meadows.

Zostera marina: This species is common on the coasts of the Atlantic and uncommon in the Mediterranean (coastal lagoons, estuaries, sometimes in intermattes *Posidonia*). *Zostera marina* is a cosmopolitan species with a certain tolerance

with respect to environmental conditions. We can find it in the coastal Atlantic and Mediterranean at depths of 3-7 m respectively and 10m. Khnifiss Bay, Bay of Ad-Dakhla and the lagoon of Nador cannot shelter this case, because of the high salinity encountered in these sites. By cons, Cape three forks, the Sidi Moussa-Qualidia complex are conducive to its development.

This study is a first attempt to determine the distribution of seagrass in Morocco. Considering the large-scale loss of seagrasses (For instance, worldwide seagrass loss between the mid-1980s and mid-1990s was estimated to be 12,000 km² [24], the seagrass area lost cannot be quantified in Morocco due to lack of a reliable baseline information. Therefore, an evaluation of the distribution of seagrasses and evaluation of their health in the Moroccan coastal ecosystems are warranted. Further investigations are needed to address their status in more depth.

Table 2. Localisation and physico-chemical conditions of study sites: Dakhla bay (DB), Khnifiss lagoon (KL), Oualidia lagoon (OL), Sidi Moussa lagoon (SML), Moulay Bouselham lagoon (MBL), Three-forks Cap (TFC), Nador lagoon (NL).

	Atlantic Ocean					Mediterranean Sea	
	DB	KL	OL	SML	MBL	TFC	NL
Localisation	23°45'N, 15°50'W	28°03'N, 12°15'W	32°46'N, 09°01'W	33°01'N, 08°44'W	34°51'N, 06°16'W	35°26'N, 02°59'W	35°10'N, 02°57'W
Morphology							
Surface area (Km ²)	400 ²⁷	65 ²⁸	3,5 ³¹	4,2 ³⁷	30 ³⁸	5.000 (ha) ⁴⁰	115 ⁴¹
Length (km)	37 ²⁷	20 ²⁸	7 ³²	5,5 ³⁷	9 ³⁸		24 ⁴¹
Width (km)	14 ²⁷	0,1 ²⁸	0,5 ³²	0,5 ³⁷	5 ³⁸		7,5 ⁴¹
Inlets	1 ²⁷	1 ²⁸	2 ³²	2 ³⁷	1 ³⁸	Limited ⁴⁰	1 ⁴¹
Depth (max) (m)	20 ²⁷	6 ²⁸	6 ³²	6 ³⁷	5 ³⁸	6 ⁴⁰	8 ⁴²
Substratum	Sandy/muddy, covered with carpet of algae and salt steppes ²⁷	sandy, muddy sand and sandy mud ²⁹	Sand, mud, muddy sand, sandy mud ³³	Sand, mud, muddy sand, sandy mud ³²	Muddy, sandy silt, sandy clay, soft sandstone ³⁸	Sand ⁴⁰	Sand, clay-sand, clay-silt-sand ⁴²
Freshwater supply	No permanent supply ²⁷	Absent ²⁹	Supply in downstream area ³⁴	Freshwater input along mainland shore ³²	Canal de Nador et de l'oued Drader et Canal du Nador ³⁸	-	River (Oued Selouane and Oued Bouareg), urban waste water ⁴²
Hydrology							
Temperature (°C)	15-22 ²⁷	16,1-24,4 ³⁰	16-25 ^{35, 36}	13-24 ³²	13-28 ³⁹	-	11,8- 27,5 ⁴²
Salinity (PSU)	36-40 ²⁷	34-44,1 ³⁰	5-40 ³⁴	22,5-35,9 ³²	Up to 35 ³⁹	-	37-42,7 ⁴³

Table 3. Study areas propitious of seagrass developpement: Dakhla bay (DB), Khnifiss lagoon (KL), Oualidia lagoon (OL), Sidi Moussa lagoon (SML), Moulay Bouselham lagoon (MBL), Three- forks Cap (TFC), Nador lagoon (NL).

	Atlantic Ocean					Mediterranean Sea	
	DB	KL	OL	SML	MBL	TFC	NL
<i>Posidonia oceanica</i>	Absent	Absent	Absent	Absent	Absent	Absent	Absent
<i>Zostera noltii</i>	Present	Absent	Absent	Absent	Present	Present	Present
<i>Zostera marina</i>	Absent	Absent	Present	Present	?	Present	Absent
<i>Cymodocea nodosa</i>	Present	Absent	Absent	Absent	?	Present	Absent

4 CONCLUSION

Seagrass beds are among the most valuable ecosystems in the world [8]. They produce a variety of goods (finfish and shellfish) and provide ecological services (maintenance of marine biodiversity, regulation of the quality of coastal waters, protection of the coast line) which are directly used by or are beneficial to humans and condition the economic development of coastal zones. In addition seagrasses are indicators of the status of the coastal zone which can be used in coastal management strategies aiming at preserving or improving the environmental quality of the coastal zone.

The growth and distribution of seagrasses are controlled by the physical, chemical and biological properties of the environment they live in. Sufficient light, nutrients and inorganic carbon are basic needs for photosynthesis, but also a suitable substratum, moderate exposure, temperature and various biological factors affect the distribution of seagrasses.

In Morocco, seagrasses are relatively unknown and underappreciated. During the last two decades hydrobiological research has multiplied, and algae have occupied a primary importance, both in terms of biodiversity [25], [26] and water quality, regardless of seagrasses, which also play several roles and reflect the ecological health of an entire ecosystem. There is no actual scientific research on the exact location or the geographical extent and composition of seagrasses meadows. Some reports and scientific studies are limited to indicating the presence of seagrasses without any inventory of species of seagrasses.

This study is a first attempt at seagrass repartitioning in the Moroccan coasts and according to our results we can deduce that the physicochemical characteristics of the six coastal areas addressed in this study are conducive to the development of *Posidonia oceanica*, *Zostera marina*, *Zostera noltii* and *Cymodocea nodosa*.

ACKNOWLEDGMENT

This research has been supported by "Centre national de la recherche scientifique et technique, CNRST (ScVie 12/11)" and "The World Academy of Sciences, TWAS NO: 11-225 RG/EAS/AF/AC_C". L. NATIJ, CNRST Scholar. We thank the anonymous reviewers for helpful comments.

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Taylor Approximation Method in Grey System Theory and Its Application to Predict the Number of Foreign Students Studying in Taiwan

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ABSTRACT: The purpose of this study is to use T-GM(1,1) and T-DGM(2,1) to predict the number of foreign students studying in Taiwan. T-GM(1,1) and T-DGM(2,1) are two prediction models based on Taylor approximation method in grey system theory to improve the predicted accuracy of GM(1,1) and DGM(2,1). Two combined models can obtain the most optimal values of prediction by multi-times approximate calculation. In addition, researchers used the MATLAB software to develop a MATLAB toolbox for two prediction models. In this study, results are not only conducted to serve as a reference for the educational administrators but also can assist the government in developing future policies regarding educational management. The accurate prediction of the number of foreign students studying in Taiwan will provide important information for educational managers to continue to attract and efficient use of resources, bring international cooperation for training and scientific research. It will not only help the managers to make good educational scholarship program for foreign students studying in Taiwan but also improve the effectiveness of education for international cooperation in education and training.

KEYWORDS: T-GM(1,1), T-DGM(2,1), Taylor approximation method, grey system theory, MATLAB toolbox.

1 INTRODUCTION

Taiwan has an outstanding higher education system that provides opportunities for foreign students to study a wide variety of subjects. In recent years, the number of foreign students studying in Taiwan is increasing. The majority of foreign students is in Taiwan for bachelor programs and Mandarin training courses, with the majority of these students coming from Asia, America, and Europe. Foreign students studying in Taiwan are the bridges of Taiwan to the international society. The number of students studying in Taiwan indicates the level of internationalization and international competitiveness of the nation's education, as well as representing the nation's power and ability to attract foreigners [1]. The accurate prediction of the number of foreign students studying in Taiwan will provide the important information for educational administrators to proactively propose the appropriate policy and to build the educational development strategy in accordance with the new conditions [2].

Grey system theory was initially presented by Deng in 1982, it is a new methodology that focuses on model uncertainty and information insufficiency in analyzing and understanding systems via research on conditional analysis, forecasting and decision-making [3, 4]. In the grey system theory, according to the degree of information, if the system information is fully known, the system is called a white system, while if the system information is unknown, it is called a black system. A system with partial information known and partial information unknown is a grey system [5-7]. It included five major parts that are grey prediction, grey relation, grey decision, grey programming, and grey control [8]. GM(m, n) denotes a grey model, where m is the order of the difference equation and n is the number of variables. Grey model has become an effective method to study uncertainty problems under discrete data and incomplete information [9]. In recent years, grey model has been

successfully applied to many prediction fields as engineering, economics, medicine. The advantage of grey model is that it only needs a small amount of data and random sample data to calculate and give prediction results [10, 11].

However, many researchers have pointed that there were some problems occurred that the predicted accuracy of grey model was unsatisfied [6, 12, 13], the parameters of prediction model based on grey model were not the optimal parameters, and the prediction precision of the model was not stable, they have performed a lot of researches for this to improve the predicted accuracy [9, 14-17]. In 2011, Li and co-workers proposed the T-GM(1,2) model, it was established based on Taylor approximation method to enhance the accuracy of prediction for GM(1,2) [18]. In July of 2014, Sheu and co-workers used Taylor approximation method to improve the predicted accuracy of three grey prediction models (GM(1,1), GVM, and GM(2,1)) [2], and they used the combination of GM(1,1) and Taylor approximation method to predict the academic achievement of student [19]. In this paper, the researchers have used Taylor approximation method in two grey prediction models (T-GM(1,1) and T-DGM(2,1)) to predict the number of foreign students studying in Taiwan.

The remainder of this paper is organized as follows: Section 2 presents basic theories, which includes grey model GM(1, 1) and direct grey model (2, 1), Taylor approximation method in grey system theory, and error analysis method. In section 3, a MATLAB toolbox for two prediction models is introduced. Section 4 describes results and discussion for using Taylor approximation method in grey system theory to predict the number of students of five continents studying in Taiwan. Finally, conclusions are drawn in section 5.

2 BASIC THEORIES

In this study, Taylor approximation method is applied in the grey system theory that is based on Taylor approximation method of approximation optimization theory and grey models of grey system theory to improve the prediction accuracy of grey models. The following section describes basic theories of grey model (1, 1) (abbreviated as GM(1,1)), direct grey model (2, 1) (abbreviated as DGM(2,1)), Taylor approximation method in grey system theory, and error analysis.

2.1 GREY MODEL (1, 1)

Before using grey model, the initial data have to be tested based on (1) whether the initial data consistent with the prediction model. If the initial data have $m \geq 4$, $x^{(0)} \in R^+$, and

$$\left. \begin{aligned} \sigma^{(0)}(k) &\in \left(e^{-\frac{2}{m+1}}, e^{\frac{2}{m+1}} \right) \\ \sigma^{(0)}(k) &= \frac{x^{(0)}(k-1)}{x^{(0)}(k)} \end{aligned} \right\} \quad (1)$$

where $k = 2, 3, \dots, n$; $\sigma^{(0)}(k)$ is called class ratio.

In grey system theory, GM(1,1) is one of the most widely used model. In general, GM(1,1) requires four observations to build a prediction model. Assume that $x^{(0)}$ is the original sequence as follows.

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(m)) \quad (2)$$

where m is the sequence length. $x^{(1)}$ is the 1-AGO sequence of $x^{(0)}$ as

$$x^{(1)} = (x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(m)) \quad (3)$$

where $x^{(1)}(1) = x^{(0)}(1)$, and

$$x^{(1)}(k) = \sum_{i=1}^k x^{(0)}(i), \quad k = 1, 2, \dots, m \quad (4)$$

The GM(1,1) model [3] can be constructed by establishing a first order differential equation for $x^{(1)}(k)$ as

$$\frac{dx^{(1)}}{dt} + ax^{(1)} = b \quad (5)$$

Then, by least-square method, the coefficients a and b can be obtained as

$$\hat{a} = [a, b]^T = (B^T B)^{-1} B^T Y \quad (6)$$

$$\text{where } B = \begin{bmatrix} -0.5(x^{(1)}(1) + x^{(1)}(2)) & 1 \\ -0.5(x^{(1)}(2) + x^{(1)}(3)) & 1 \\ \vdots & \vdots \\ -0.5(x^{(1)}(m-1) + x^{(1)}(m)) & 1 \end{bmatrix} \quad (7)$$

$$Y = [x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(m)]^T \quad (8)$$

$$\hat{x}^{(1)}(k+1) = (x^{(0)}(1) - \frac{b}{a})e^{-ak} + \frac{b}{a} \quad (9)$$

The result obtained $\hat{x}^{(1)}$ from (9). Applying the inverse accumulated generation operation (IAGO). The predicted equation is [8]

$$\hat{x}^{(0)}(k+1) = (x^{(0)}(1) - \frac{b}{a})(1 - e^{-a})e^{-ak} \quad (10)$$

where $\hat{x}^{(0)}(1) = x^{(0)}(1)$, $k = 1, 2, \dots, m, \dots$.

$\hat{x}^{(0)}(1), \hat{x}^{(0)}(2), \dots, \hat{x}^{(0)}(m)$ are called the fitted values, and $\hat{x}^{(0)}(m+1), \hat{x}^{(0)}(m+2), \dots, \hat{x}^{(0)}(m+h)$ are called the predicted values.

2.2 DIRECT GREY MODEL (2, 1)

Assume that $x^{(0)}$ is the original sequence as follows.

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(m)) \quad (11)$$

where m is the sequence length. $x^{(1)}$ is the 1-AGO sequence of $x^{(0)}$ as

$$x^{(1)} = (x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(m)) \quad (12)$$

where $x^{(1)}(1) = x^{(0)}(1)$, and

$$x^{(1)}(k) = \sum_{i=1}^k x^{(0)}(i), \quad k = 1, 2, \dots, m \quad (13)$$

The DGM(2,1) model can be constructed by establishing a second order differential equation for $x^{(1)}(k)$ as

$$\frac{d^2 x^{(1)}}{dt^2} + a \frac{dx^{(1)}}{dt} = b, \quad (14)$$

$$\text{and } \alpha^{(1)} x^{(0)}(k) + ax^{(0)}(k) = b \quad (15)$$

is called direct grey model (2, 1) [20].

Then, by least-square method, the coefficients a and b can be obtained as

$$\hat{a} = [a, b]^T = (B^T B)^{-1} B^T Y \quad (16)$$

$$B = \begin{bmatrix} -x^{(0)}(2) & 1 \\ -x^{(0)}(3) & 1 \\ \vdots & \vdots \\ -x^{(0)}(m) & 1 \end{bmatrix}, \quad Y = \begin{bmatrix} \alpha^{(1)}(2) \\ \alpha^{(1)}(3) \\ \vdots \\ \alpha^{(1)}(m) \end{bmatrix} = \begin{bmatrix} x^{(0)}(2) - x^{(0)}(1) \\ x^{(0)}(3) - x^{(0)}(2) \\ \vdots \\ x^{(0)}(m) - x^{(0)}(m-1) \end{bmatrix} \quad (17)$$

From (15), the solution $\hat{x}^{(0)}(k)$ is obtained by [21]

$$\hat{x}^{(1)}(k+1) = \left(\frac{b}{a^2} - \frac{x^{(0)}(1)}{a} \right) e^{-ak} + \frac{b}{a}(k+1) + \left(x^{(0)}(1) - \frac{b}{a} \right) + \frac{1+a}{a} \quad (18)$$

$$\hat{x}^{(0)}(k+1) = \hat{x}^{(1)}(k+1) - \hat{x}^{(1)}(k) = \left(\frac{b}{a^2} - \frac{x^{(0)}(1)}{a} \right) (1 - e^a) e^{-ak} + \frac{b}{a} \quad (19)$$

where $\hat{x}^{(0)}(1) = x^{(0)}(1)$.

By (19), $\{\hat{x}^{(0)}(1), \hat{x}^{(0)}(2), \dots, \hat{x}^{(0)}(m)\}$ are called the fitted values, and $\{\hat{x}^{(0)}(m+1), \hat{x}^{(0)}(m+2), \dots, \hat{x}^{(0)}(m+h)\}$ are called the predicted values.

2.3 TAYLOR APPROXIMATION METHOD IN GREY SYSTEM THEORY

In this paper, Taylor approximation method is applied in grey system theory including Taylor approximation method in grey model (1, 1) (abbreviated as T-GM(1,1)) and Taylor approximation method in direct grey model (2,1) (abbreviated as T-DGM(2,1)), they are described as follows [18].

Algorithm of T-GM(1,1) or T-DGM(2,1)

Step 1: Initialization

1) *Setting the updated times K.* In this study, K=100 is used for T-GM(1,1) and T-DGM(2,1).

2) *Setting objective function vector:*

$$G = [x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(m)]^T \quad (20)$$

where $\{x^{(0)}(i), i=1, 2, \dots, m\}$ are the measured data.

3) *Setting approximation function vector $F^{(K)}$:*

$$F^{(K)} = [\hat{x}^{(0)(K)}(1), \hat{x}^{(0)(K)}(2), \dots, \hat{x}^{(0)(K)}(m)]^T \quad (21)$$

where $\{\hat{x}^{(0)(K)}(i), i=1, 2, \dots, m\}$ are K times generated predicted sequence of indirect measurement model based on T-GM(1,1) or DGM(2,1). When K=0, $F^{(0)}$ is the predicted data series $\hat{x}^{(0)}$.

4) *Setting approximation parameters:*

$$\hat{a}^{(K)} = [a, b]^T \quad (22)$$

where $\hat{a}^{(K)}$ is the K-th time of generated parameter series, $\hat{a}^{(0)}$ is the initial series of coefficients a and b of GM(1,1) or coefficients a and b of DGM(2,1).

Step 2: Updating the calculation of approximated function vector $F^{(K+1)}$ according to the first order Taylor development:

$$F^{(K+1)} = F^{(K)} + F_a^{(K)}[a^{(K+1)} - a^{(K)}] + F_b^{(K)}[b^{(K+1)} - b^{(K)}] \quad (23)$$

$$F_a^{(K)} = \frac{\partial F^{(K)}}{\partial a^{(K)}} \approx \frac{F^{(K)}(a^{(K)} + C_a^{(K)}) - F^{(K)}(a^{(K)})}{C_a^{(K)}} \quad (24)$$

$$F_b^{(K)} = \frac{\partial F^{(K)}}{\partial b^{(K)}} \approx \frac{F^{(K)}(b^{(K)} + C_b^{(K)}) - F^{(K)}(b^{(K)})}{C_b^{(K)}} \quad (25)$$

$C_a^{(K)} = \frac{a^{(K)}}{h}$, $C_b^{(K)} = \frac{b^{(K)}}{h}$. Coefficient h is called the step length.

In this study, $h=500$ is used for T-GM(1,1) and T-DGM(2,1).

Step 3: Setting the evaluation function $Q^{(K)}$

$$Q^{(K)} = [F_D^{(K)} - F_a^{(K)}\eta_a^{(K)} - F_b^{(K)}\eta_b^{(K)}]^T \cdot [F_D^{(K)} - F_a^{(K)}\eta_a^{(K)} - F_b^{(K)}\eta_b^{(K)}] \quad (26)$$

$$F_D^{(K)} = G - F^{(K)} \quad (27)$$

$$\eta^{(K)} = \begin{bmatrix} \eta_a^{(K)} \\ \eta_b^{(K)} \end{bmatrix} = \begin{bmatrix} \eta_a^{(K+1)} - \eta_a^{(K)} \\ \eta_b^{(K+1)} - \eta_b^{(K)} \end{bmatrix} \quad (28)$$

Step 4: Detecting the stop criterion

If $Q^{(K)} \leq \varepsilon$ or $K=100$, stop; otherwise, go to Step 5. Where ε is the tolerance error.

Step 5: Updating the approximated parameters $\hat{a}^{(K)}$

$$\text{In order to minimize: } Q^{(K)} \rightarrow 0 \quad (29)$$

$$\text{let } \frac{\partial Q^{(K)}}{\partial \eta_a^{(K)}} = 0, \quad \frac{\partial Q^{(K)}}{\partial \eta_b^{(K)}} = 0 \quad (30)$$

The updated equation of parameters $\hat{a}^{(K)}$ can be obtained by

$$\hat{a}^{(K+1)} = \hat{a}^{(K)} + \frac{1}{H} [A^{(K)T} A^{(K)}]^{-1} A^{(K)T} F_D^{(K)} \quad (31)$$

$$A^{(K)} = [F_a^{(K)}, F_b^{(K)}] \quad (32)$$

H is adjustment coefficient. In this study, $H=20$ is used for T-GM(1,1) and T-DGM(2,1).

Step 6: Increasing the updated times: $K=K+1$; go to Step 2.

End of algorithm

Using the optimization process, the parameters $\hat{a}^{(K)}$ are updated for K times, and the evaluation function $Q^{(K)}$ as the convergent error is reduced. When $K=100$, the researchers can find the optimal parameters and the convergent error is reduced to a minimum in this study. At this time, vector $F^{(K)}$ becomes the K -th predicted series $\hat{x}^{(0)(K)}$ as the result of approximated calculation.

2.4 ERROR ANALYSIS

In this paper, researchers have used mean absolute percentage error (MAPE), which can be calculated using the following (33) as the error analysis method [22-24]. If the MAPE is less than 10%, the prediction result will be accepted [23, 25, 26].

$$\text{MAPE} = \left(\frac{1}{m} \sum_{k=1}^m \left| \frac{x^{(0)}(k) - \hat{x}^{(0)}(k)}{x^{(0)}(k)} \right| \right) \times 100\% \quad (33)$$

3 BUILDING THE MATLAB TOOLBOX

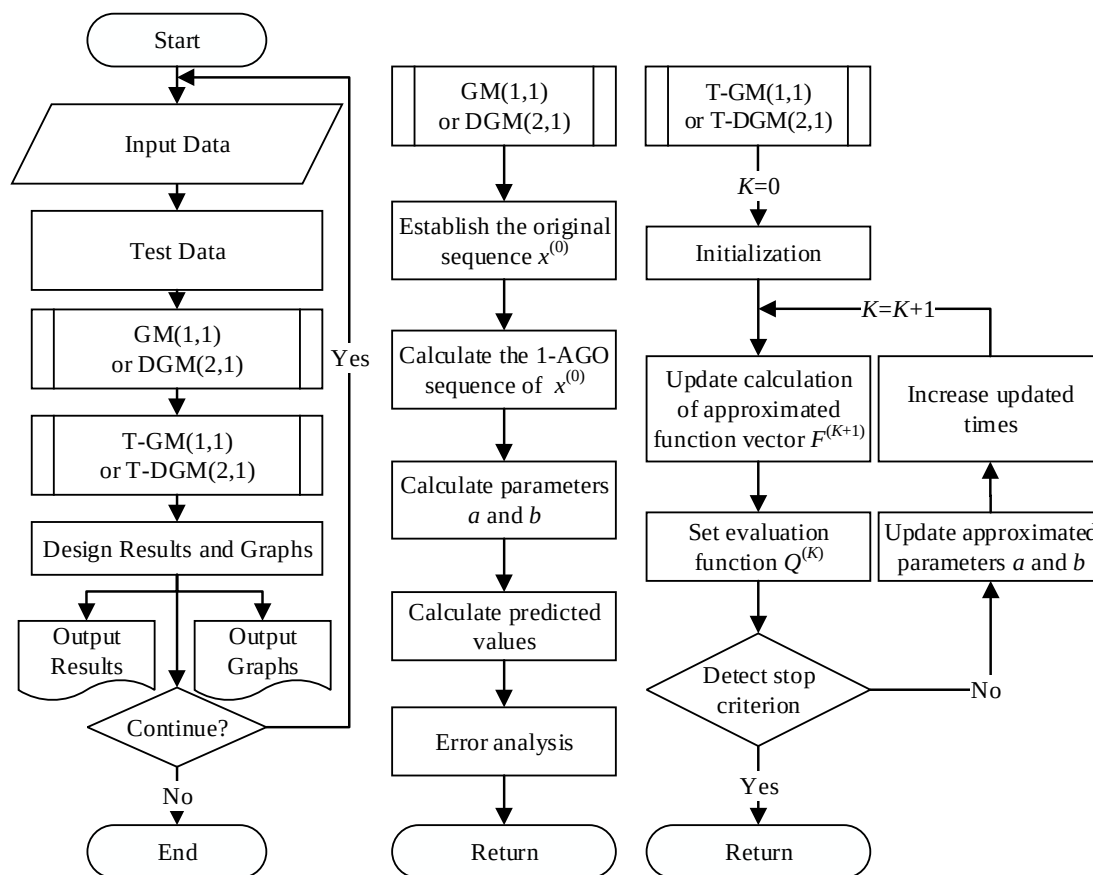


Fig. 1. The flowchart for two prediction models

This paper presents a sample program that is developed by MATLAB, including many scientific functions due to the provision of experimental environment on the computer, and then a reliable program can be developed. The program for two prediction models have been developed by the MATLAB R2012b software [27-31].

3.1 SOFTWARE SPECIFICATIONS AND REQUIREMENTS

- Windows XP, Windows 7 or upgrade versions.
- Screen resolution 1280×800.
- MATLAB R2012b version or upgrade versions.

3.2 THE PROGRAM FOR TWO PREDICTION MODELS

The operation of program for two prediction models is performed as in Fig. 1, and is specifically described by six basic steps as follows.

Step 1: Input data. Data are the number of students of the five continents (Asia, America, Europe, Africa, and Oceania) studying in Taiwan from the 2005-2006 to the 2013-2014 school year. The data have to be numerical, and written in *.csv file or *.xlsx or *.xls file.

Step 2: Test data input to select the prediction model.

Step 3: Using GM(1,1) to calculate parameters a and b ; or using DGM(2,1) to calculate parameters a and b ; then calculate

the values of prediction and error analysis.

Step 4: Using T-GM(1,1) to calculate parameters a and b ; or using T-DGM(2,1) to calculate parameters a and b ; then calculate the values of prediction and error analysis.

Step 5: Design results and graphs to display results and graphs on a graphical user interface visually. The user can save the results as an EXCEL file and the graphs as an image file (JPG).

Step 6: Continue or exit program. If the user inputs a new data, the program will continue and back to step 1, or else the program will be closed.

4 RESULTS AND DISCUSSION

4.1 DATA

In this study, data are taken from the website of Ministry of Education (Taiwan). Data are the number of students of the five continents (Asia, America, Europe, Africa, and Oceania) studying in Taiwan from the 2005-2006 to the 2013-2014 school year (Data are shown in the Table 1).

Table 1. The number of foreign students studying in Taiwan

School Year	Unit: Person				
	Asia	America	Europe	Africa	Oceania
2005-2006	7039	2305	1116	262	313
2006-2007	8119	2819	1544	294	294
2007-2008	9532	3409	1766	369	360
2008-2009	10722	3608	1846	366	367
2009-2010	11853	4393	2346	381	403
2010-2011	13332	4524	2509	542	449
2011-2012	15393	5133	2867	652	494
2012-2013	16294	4885	2979	790	504
2013-2014	18955	4680	3079	868	525

(Data from the website of Ministry of Education (Taiwan) <http://english.moe.gov.tw>)

4.2 RESULTS

Before using T-GM(1,1) and T-DGM(2,1) to predict the number of foreign students studying in Taiwan, the initial data are tested based on (1). In this case $n = 9$, class ratio obtained $\sigma^{(0)}(k) \in [0.819, 1.221]$. Results of testing data showed that data (Asia) is consistent with the T-GM(1,1) model and data (America, Europe, Africa, and Oceania) are not consistent with the T-GM(1,1) model (Results of testing data are shown in the Table 2). In this study, researchers used two prediction models (T-GM(1,1) and T-DGM(2,1)) to predict the number of foreign students studying in Taiwan, and then compared the predicted results and the accuracy of the two prediction models.

Table 2. The results of testing data

Asia	$\sigma^{(0)}(k)$	0.867	0.852	0.889	0.905	0.889	0.866	0.945	0.860
America	$\sigma^{(0)}(k)$	0.818	0.827	0.945	0.821	0.971	0.881	1.051	1.044
Europe	$\sigma^{(0)}(k)$	0.723	0.874	0.957	0.787	0.935	0.875	0.962	0.968
Africa	$\sigma^{(0)}(k)$	0.891	0.797	1.008	0.961	0.703	0.831	0.825	0.910
Oceania	$\sigma^{(0)}(k)$	1.065	0.817	0.981	0.911	0.898	0.909	0.980	0.960

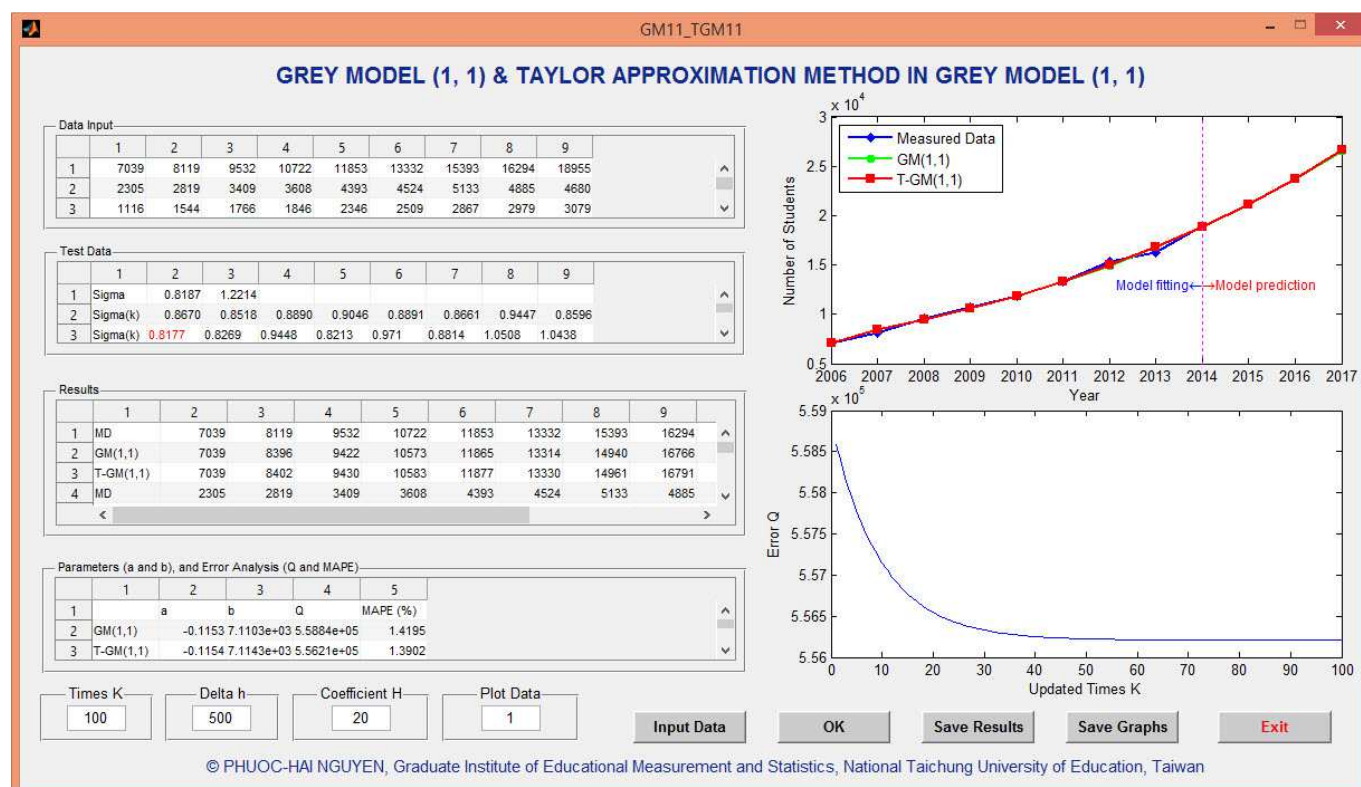


Fig. 2. The graphical user interface of the MATLAB toolbox for GM(1,1) and T-GM(1,1)

Table 3. The predicted results and the accuracy of the T-GM(1,1) model

Unit: Person

School Year	Asia	America	Europe	Africa	Oceania
2005-2006	7039	2305	1116	262	313
2006-2007	8402	3269	1638	276	321
2007-2008	9430	3496	1807	326	346
2008-2009	10583	3739	1993	385	373
2009-2010	11877	3999	2199	456	403
2010-2011	13330	4277	2426	538	434
2011-2012	14961	4574	2677	636	469
2012-2013	16791	4892	2954	752	506
2013-2014	18844	5232	3259	888	546
2014-2015	21149	5596	3595	1050	589
2015-2016	23736	5985	3967	1241	635
2016-2017	26639	6402	4376	1466	686
MAPE (%)	1.39	6.60	4.36	5.88	3.06

The prediction results and the accuracy of the T-GM(1,1) model are shown in the Table 3. Calculation details for using the T-GM(1,1) model to predict the number of students of Asia studying in Taiwan are described as follows. In this section, researchers used the data of the number of students of Asia studying in Taiwan in nine years to predict the next three years (Fig. 2).

Establishing the original sequence for the number of students of Asia studying in Taiwan:

$$x^{(0)} = (7039, 8119, 9532, \dots, 15393, 16294, 18955) .$$

Using the GM(1,1) model to calculate parameters a and b , the result obtained $a = -0.1153$ and $b = 7.11E+03$; the predicted values $\hat{x}^{(0)} = (7039, 8396, 9422, \dots, 14940, 16766, 18814, 21112, 23691, 26585)$; and the predicted error of the GM(1,1) model: $Q = 5.59E+05$, $MAPE = 1.42\%$.

Using the T-GM(1,1) model to calculate parameters a and b , the result obtained $a = -0.1154$ and $b = 7.11E+03$; the predicted values $\hat{x}^{(0)} = (7093, 8402, 9430, \dots, 14961, 16791, 18844, 21149, 23736, 26639)$; and the predicted error of the T-GM(1,1) model: $Q = 5.56E+05$, $MAPE = 1.39\%$.

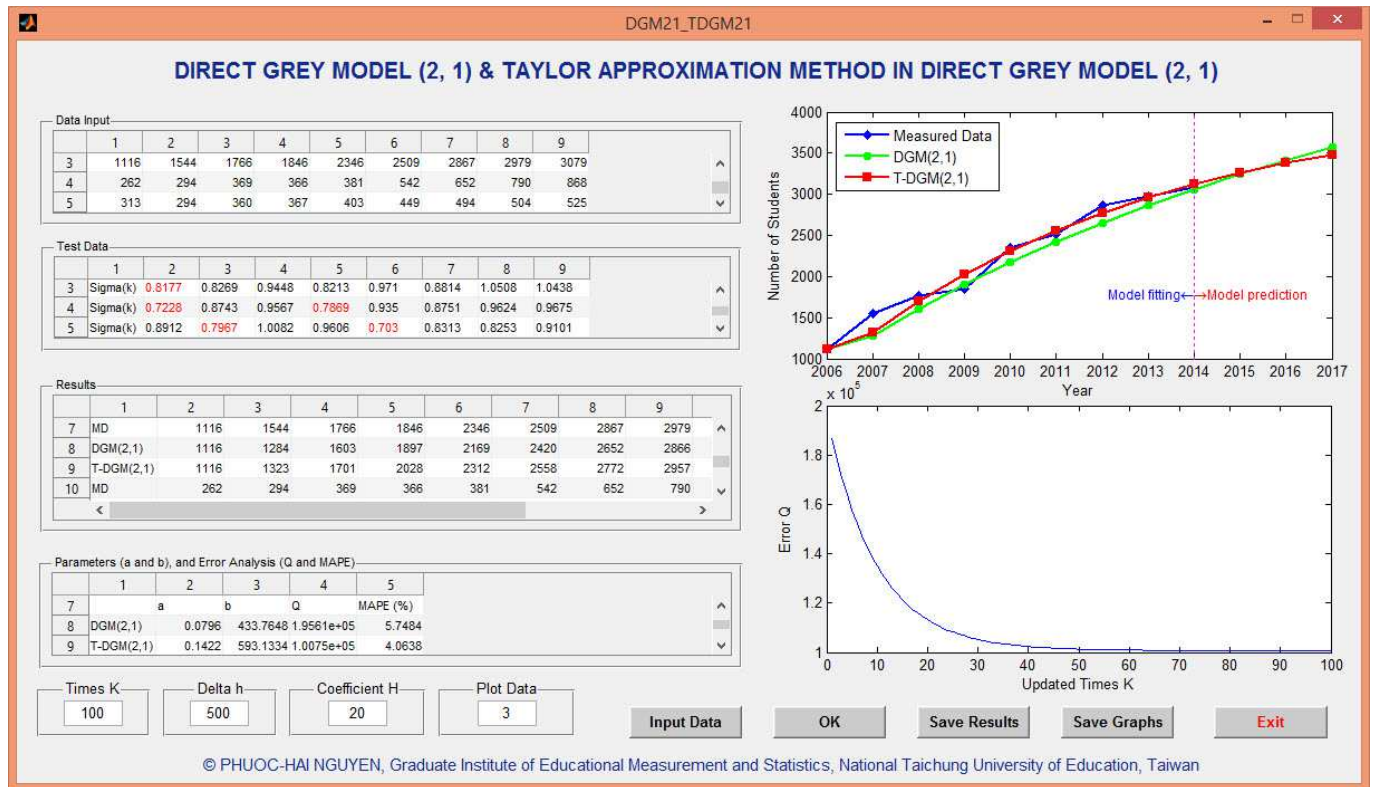


Fig. 3. The graphical user interface of the MATLAB toolbox for DGM(2,1) and T-DGM(2,1)

Table 4. The predicted results and the accuracy of the T-DGM(2,1) model

Unit: Person					
School Year	Asia	America	Europe	Africa	Oceania
2005-2006	7039	2305	1116	262	313
2006-2007	7713	2730	1323	282	326
2007-2008	9095	3418	1701	328	354
2008-2009	10530	3916	2028	383	382
2009-2010	12019	4277	2312	450	411
2010-2011	13566	4538	2558	531	441
2011-2012	15171	4726	2772	630	472
2012-2013	16838	4863	2957	750	503
2013-2014	18568	4962	3118	895	536
2014-2015	20365	5033	3258	1071	569
2015-2016	22230	5085	3378	1284	603
2016-2017	24166	5122	3483	1543	639
MAPE (%)	2.37	3.26	4.06	5.73	3.02

The prediction results and the accuracy of the T-DGM(2,1) model are shown in the Table 4. Calculation details for using the T-DGM(2,1) model to predict the number of students of Europe studying in Taiwan are described as follows. In this

section, researchers used data of the number of students of Europe studying in Taiwan in nine years to predict the next three years (Fig. 3).

Establishing the original sequence for the number of students of Europe studying in Taiwan:

$$x^{(0)} = (1116, 1544, 1766, \dots, 2867, 2979, 3079).$$

Using the DGM(2,1) model to calculate parameters a and b , the result obtained $a = 0.0796$ and $b = 433.7648$; the predicted values $\hat{x}^{(0)} = (1116, 1284, 1603, \dots, 2652, 2866, 3063, 3246, 3415, 3570)$; and the predicted error of the DGM(2,1) model: $Q = 1.96E+05$, $MAPE = 5.75\%$.

Using the T-DGM(2,1) model to calculate parameters a and b , the result obtained $a = 0.1422$ and $b = 593.1334$; the predicted values $\hat{x}^{(0)} = (1116, 1323, 1701, \dots, 2772, 2957, 3118, 3258, 3378, 3483)$; and the predicted error of the T-DGM(2,1) model: $Q = 1.01E+05$, $MAPE = 4.06\%$.

4.3 DISCUSSION

According to the predicted results and the accuracy of T-GM(1,1) and T-DGM(2,1) indicated that data (Asia) is consistent with the T-GM(1,1) model and data (America, Europe, Africa, and Oceania) are consistent with the T-DGM(2,1) model. The results also showed that the MAPE value of T-GM(1,1) is less than the MAPE value of T-DGM(2,1) for data (Asia), and the MAPE values of T-GM(1,1) are greater than the MAPE values of T-DGM(2,1) for data (America, Europe, Africa, and Oceania) (Results are shown in the Table 3 and the Table 4). These results showed that the predicted accuracy of T-GM(1,1) and T-DGM(2,1) is very good for predicting the number of students of the five continents studying in Taiwan. In addition, these results indicated that the MATLAB toolbox can help to process data quickly, accurately, which displays results and graphs on a graphical user interface visually. These results are not only conducted to serve as a reference for the educational administrators in Taiwan but also can assist the government in developing future policies regarding educational management. In the era of scientific and technological revolution nowadays, education and training are becoming the main motive force for the developmental acceleration and considered as a determining factor for the success or failure of a nation in international competitions and for the success of each individual in his life. The predicted data are required reliable and high accuracy to contribute to the success in the educational development of the country.

5 CONCLUSION

Based on the findings from this study, some conclusions and suggestions are as follows:

This study has successfully used Taylor approximation method in grey system theory (T-GM(1,1) and T-DGM(2,1)) to predict the number of students of the five continents studying in Taiwan. The prediction results will provide important information for educational managers to continue to attract and efficient use of resources, bring international cooperation for training and scientific research. It will not only help the managers to make good educational scholarship program for foreign students studying in Taiwan but also improve the effectiveness of education for international cooperation in education and training.

This study has successfully developed a MATLAB toolbox for two prediction models based on Taylor approximation method in grey system theory. This toolbox has many advantages such as: easy to use, time-saving, accurate and clearly visual output. Especially, the user can save the results as an EXCEL file and the graphs as an image file (JPG).

Two prediction models are not only used to predict the number of foreign students studying in Taiwan but also can be suggested to use in many fields such as education, engineering, economics, and medicine.

To sum up, two prediction models are actually useful for the predicted problems of uncertainty systems when the number of data is not enough for mathematical statistics methods, and the MATLAB toolbox not only helps the user to process data quickly and accurately but also displays results and graphs on a graphical user interface visually.

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QUORUM SENSING EFFECT THE LYSIS MECHANISM OF T4 BACTERIOPHAGE

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ABSTRACT: According to the cell density bacteria can regulate their gene expression. Gene regulation is initiated by the release of signaling molecules into the environment which are called autoinducers. When the population density increases, these autoinducers accumulate extracellularly and these can be detected by the bacteria through quorum sensing. We found that *E. coli* make use of indole quorum-sensing signals to prevent it from infection by T4 phage. This has been acknowledged for the first time that *E. coli* utilizes antiphage defense mechanism regulated by quorum sensing. We proposed that through quorum sensing *E. coli* is protected in conditions where there is increased risk of infection as for example during growth in high cellular density in which there is mixed species environments. In microbial communities, quorum-sensing is a general phenomenon which controls *E. coli* susceptibility to phage.

KEYWORDS: Quorum, Sensing, Lysis, Mechanism, T4 Bacteriophage

1 INTRODUCTION

Quorum sensing (QS) is an important way to communicate information between bacteria. Bacteria used different quorum sensing molecule for communication and these signals molecules are called autoinducer (AI). These autoinducers are produced and released by the quorum sensing bacteria to levels dominating the increasing cell-population density. The attainment of minimal threshold stimulatory concentration of an autoinducer leads to an alteration in gene expression. Both Gram-positive and Gram-negative bacteria are capable of using quorum sensing communication circuits for regulating a diverse array of physiological activities. These activities include symbiosis, competence, virulence, conjugation, antibiotic production, sporulation, motility and biofilm formation. In the field of quorum sensing revealed, cell to cell communication via autoinducers both within and between bacterial species. The establishment of enormous data in this field suggests autoinducers acquiring specific responses from host organisms. Despite the difference in chemical signals, signal relay mechanisms and the target genes controlled by the bacterial quorum sensing systems, the ability to communicate with one another allows bacteria to coordinate the gene expression as well as the behavior of the entire community. This process presumably confers upon the bacteria some of the qualities of higher organisms. The evolution of quorum sensing systems in bacteria thus could have been one of the early steps in the development of multicellularity [1].

This study was influenced by the hypothesis that quorum sensing could additionally be used as a mean of regulating phage-bacterium interactions. Bacteriophages are viruses that attack their respective bacteria. Under natural environments the phages exert around 10 fold predation pressure which might result in outstripping of bacterial cells [2]. Therefore host bacteria have developed very strong antiphage mechanisms, such as blocking phage initial attachment, degrading phage genome, or host suicide there by preventing the phage progeny spread in the population [3]. As bacterial host is always required for the proliferation of phages, therefore in thickly populated mixed-species environments the phages are always

more abundant and diverse than in sparsely populated environments, so the risk of suffering phage attacks is generally higher in microbial cell densities. The costs associated with phage resistance mechanisms are considerable and help as a key factor in shaping the evolutionary dynamics between the phage and host [4-5]. We assume that if bacteria used quorum sensing to adjust their antiphage activities, they could accurately regulate their defense mechanisms to elude infection during growth under high-risk conditions, while saving the metabolic load of maintaining constantly raised antiphage tactics.

The initial effort to test whether quorum sensing is used to regulate phage-bacterium interactions, we explored the role of quorum sensing in the standard model system of T4 phage and its host *Escherichia coli* BL21. Since the discovery of T4 phage about 60 years back, it has been studied extensively and by this way phage represents the most widely understood biological entity. The investigations upon T4 phage and its interactions with *E. coli* have served as a bridge in molecular studies and paved the way to understand the key mechanisms of quorum sensing [6].

However many researchers have explained that *E.coli* use multiple systems of quorum-sensing [7] and one of the most important molecule for inter-species quorum sensing is indole [8], which acts as a signaling molecule and activates transcription of *astD*, *tnaAB* and *gabT* genes. Among these genes, *tnaAB* operon activation induces indole production, whereas the remaining two genes i.e. *gabT* and *astD* activation leads to the degradation of amino acids to either succinate or pyruvate. Signaling pathway, which utilizes indole, plays an important role in adaptation of bacteria in poorly nourished environment, where degradation of amino acids is an important energy source [9].

The goal of our research was to clarify the role of bacterial quorum sensing, in shaping the interactions between bacteria and the bacteriophage that prey on them. I presented evidence for this hypothesis by using model system of *Escherichia coli* and T4 bacteriophage.

2 MATERIALS AND METHODS

2.1 BACTERIA AND BACTERIOPHAGE

In order to conduct the study, the *E. coli* BL21 (DE3) strain was used as the primary host for lysis activity of the bacteriophage named *E. coli* bacteriophage (ATCC11303-B4). The *E. coli* BL21 (DE3) pLysS was obtained from the American Type Culture Collection (ATCC). All bacterial and phage stock cultures prepared/obtained were stored at -80°C in Luria-Bertani broth (Oxoid) containing 50% (v/v) glycerol. Phage titer was determined as plaque-forming units (pfu/ml) using the double layer agar plate method.

2.2 LURIA-BERTANI MEDIA

LB medium containing 10 g tryptone, 5 g yeast extract and 10 g sodium chloride per 1,000 ml of water (pH 7).

2.3 SEMI SOLID MEDIA

For phage-plaque formation semi solid medium containing 1.5 and 0.5% agar was used for the upper layer, respectively.

2.4 CHEMICALS

Indole C_8H_7N (>99%) was obtained from Sigma–Aldrich (USA) and indole working solution was diluted in water to receive a final concentration of 1%.

2.5 PLAQUE COUNT ASSAYS

The progress of lysis was recorded by plaque count assays to check the effect of indole on the lysis activity of T4 bacteriophage (4×10^9 pfu/ml) against *E. coli* BL 21(DE3) (1 OD at 600nm). In order to avoid indole production by *E. coli*, 12 hours incubated *E.coli* cells in LB media were centrifuged (13000rpm/15min). By centrifugation all the indole produced during incubation in media was removed. The *E. coli* cells were taken and suspended in fresh LB media broth for experimental use.

2.6 PLATING OF T4 BACTERIOPHAGE

For indole experiment 20 µl of indole, was added to 0.2 ml of bacterial culture (*E. coli* cells from fresh LB media) and then allowed to adsorb to the *E. coli* for 5 minutes followed by addition of 0.1 ml of T4 bacteriophage to suspension. The

suspension was then added to the soft agar and poured onto base plate. Agar tube was rolled between palms to mix for 2 or 3 seconds, and quickly poured onto agar surface of warm base plate. In order to disperse soft agar over the surface of the base plate agar they were gently moved in the pattern of figure eight. Soft agar was allowed to harden and then Incubated at 37°C.

2.7 STATISTICAL ANALYSIS

Statistical analysis included t test for the comparison of change in outcome variables in response to Indole with methods described by sigma stat. The analysis was carried out with Graph Pad Prism 5 software.

3 RESULT

In nature, bacteria normally occur in polymicrobial communities. Interactions between community members typically involve several mechanisms, including responses to antimicrobial compounds, nutritional interactions, and signaling. Chemical signaling is widespread in bacteria, and in *E. coli* it involves several compounds, including indole. A common diagnostic marker for *E. coli* identification is indole, which is formed by tryptophanase enzyme from tryptophan. Indole can also act as an extracellular signaling molecule. In this study, we have demonstrated that quorum sensing molecule indole can reduce the infection activity and production up to 45% of T4 phage as shown in Figure-1.

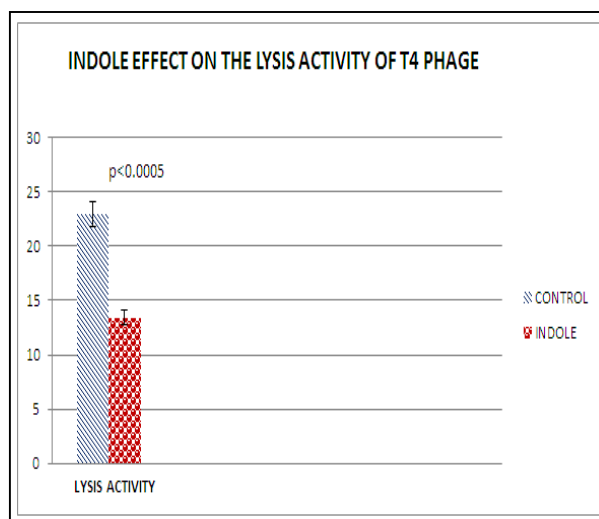


Figure-1: Indole signaling pathway has its role in adaptation of bacteria in a poor nutrient environment, where amino acids degradation is a very important source of energy while in our experiment we checked the effect of indole on the lysis activity of T4 phage and result showed that indole decreased the lysis activity of T4 bacteriophage. Reported differences were evaluated using t test. ($P<0.0005$)

4 CONCLUSION

Quorum sensing plays an important role in both symbiotic and pathogenic bacteria-host interactions. In addition, bacteria have evolved to use quorum sensing as a way of regulating their interaction with their prey that is virus which is the most numerous biological entities on earth.

The present study was an effort to look at the effect of quorum sensing molecule which is indole on production and infection activity of T4 bacteriophage. In this study, we have identified a unique antiphage defense mechanism regulated by quorum sensing in *E. coli*. Results obtained during the study showed that indole which can also act as a signaling molecule and is a common diagnostic marker for the identification of *Escherichia coli* reduced the infection activity and production of T4 bacteriophage as Mahyar, [10] reported that indole can reduced virus attachment to host.

ACKNOWLEDGMENTS

This research was funded by National Natural Science Foundation of China (No. 31160121).

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THE EFFECT OF LIVESTOCK PRODUCTION SYSTEM ON THE NATURAL ENVIRONMENT OF DISTRICT BARKHAN BALOCHISTAN, PAKISTAN

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ABSTRACT: The study results showed that due to advent of market economy the resource system changed from range based livestock production and rain fed agriculture to irrigated mode of agriculture supported by tube well/dug well and sedentary and household level livestock production systems. This triggered changes in the settlement pattern in human communities from nomadic and transhumant to resident communities. With this change in the settlement pattern, the earlier prevalent joint family system gave way to the extended family system. Similarly the human behavior also changed with increasing territoriality, weakening of social bonds and communication, lowering levels of altruism and a multiplier effect reflected in the adoption of new innovation. These changes also brought about alterations in the physical environment i.e. natural resources being used in the resources system. Rangelands of the area, previously protected/managed for community livestock use assumed the role of open to grazing areas and were invaded by herders/nomads from outside. Livestock of nomads grazing the rangelands brought with them new ecto/endo parasites which not only infected the local livestock populations but were also source of pollution in the water. Rangelands also showed signs of deterioration due to overstocking and heavy/overgrazing. Based upon study results it is recommended that introduction of new resource process in a stable resource system needs careful thinking so that not only the human – environment relationship could be maintained in a harmonious manner but also support the existing social order.

KEYWORDS: Livestock, System, Natural, Environment, Barkhan

1 INTRODUCTION

The livestock is major provider of livelihoods for the largest part of the world's poor people; 1.3 billion people globally and directly support the livelihood over 600 million poor small holders' farmers in developing world [1], of the 565 million livestock keepers living in absolute poverty line, and 75% (estimated) of the poor live in rural areas of tropical developing countries [2]. Livestock is also important provider of nutrients, dietary protein and energy (Meat), food energy (Milk, Cheese, Butter, etc), its products contribute 17% to kilocalories consumption and 33% to protein consumption globally [3], provide manure, blood and bones as a fertilizer, provide power traction for growing crops in smallholder systems for that more people keep livestock which is known as most important asset of the poor as it brings income the livestock is now recognized the fastest growing part of the agriculture sector. The consumption of livestock products is growing even faster than the increase in world population. Human population in 2050 is estimated to be 9.15 billion, with a range of 7.96-10.46 billion [4]. Most of the increase is projected in the cities of the developing countries [5], more people now live in urban setting than in rural area this urban populations need more animal products than those of rural areas and the main livestock products to serve the world are meat, milk and egg etc [6].

Industrialization and green revolution have enhanced the future demand for livestock to be another revolution that may be called as livestock revolution, and it is capable to provide an engine for sustainable intensification of small-scale farming as well as marketing. It can play a crucial role in reduction of poverty and hunger worldwide [7].

In the perspective of climate change, environment may have significant effects on the global livestock production system, [7], but another side livestock sector stresses many ecosystems and contributes to the world most pressing environmental problems, including global warming, land degradation, air, water pollution and loss of biodiversity [8].

This situation encouraged me to find out the settlement pattern of people in study area in which their livelihood are completely or partially dependent on livestock rearing and their relationship with natural environment for livestock and agriculture production system and to see the changes through external factor in production system which arising changes in natural environment out of human exploiting of natural resources for sustaining livelihood.

2 MATERIALS AND METHODS

Five sources, fecal, water, soil, blood and external parasite samples were selected to study the effect of livestock parasitic on natural environment of Barkhan.

2.1 FECAL SAMPLES

Fecal samples were collected from the rectum and freshly passed deposit on ground. An appropriate 10 g sample size was taken in zip-lock plastic bag and container. The samples were sent to lab in cooled chain condition within 24 hours. The microscopic examination of faeces samples were performed by indirect method (concentration method), which give more accurate results because there is no chance of false negative results. Even mild infections can be detected by floatation method.

2.2 WATER SAMPLES

500ml water samples were collected from rivers, ponds and well in sterilized bottle. The samples were sent to lab in cooled chain condition within 24 hours. The microscopic examination of water samples were performed by indirect method.

2.3 SOIL SAMPLES

25g soil samples were collected from the depth of 10 cm rangeland in sealed plastic bags and the samples were sent to lab in cooled chain condition within 24 hours. The microscopic examination of soil samples were performed by indirect method (concentration method), which give more accurate results because there is no chance of false negative results. Even mild infections can be detected by floatation method.

2.4 BLOOD SAMPLES

3ml blood samples were collected from different flock in sterilized tube which contained anticoagulant. The samples were sent to lab in cooled chain condition within 24 hours. The microscopic examination of blood samples were performed under compound microscope.

2.5 EXTERNAL PARASITE IDENTIFICATION

The ticks were identified by their shape of the capitulum and mouthparts.

3 RESULT

A drastic shift from nomadic and transhumant production systems towards sedentary and household level production observed in this study reflects changes in the settlement patterns of farming communities over the years (Table-1). In the past agriculture production was predominantly rain fed while livestock production has been rangeland based with limited crop residual support during winter. After cultivating their rain fed agriculture the farmers used to move their livestock far away from agriculture areas and returned back to their permanent settlements at the time of crop harvest and during winters.

Table-1: Livestock production systems of the study area

Livestock Production System	Previous study percentage	At present
Nomadic	30 %	Nil
Transhumant	60 %	28 %
Sedentary	10 %	61%
House hold level production	0 %	11 %
FAO 1983		

The negative growth in the population of pack animal, camels reflects the use of mechanization in agriculture production practices and availability of modern means of transport. While very high rate of growth in cattle and buffaloes' during the period has been due to change in livestock production system towards household level production (Table-2).

Table-2: Comparison of animal population and growth trends

Censuses	Cattle	Buffalos	Sheep	Goats	Camels	Horses	Mules	Asses
2006	117286	2005	413840	155581	3930	2127	150	9507
1996	57047	1243	350810	144703	5046	635	16	3617
Difference	60221	762	63030	10878	-1116	1492	134	5890

The comparative growth trend in cattle & buffaloes as compared with other species has been quite significant from 1996 to 2006 in spite of long spell drought (1998 – 2004) in the province. During interviews and group discussing at all the study sites majority of the respondents confirmed that the continued drought from 1998 to 2004 resulted in crop failure of rain fed agriculture and drying up of large number of orchards supported through irrigation sources. Thus they were forced to invest their earnings and savings in milch animals so as to have a sustainable livelihood source. The higher growth trend in cattle and buffaloes since 1996 census (figure-1) has therefore been due to investment of farming community of study area in livestock sector. Another reason for comparative growth trend reflected particularly for sheep during this very period is incoming of these this species from other very arid parts of province to Barkhan and adjacent areas that fall in semi arid climatic zone. Due to its location in the semi arid climatic zone, Barkhan receives monsoon showers. During drought period unlike other parts of the province falling in hyper arid and arid zones, the district received some showers that encouraged the grass and shrub growth in the area. This attracted the livestock from other area.

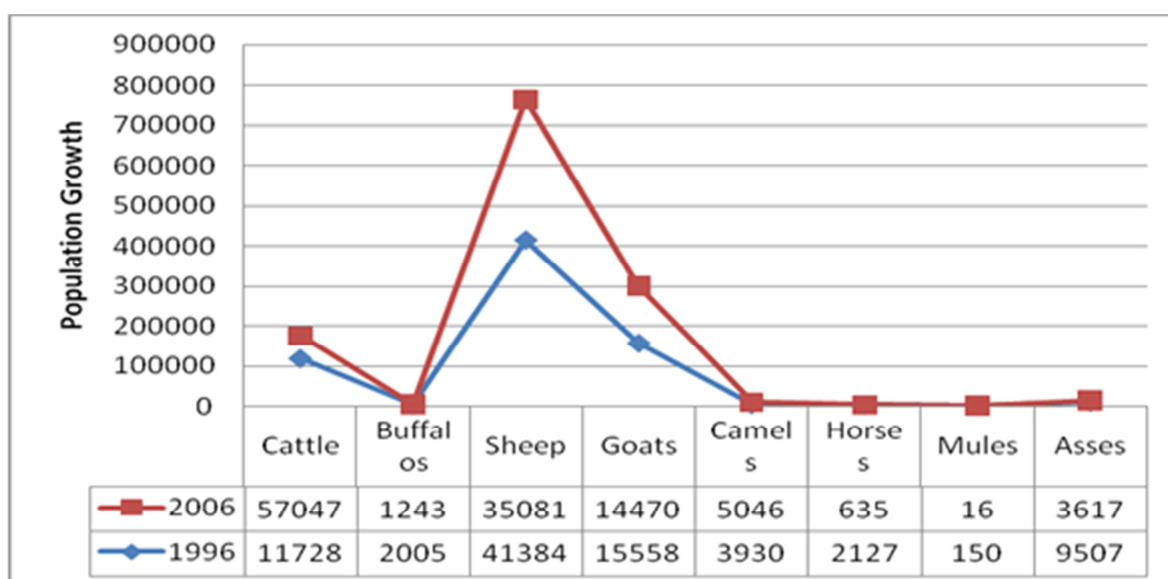


Figure-1: Trend in Population growth in small ruminant in Barkhan

The laboratory analysis of samples collected from study sites reveal that 87% animals were infested with one or an other type parasites or even having multiple type of parasites. The stages in the life cycle of identified parasites, Larval stage was highest (44%) followed by (37%) Cestodes and (12%) nematodes. The coccidiosis were found in 29 % of the samples (Figure-2). Findings of present study are quite in line with the earlier research studies conducted in the developed world (Barrell, 1997) having findings that the parasitic load of animals depends on many variables, such as stocking density, time of the year, the reproductive status of the animals etc. since at the time of study the rangeland has been dry leading to less availability of nutrition, more stocking density of livestock on the available rangelands and reproductive status of animals as in the study area breeding starts from mid of september.

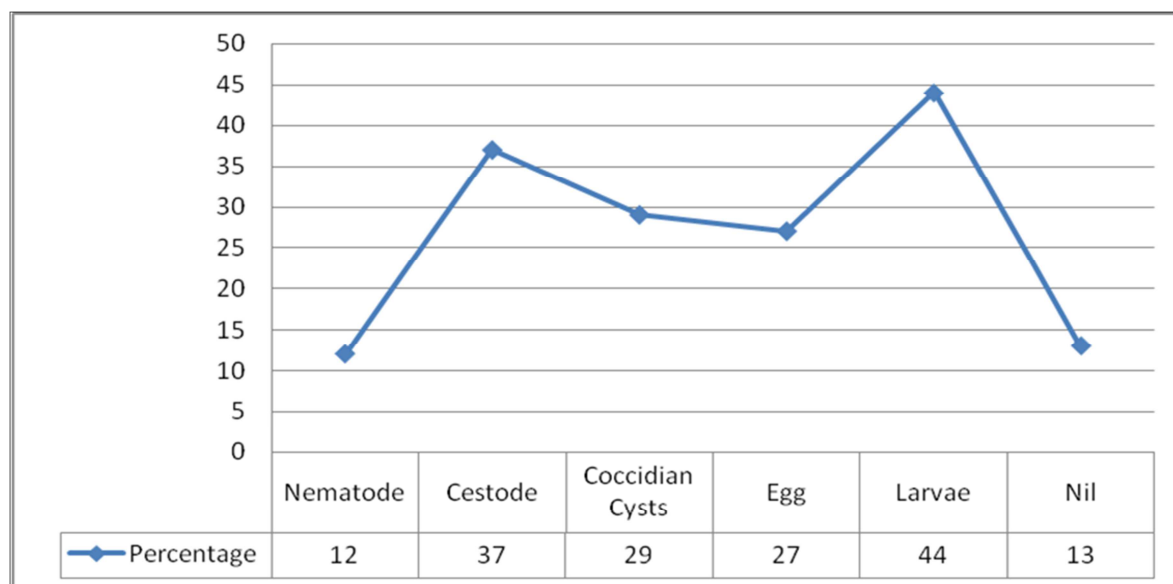


Figure-2: Percentage of internal parasitic infestation

In addition introduction of animals from arid conditions during drought period of 1998-2004 also contributed towards higher rate of parasitic infestations in area of this study. During focus group discussion the community members at large were of the opinion that animals introduced from arid zones were physically quite weak with poor immunity and were thus easily overwhelmed by worms.

Good nutrition plays a big part in how well the animal's immune system mounts the proper defenses, and in the animal's overall ability to tolerate the presence of some worms. Healthy and well-nourished animals will be able to develop resistance and resilience to worms and other parasites much better than thin animals that do not have good availability of quality feed. Resistance is the ability of an animal to prevent the establishment and maintenance of a parasite population within the gastrointestinal tract. Some individuals and some breeds show more resistance to parasitic infection than others. Research to identify characteristics in such individuals is a hot area. Culling susceptible animals can take advantage of this. Resilience is the ability of an animal to reduce production loss during a parasite infestation. Both of these traits are being looked at as ways of selecting animals that will be less susceptible to parasite effects. Animals that possess some genetic resistance or resilience can still be infected with worms. Therefore, you must keep in mind that this is just one more measure that will help control worm problems, not a cure by itself.

The water and soil samples collected from various sources of all the study sites were found contaminated with parasites thus contributing towards high rate of parasitic infestation in the sheep population of the area of study. The external samples collected from all sites' flocks were found positive and having, Ixodae Ricinus, Dermacentor Albipictus while blood samples have no parasite.

4 CONCLUSION

Livestock provides the basic security to the rural poor society for food and hard cash. Consequently the grazing pressure leads to the degradation of the rangeland. The number of livestock is a serious constraint for the conservation and

sustainable use of rangeland. Because of the socio-economic factors, the number are not likely to come down without developing socially acceptance, economically viable and environmentally safe alternative means of sustainable livelihood.

As far as the natural resources in the system are concerned, in the unstable resource use system these also followed the path of degradation. Changes in settlement pattern and livestock and agriculture production system triggered changes in natural resource use such as the rangeland/grazing lands. In the past, rangelands/grazing lands were important in the community for livestock grazing and maintained through closure and opening for grazing requirements of local community livestock. However, in the newly established unstable resource system these rangelands were suddenly left unattended. This act of human community towards rangeland use attracted other resource users from outside to fill out this niche. In the absence of any resource use norm, as prevalent in the past, the area was subjected to overgrazing due to heavy stocking rate resulting in rangeland degradation on one hand and introduction of new strains of livestock diseases, heavy parasitism among local livestock and contamination of drinking water sources on the other hand. The local livestock having poor immunity against these new diseases proved very vulnerable to their spreading with escalated mortality rate on one hand and weight loss on the other.

ACKNOWLEDGMENTS

I am very thankful to Center for Advanced Studies in Vaccinology and Biotechnology University of Balochistan for providing financial support for this study. I would also like to appreciate greatly Dr Alam Mangle, Mr Ghulam Mohammad and Dr Sadullah for their valuable and constructive suggestions during the planning and conduction of this research work.

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Mésothéliome malin de localisation clitoridienne : A propos d'un cas

[Malignant mesothelioma of the clitoral location: About one case]

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ABSTRACT: A case of a malignant mesothelioma of clitoral location is reported in a 52 year-old woman. The microscopic and immunohistochemical exam of biopsy confirmed the diagnosis of malignant mesothelioma of the clitoris. The computed tomography scan of thoraco abdominal pelvic was normal. The patient underwent surgical treatment followed by radiotherapy and chemotherapy. Most malignant mesotheliomas are pleural location; they rarely occur within the peritoneum and their clitoral location is exceptional. Our objective about this particular case is to discuss the diagnostic problems of exceptional tumour of the clitoris and clinical and pathologic aspects.

KEYWORDS: Tumor of the vulva, malignant mesothelioma, tumor of the clitoris.

RESUME: Nous rapportons un cas de mésothéliome malin de localisation clitoridienne diagnostiqué chez une patiente âgée de 52 ans dont l'étude histologique et immunohistochimique de la Biopsie avait conclu à un mésothéliome malin du clitoris. Le scanner thoraco-abdomino-pelvien était normal. La patiente a bénéficié d'un traitement chirurgical suivi d'une radiothérapie et une chimiothérapie. Les mésothéliomes malins sont des tumeurs de localisation le plus souvent pleurale, plus rarement au niveau du péritoine, la localisation clitoridienne est exceptionnelle. L'objectif de notre observation particulière est de discuter le diagnostic de cette tumeur clitoridienne exceptionnelle ainsi que les aspects anatomocliniques.

MOTS-CLEFS: Tumeur de la vulve, mésothéliome malin, lésion clitoris.

1 INTRODUCTION

Les mésothéliomes malins sont des tumeurs qui siègent le plus souvent au niveau de la plèvre, plus rarement au niveau du péritoine en particulier chez la femme [1]. La localisation vulvaire est exceptionnelle, à notre connaissance, deux cas a été rapporté dans la littérature [2]. Nous rapportons un cas de mésothéliome malin de localisation clitoridienne qui a été confirmé par étude immunohistochimique. L'objectif de cette observation particulière est de discuter les aspects anatomocliniques et le diagnostic de cette tumeur inhabituelle du clitoris.

2 CAS CLINIQUE

Patiente âgée de 52 ans, multipare, diabétique et hypertendue qui consulte pour une masse de localisation clitoridienne apparu depuis 2 mois légèrement douloureuse, l'examen général est strictement normal alors que l'examen gynécologique montre une tumeur charnue clitoridienne (Fig 1), le reste de l'examen gynécologique est sans particularité les aires ganglionnaires inguinales libres. L'étude histologique est immuno-histochimique de la biopsie réalisée sur la tumeur montre

l'aspect d'une prolifération tumorale faite de cellules de taille moyenne à grande, à cytoplasmes clairs ou modérément éosinophiles parfois chargées de pigment mélanique. Le diagnostic de mélanome malin a été confirmé par cette étude vu que les cellules tumorales exprimaient la vimentine, la protéine S100 Et le HMB 45.



Fig 1 et 2: tumeur charnue de localisation clitoridienne

3 DISCUSSION

Les mésothéliomes malins sont des tumeurs dont les cellules ont les caractéristiques microscopiques, histochimiques et immunohistochimiques de la cellule mésothéliale normale ou hyperplasique. La localisation vulvaire est exceptionnelle. Selon notre connaissance, deux cas ont été rapportés dans la littérature, un a constitué la circonstance de découverte d'une masse para-ovarienne gauche correspondant à un mésothéliome malin du péritoine qui a été en fait extériorisé au niveau de la vulve ; cette éventualité exceptionnelle est en rapport avec une persistance du canal de Nuck chez la femme, équivalent du canal péritonéovaginal chez l'homme [2]. Le deuxième cas d'une patiente opérée pour une tumeur de la vulve dont l'aspect clinique était évocateur d'un kyste de la glande de Bartholin ou d'un fibrome alors que l'étude histologique et immunohistochimique avait conclu à un mésothéliome malin biphasique de la vulve [11]. L'âge moyen de survenue d'un mésothéliome malin du péritoine chez la femme est de 52 ans [1]. Les principaux facteurs étiologiques incriminés sont l'asbestose, l'irradiation et l'inflammation chronique [1]. Les circonstances de découverte sont à type de douleurs ou de masse abdominale souvent associée à une ascite [1],[3] ; exceptionnellement, il peut s'agir d'une tumeur vulvaire révélatrice[2] comme c'est le cas de notre observation.

Le diagnostic est anatomopathologique. Macroscopiquement, il s'agit le plus souvent d'une tumeur solide de couleur blanc grisâtre ou jaunâtre, généralement diffuse au niveau du péritoine [1]. Histologiquement, la morphologie du mésothéliome malin est très trompeuse (épithéliale dans 50 à 78 % des cas, biphasique dans 22 à 34 % des cas et desmoplastique dans 3 à 16 % des cas) [1],[4]. La composante épithéliale peut être solide, papillaire ou tubulaire; les atypies sont modérées ou sévères et les mitoses nombreuses. À l'étude immunohistochimique, il n'y a pas de marqueur spécifique de la cellule mésothéliale, mais la coexpression kératine–vimentine est très évocatrice [1],[4],[5].

Cette étude est positive pour la calrétinine dans 87 % des cas [6] ; une positivité pour CA 125 peut être observée dans 14 % des mésothéliomes malins du péritoine [7]. Le diagnostic différentiel peut se poser morphologiquement avec un synovialosarcome biphasique [8], une hyperplasie mésothéliale atypique (toujours associée à l'inflammation et rarement tumorale) [3], la métastase d'un adénocarcinome [4] et le carcinome séreux du péritoine qui est une tumeur plus volumineuse, souvent kystique, plus agressive, plus riche en corps psammeux et positive au moins pour deux des anticorps anti-protéine S100, Leu M1 (CD15), TAG72, CEA et Ber EP4 (TAG72 est une glycoprotéine largement distribuée dans différents types de carcinomes ; en immunohistochimie, ce marqueur est utile pour distinguer entre adénocarcinome et mésothéliome) [1],[4],[9]. Le diagnostic différentiel se pose également avec une tumeur mixte mullérienne développée à partir de lésion d'endométriose ou associée à une localisation ovarienne [10].

Sur le plan évolutif, les mésothéliomes du péritoine sont cliniquement bénins lorsqu'ils sont typiquement asymptomatiques, solitaires, polypoides ou nodulaires, de moins de 2 cm de taille, purement épithéliaux avec une composante tubulopapillaire prédominante et un faible grade nucléaire [3]. En revanche, les mésothéliomes malins du

péritoine sont typiquement symptomatiques, associés à une ascite, disséminés, avec un haut grade nucléaire ; le pronostic de ces mésothéliomes malins est souvent mauvais, l'évolution étant fatale dans 1 mois à 6 ans du diagnostic malgré la radiothérapie ou la chimiothérapie postopératoire [1],[3]. Alors que en cas des mésothéliomes malins de localisation vulvaire reste d'évolution fatale malgré les progrès thérapeutiques [2].

4 CONCLUSION

La localisation clitoridienne du mésothéliome malin est exceptionnelle, posant un problème de diagnostic et de prise en charge thérapeutique, le pronostic reste fatale malgré la chirurgie, la radiothérapie et la chimiothérapie.

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QR Verification System Using RSA Algorithm

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ABSTRACT: Now a days, in data transmission security and authentication are the major challenges. To resolve these problems different techniques are used like cryptography, steganography etc. in the image steganography, we are using two images i.e., cover image and hidden image. The hidden image is sent by put it in the cover image. In the present techniques, only one key is used for both encryption and decryption. So, the users can see the data and also they can modify the content of the data. . Now we are using QR code which represents the hidden image and sent the QR code by encryption and decryption. We proposed a novel algorithm, in which the sender has two keys (public and private keys) and the user is provided with only one key (public key) by using RSA algorithm. Thus, the user can only see the data and he can't modify the data.

KEYWORDS: RSA algorithm, RS code, QR code, Finite fields, steganography.

1 INTRODUCTION

In this age of the digital world, with the progress of technology and continuous growth in digital data, there is a vital need of optimization of data and information presently in the digital world. The authenticity of data is the trickiest issue in management of data in the internet database. In this, we mainly consider the authenticity of security passwords, phone numbers or security information. This process also applied to steganography technique to hide the secret images, route maps. Furthermore, there is no second certification on human eye verification of documents. Keeping this problem in mind, we have introduced a new digital documentation system using QR codes.

QR Code is a type of 2 dimensional matrix barcode, which is more popular than 1-D barcodes because of its large capacity of digital data and it can be readable in any mobile devices. In our new document, we save the essential data like passwords, signature in the QR Code. But, all the data saved in the QR Code, are encrypted, then the QR Codes are printed on the document.

This paper is planned as follows: Section 2 deals with Literature survey. Section 3 describes RSA algorithm. Section 4 deals with RS codes. Section 5 deals with proposed. The results and conclusions are specified in section 6 and 7.

2 RELATED WORK

Algorithms for encoding and decoding the QR codes and data security are existing in the literature. During the years, many have urbanized algorithms for QR codes, a few of them are Somdip Dey [1] proposed a method Confidential Encrypted Data Hiding and Retrieval Using QR Authentication System. Sartid Vongpradhip [2] proposed an algorithm Use Multiplexing

to Increase Information in QR Code. Prathibha.N.Pillai, K.Naresh proposed an algorithm to Improving the Capacity of QR Code by Using Color Technique.

Somdip Dey et al [1] proposed an algorithm Confidential Encrypted Data Hiding and Retrieval Using QR Authentication System, in this algorithm encrypt the mark sheet data using the TTJSA encryption algorithm. In this method, read the 32 bytes data and it converts into bits (256 bits). These bits are XOR with the key bits, the result bits are replaced with original bits in encryption side. In decryption side these bits are again XOR with key bits we get the original information.

3 RSA METHODOLOGY

In TTJSA algorithm we use same key in the encryption and decryption side. Due to this reason the data can be modified by the other user. To resolve this problem we can use the RSA algorithm. In this algorithm we use different key on both sides. On the encryption side, we use the private key in the same way in decryption side we use a public key.

The RSA cryptosystem is one of the famous security algorithm. In RSA algorithm, there are mainly three steps: key generation, encryption and decryption procedure.

Key Generation:

1. Select the two prime numbers p, q and $p \neq q$.
2. Calculate $n = p \times q$.
3. $\phi(n)$ calculated as $\phi(n) = (p-1) \times (q-1)$.
4. Select integer e whose $\gcd(\phi(n), e) = 1$, $1 < e < n$.
5. Calculated such that $ed-1$ is exactly divisible by $\phi(n)$.
6. Public key (e, n) .
7. Private key (d, n) .

Encryption process

Plain text --- m

Cipher text $C = ((m^e) \bmod n)$.

Decryption process

Cipher text --- C

Decipher text $D = ((C^d) \bmod n)$.

For example, consider $p = 5$, $q = 3$. So, $\phi(n) = (5-1)(3-1) = 8$.

Therefore, $e = 11$, $d = 3$.

Plain text --- 2.

Cipher text $C = (2^{11} \bmod 15) = 2048 \bmod 15 = 8$.

Decipher text $D = (8^3 \bmod 15) = 512 \bmod 15 = 2$.

$D = m$.

4 REED SOLOMON CODE

In communication, there is a possibility of occurring either single bit or multiple bit error, but in data storage it is burst errors [1]. So, we use the Reed-Solomon codes in the data storage. The encoding process of RS code as follows:

- Multiply the non-binary message polynomial $m(x)$ by x^{n-k}
- Dividing $x^{n-k}m(x)$ by $g(x)$ to obtain the remainder $b(x)$
- Forming the codeword $b(x) + x^{n-k}u(x)$

In the data storage, if the information bits are damaged or distorted can be retrieved by using the RS code decoding process. The steps for decoding of RS code as follows:

Step1: Calculate the syndrome vector.

Step2: Calculate the error location polynomial.

Step3: Calculate the roots of the error location polynomial.

Step4: Calculate the value of the errors, and do the error correction.

5 PROPOSED METHOD

In this paper proposed a new algorithm for Confidential data based on the RSA algorithm. In this algorithm the confidential information is encrypted by using RSA algorithm, then we generate the QR code. The following steps explain the encoding process.

- Step 1: enter the confidential information.
- Step2: each character is converted into ASCII equivalent, then apply the RSA algorithm for each value with Private key.
- Step3: generate the codeword for the given information by using non-binary RS code, due to this if the QR is damaged or distorted it is retrieved.
- Step 4: convert the codeword into binary and place these bits in QR pattern.

The decoding process is as follows:

- Step 1: read the QR image as the input to the decoding process.
- Step 2: eliminate the unwanted bits in QR code(finder patterns) and read the information bits from QR code.
- Step 3: convert these bits into decimal and eliminate the parity bytes by using an RS decoding process.
- Step 4: apply the RSA algorithm by using Public key to get the original information.

6 EXPERIMENTAL RESULTS AND DISCUSSIONS

In this paper, we focus on the confidential data like password or signatures. For example, consider the confidential information is a password for locker like ABCD1234. By applying the RSA algorithm for this key it is converted into some other format as follows:

A means it's ASCII is 65.

$65^{11} = 87507831740087890625$.

$87507831740087890625 \bmod 15 = 5$.

Similarly, convert the all characters by using RSA algorithm. Then we generate codeword for this information by using Reed Solomon code for retrieve the information if the QR is damaged. For generation codeword is done by using simlink in matlab the block diagram as follows:

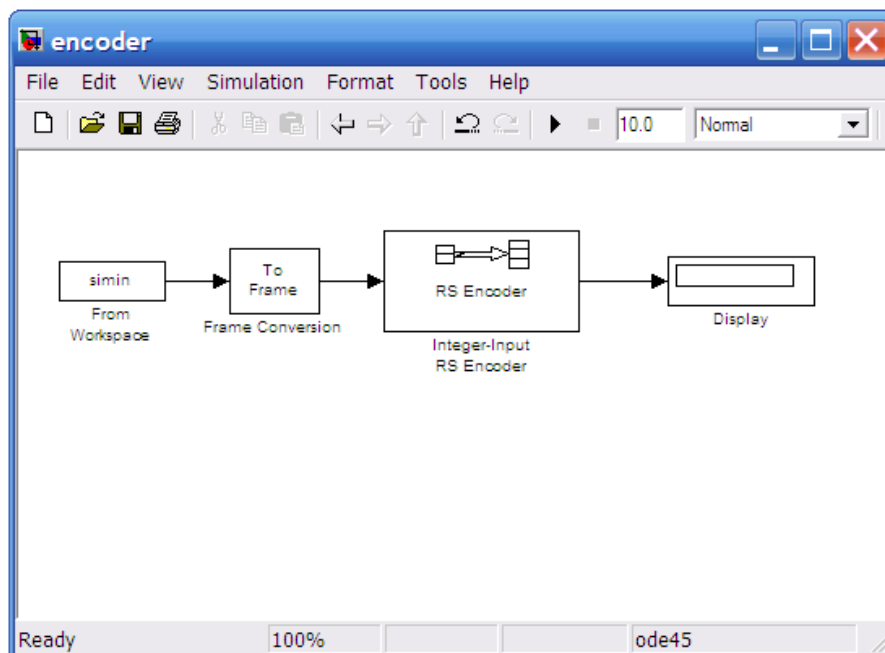


Figure 1: RS encoder diagram using simlink



Figure 2: QR code for given information

Figure 2 shows the QR code for the given information. It contains the codeword of the given information of length 255 because it is a (n, k) encoder. Here $n = 255$, $k = \text{length of message}$.

In the same way, in decoding side the QR is considered as input image. Read the information bits from the QR code and eliminate unwanted bits like finder patterns. This codeword is given as input to the RS decoder. RS decoder using simlink is shown below.

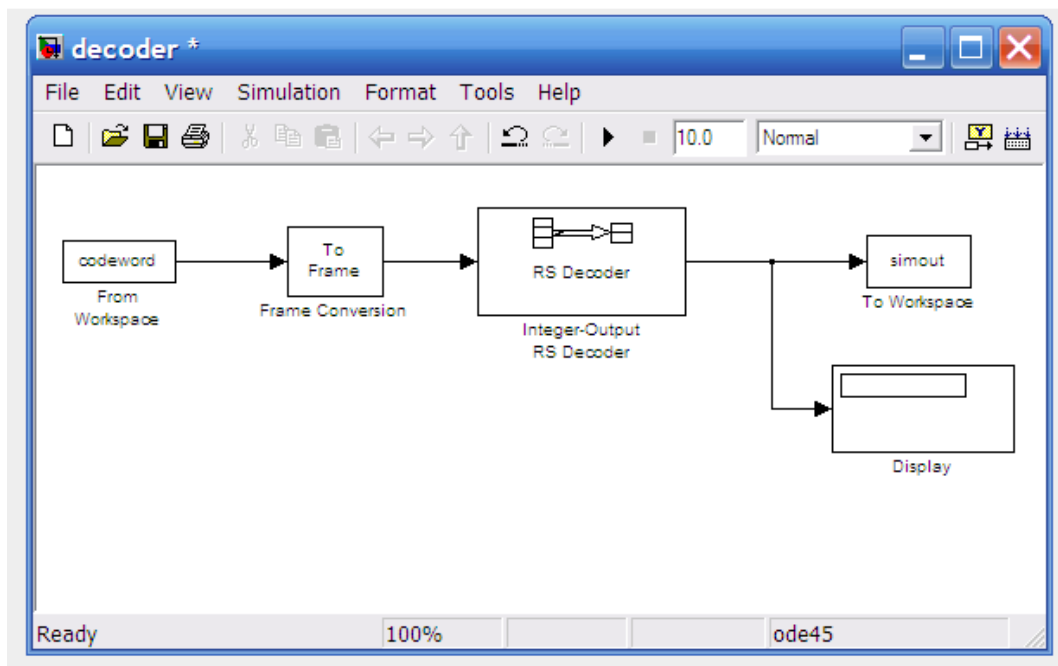


Figure 3: RS decoder diagram using simlink

In figure 3, simout gives the cipher text of the RSA algorithm. Applying the RSA decoding processor for getting plain text or password (ABCD1234).

7 CONCLUSION

In this paper, a new algorithm is implemented for confidential information. As compared with single password secure systems, this method has high security. Due to beauty of RS code if the QR is damaged up to 30% can also be retrieve the information from QR code. This algorithm is also useful in image processing for cryptography and steganography.

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An ID-Based Anonymous Proxy Chameleon Signature Based on Bilinear Pairings

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ABSTRACT: Anonymous proxy signature is suitable for the situation where the proxy signer's identity needs to be kept secret. The verifier needs to reveal the real identity of the proxy signer with the help of the original signer. A new ID-based anonymous proxy chameleon signature scheme based on bilinear pairing is proposed in this paper. This scheme is based on Gap Diffie-Hellman group and meets the security requirements such as verifiability, un-forge ability, anonymity, traceability, Prevention of misuse, non-repudiation and Message hiding.

KEYWORDS: Anonymous Proxy Chameleon Signature, Chameleon Hashing, Gap Diffie-Hellman Group, Bilinear Pairing.

1 INTRODUCTION

The concept of proxy signature was introduced by Mambo et al. [6] in 1996. In a proxy signature scheme, the original signer delegates his/her signing right to a proxy signer who can sign a message on behalf of the original signer. Proxy signature can be verified using a modified verification equation where the verifier is convinced that the signature is generated by the authorized proxy signer. In 2009, Yu et al. [8] further proposed an anonymous proxy signature scheme (APSS) which provides anonymity property for proxy multi-signature. In their scheme, there is a group of proxy signers, but only one proxy signer can anonymously sign the message. By using a group of signers, Yu et al. [8] provide privacy and anonymous protection for the proxy signer such that any other proxy signer cannot know who is the real signer.

Krawczyk and Rabin [5] proposed the concept of chameleon hash function in 2000. A chameleon hash function is a trapdoor one-way hash function where it is hard to find collision without the knowledge of the trapdoor. However, with the knowledge of the trapdoor, collision hash function and the pre-images hash function can be found easily.

In 1984, Shamir [7] proposed ID-based encryption and signature scheme to simplify key management procedures in certificate-based public key setting. The main idea of ID-based cryptosystem is that the user's public key can be calculated directly from his/her identity rather than being extracted from a certificate issued by a certificate authority (CA). ID-based public key setting can be a good alternative for certificate-based public key setting, especially when efficient key management and moderate security are required.

Zhang et al. [9] proposed proxy chameleon signature scheme based on bilinear pairing which is secure against existential forgery under adaptive chosen message attack in the random oracle model. The bilinear pairings, namely the weil-pairing and the tate-pairing of algebraic curves, are important tools for research in algebraic geometry. They have been found various applications in cryptography [1, 2, 3, 4].

Our Contribution: We propose an efficient ID-based anonymous proxy chameleon signature scheme based on bilinear pairing with Gap Diffie-Hellman group. Security analysis and efficiency of the proposed scheme is given.

Organization: We describe the preliminaries in section 2. Proposed ID-based anonymous proxy signature scheme introduced in section 3. The analysis of proposed scheme is described in section 4. The security analysis is given in section 5. Efficiency in our scheme in section 6. Finally, we conclude our opinion in section 7.

2 PRELIMINARIES

In this section, we briefly describe the basic definitions, properties of bilinear pairings and Gap Diffie-Hellman Group.

(1) Definition: (Bilinear Pairing). Let G_1 be a cyclic additive group generated by P , whose order is a prime q and G_2 be a cyclic multiplicative group of the same order q . Let a and b be elements of Z_q^* . A bilinear pairings is a mapping $e: G_1 \times G_1 \rightarrow G_2$ with the following properties:

* **Bilinear:** $e(aP, b, Q) = e(P, Q)^{ab}$

* **Non-degenerate:** There exists P and $Q \in G_1$ such that $e(P, Q) \neq 1$.

* **Computable:** There is an efficient algorithm to compute $e(P, Q)$ for all $P, Q \in G_1$

(2) Definition: (Gap Diffie-Hellman Group). Let G_1 be a cyclic additive group generated by P , whose order is a prime q . Assume that the inversion and multiplication in G_1 can be computed efficiently. The following properties are satisfied:

* **Discrete Logarithm Problem (DLP):** Given two elements P and Q , to find an integer $n \in Z_q$, such that $Q = nP$ whenever such an integer exists.

* **Computation Diffie-Hellman Problem (CDHP):** Given P, aP, bP for $a, b \in Z_q^*$ to compute abP .

* **Decision Diffie-Hellman Problem (DDHP):** Given P, aP, bP, cP for $a, b, c \in Z_q^*$ to decide whether $c \equiv ab \pmod{q}$.

(3) Definition (Gap Diffie-Hellman Problem (GDHP)). DDHP is easy, but CDHP is difficult on the group, which is called a Gap Diffie-Hellman Group [2,3]. Meanwhile, there exists a difficult problem to solve the inverse algorithm of bilinear pairings, i.e., given $P \in G_1$ to find an element, $r \in G_2$, such that $Q \in G_2$, $r = (P; Q)$ whenever such an element exists.

3 PROPOSED SCHEME

Our proposed scheme is given in five phases i.e., Setup, Extraction, Key Generation, Signature Generation and Signature Verification as below:

- Setup:** Let two cryptography hash function, $H_0: \{0,1\}^* \rightarrow G_1^*$, $H_1: \{0,1\}^* \times G_2 \rightarrow Z_q^*$, and $H_2: \{0,1\}^* \rightarrow Z_q^*$, and PKG choose random integer $s \in Z_q^*$ and $P_{pub} = sP$, PKG publishes system parameters = $\{G_1, G_2, e, q, P, P_{pub}, H_0, H_1\}$, here PKG keeps s secretly as the master key.
- Extraction:** Original signer A submits his identity information ID_A to PKG. PKG computes the signer's public key as $Q_{ID_A} = H_0(ID_A)$, and returns to A as his private key and sends it via a secure channel $S_{ID_A} = sQ_{ID_A}$. Same to proxy signer, proxy signer's public and private key is (Q_{ID_B}, S_{ID_B}) . Given identity information of proxy signer, recipient, and verifier from customized identity $(ID_B \parallel ID_{Recipient} \parallel ID_{Transaction})$ and transaction.
- Key Generation:** To delegate the signing capacity to proxy signers, the original signer uses the signed warrant m_w and A do the following operations:

- The original signer random chooses $k_A \in Z_q^*$, Computes $r_A = e(P, P_{pub})^{k_A}$, $c_A = H_1(m_w \| r_A)$, $U_A = c_A S_{ID_A} + k_A P_{pub}$ and $U_p = c_A (Q_{ID_A} + Q_{ID_B}) + k_A P$ where m_w is warrant message, and makes U_p public in the system as public key of proxy chameleon signature.
- A sends (m_w, c_A, U_A) to proxy signer B in a secure way.
- After receiving (m_w, c_A, U_A) , the proxy chameleon signer B first computes $r_A = e(U_A, P)e(Q_{ID_A}, P_{pub})^{-c_A}$, accepts it if and only if $c_A = H_1(m_w \| r_A)$. If it is right, he accepts it as a valid proxy, and uses the privilege of signature on behalf of A, then computes $S_p = c_A S_{ID_B} + U_A$ and takes S_p as a private key of proxy signature, and stores (U_p, ID_B) . Otherwise he rejects it.

4. Signature Generation:

- **Hash:** Given a message $m \in \{0,1\}^*$, cash Proxy signer choose a random element R from G_1 and calculate the Chameleon hash function $h = Hash(P_{pub}, m, R, ID_j) = e(P, R)e(H_2(m)H_0(ID_j), P_{pub})$
- **Forge:** Recipient can make a forgery $R = Forge(P_{pub}, ID_j, S_j, m, R, m') = (H_2(m) - H_2(m')Q_j + R)$, and accepts this signature if and only if $c_p = H_1(h \| r_p)$. The proxy signer wants to sign a delegated message m on behalf of the original signer. Each proxy signer generates the partial proxy signature to generate proxy signature.
Each: Proxy signer B randomly chooses, $k_B \in Z_q^*$, $k_B \neq 1$ and computes $r_B = e(P, P_{pub})^{k_B}$, $c_B = H_1(h \| r_B)$, $U_B = c_B S_p + k_B P_{pub}$. Hence the first final proxy signature is $(m_w, c_B, U_B, U_p, m, R)$.

5. **Verification Phase:** Phase the receiving the proxy blind signature $(m, c_B, U_B, U_p, m_w, R)$, the verifier V computes $r'_B = e(U_B, P)e(U_p, P_{pub})^{-c_A}$, then computes $c'_B = H_1(h \| r'_B)$, the signature holds true if and only if $c_B = c'_B$.

4 ANALYSIS OF THE PROPOSED SCHEME

The correctness of the ID-based Proxy signature is justified by the following proof of correctness the forgery equation as below:

$$\begin{aligned}
 & Hash(P_{pub}, m', R', ID_j) \\
 &= e(R' P) e(H_2(m') H_0(ID_j) + P_{pub}) \\
 &= e(H_2(m) - H_2(m') Q_j + R, P) e(H_2(m') Q_j, P_{pub}) \\
 &= e(H_2(m) - H_2(m') Q_j, P) e(R, P) e(H_2(m') Q_j, P_{pub}) \\
 &= e(R, P) e(H_2(m) - H_2(m') H_0(ID_j), P_{pub}) e(H_2(m') H_0(ID_j), P_{pub}) \\
 &= e(R, P) e(H_2(m) H_0(ID_j), P_{pub}) \\
 &= Hash(P_{pub}, m, R, ID_j)
 \end{aligned}$$

The verification of the signature is justified by the following equation:

$$\begin{aligned}
 & r'_B \\
 &= e(U_B, P) e(U_p, P_{pub})^{-c_B} \\
 &= e(c_B S_p + k_B P_{pub}, P) e(U_p, P_{pub})^{-c_B} \\
 &= e(c_B S U_p + k_B P_{pub}, P) e(U_p, P_{pub})^{-c_B} \\
 &= e(c_B U_p, P_{pub}) e(k_B P_{pub}, P) e(U_p, P_{pub})^{-c_B} \\
 &= e(P, P_{pub})^{k_B}
 \end{aligned}$$

So, we have $C_B = C'_B$.

5 SECURITY ANALYSIS

1. **Verifiability:** In anonymous proxy chameleon signature verification phase, after verifier checking and verifying the anonymous proxy chameleon signature tuple $(m, R, U_B, C_B, U_p, m_w)$ the verifier calculate the equation $r_B = e(U_B, P)e(U_p, P_{pub})$ hold. The verifier can convinced that the received message is signed by the proxy signer has original signer signature on the m_w . The warrant contains satisfies the verification equation the limit of the delegated signing capacity and also give the identity information.
2. **Un-forge ability:** The third adversary who wants to forge the proxy chameleon signature of a message m' for the proxy signer Bob and the original signer Alice, he must have the original signers signature on a warrant m_w . But he cannot forge this signature, since the original signer Alice uses Hesss ID-based signature scheme, which is proved to be secure against existential forgery on adaptive chosen message attacks under the random oracle model the chameleon signing phase, or find collision in the Id-based chameleon hash function, which in turn, implies setting the GDH problem. The recipient also cannot produce a signature with a new component, as this requires to break the regular digital signature.
3. **Anonymity:** From the verification of the signature, any one cannot judge the information about the signer. So it satisfies anonymity requirement.
4. **Non-transferability:** The proxy chameleon signature $(m, R, U_B, C_B, U_p, m_w)$ generated by proxy signer for recipient C, the recipient cannot convince a trusted third party. In forge procedure, we can see that for every possible message m' , C can compute a value $R' = (H_2(m) - H_2(m')S_{ID_j} + R)$ such that $Hash(P_{pub}, ID_j, m, R) = Hash(P_{pub}, ID_j, m', R')$. Thus $(m', R', C_B, U_B, U_p, m_w)$ is a correct proxy chameleon signature. Furthermore, for every possible message m' there exists exactly one value R' which produces a proper signature these nothing can be know about the value of m . Hence, non-transferability is achieved.
5. **Traceability:** The verifier proposes the disputation for the signature, since the original signer stores the proxy signer's the proxy signature public key and the identity, so he can reveal the real identity of the proxy signer with the help of the original signer.
6. **Prevention of Misuse:** The proxy key cannot be used for the purposes other than generating the valid proxy signatures. In the case of misuse, the responsibility of proxy signer would be determined explicitly.
7. **Non-repudiation:** The proxy signer uses his private key to sign the message m , the valid proxy signature contains the warrant m_w , which is verified in the verification phase, it cannot be modified by the proxy signer. And give a valid signature $(m, R, C_B, U_B, U_p, m_w)$ generated by the proxy signer B, B cannot create another tuple $(m', R', C_B, U_B, U_p, m_w)$ for $m' \neq m$, as this would be equivalent to finding a collision of the ID-based chameleon hash function, which we assume to be infeasible by the hardness GDH group.
8. **Message Hiding:** We can see the anonymous proxy chameleon signature uses the false signature and the original signature to produce another false signature for any message with the same component of anonymous proxy chameleon signature without leaking anything about the contents of the original message.

6 EFFICIENCY

Computational cost of our proposed scheme is given below:

Mul-mutiplication, H1 and H2-hash function, Exp-Exponent, Add-Addition, Pa-Pairing.

Table 1: Computational cost of proposed scheme

Phase	Mul	H1	H2	Exp	Add	Pa
Setup	1	1	1			
Extract	1					
KeyGenerartion	4	2		2	3	2
Signature Generation	3	1	1	1	1	2
Signature Verification				1		2

7 CONCLUSION

We conclude to say that, we have proposed an ID-based anonymous proxy chameleon signature scheme based on bilinear pairings with more efficiency. The proposed signature scheme is suitable in the situation where the proxy signer's identity needs to be secret. The proposed scheme satisfies the required security properties of an ID-based anonymous proxy chameleon signature, i.e., verifiability, un forge ability, anonymity, non transferability, traceability, prevention of misuse, non-repudiation and message hiding .

ACKNOWLEDGMENT

The first author 1 is thankful to UGC, New Delhi, India for providing Rajiv Gandhi National Fellowship(F1-17.1/2010-13/RGNF-2012-13-ST-CHH-35416) as financial assistance for this Research work.

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A SURVEY ON DIFFERENT CLUSTERING ALGORITHMS AND ITS TECHNIQUES

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ABSTRACT: Clustering is an approach to find similar objects and group these similar objects. It is the powerful method for finding the similarity among objects. The group of objects is called cluster. The objective of the cluster is to find the structure of a dataset and it is very much close to the human way of thinking. The clustering algorithms are used to categorize the large number of data in to group or cluster. In this paper different clustering algorithms are analyzed and these fall into the different clustering methods. These clustering algorithms are partitioning the data set into several groups.

KEYWORDS: clustering, clustering methods, clustering algorithms, density based method, grid based methods, hierarchical based methods and partitioning method.

1 INTRODUCTION

Cluster analysis is the process of grouping similar objects. The clustering algorithms are used to categorize the large data set into a number of similar object group. The process produces a group of objects called as a cluster/s, which consists of the objects that are similar to each other in a given cluster and dissimilar to the objects in another cluster. Thus the objective of clustering is explored in a nature to find a structure in the dataset. The term data clustering was first appeared in the title of a 1954 article dealing with anthropological data. The cluster analysis is as old as a human life and has its roots in many fields such as statistics, machine learning, biology, artificial intelligence. Cluster analysis is therefore known as differently in the different field such as a Q-analysis, typology, clumping, numerical taxonomy, data segmentation, unsupervised learning, data visualization, learning by observation [1] [7].

2 CLUSTER ANALYSIS PROCESS

2.1 FEATURE EXTRACTION

Feature selection is the process of identifying the most effective subset of the original features to use in clusters, whereas the feature extraction is the process of transforming one or more input features to produce new salient feature. Clustering process is highly dependent on this step. Improper selection of features increases the complexity and may result into irrelevant clusters, too [1].

2.2 CLUSTERING ALGORITHM DESIGN

The impossibility theorem states that, "no single clustering algorithm simultaneously satisfies the three basic axioms of data clustering, i.e., scale-invariance, consistency and richness". Thus, it's impossible to develop a generalized framework of clustering methods for the application in the different scientific, social, medical and other fields. It is therefore very important to select the algorithm carefully by applying domain knowledge. Generally, all algorithms are based on the different input parameters, like number of clusters, optimization/construction criterion, termination condition, proximity measure, etc. This different parameters and criteria are also designed or selected as a prerequisite of this step[1].

2.3 CLUSTERING VALIDATION

As there is no universal algorithm for clustering, different clustering algorithm applied to same dataset produce different results. Even the same algorithm, with the different values of parameter produces different clusters. Therefore, it becomes necessary to validate or evaluate the result produce by the clustering method. The evaluation criteria are categorized as:

- **Internal indices:** The internal indices generally evaluate the clusters produces by the clustering algorithm by comparing it with the data only.
- **External indices:** The external indices evaluate the clustering results by using the prior knowledge, e.g. Class labels.
- **Relative indices:** As the name suggests, this criteria compares the results against various other results produced by the different algorithms [1].

2.4 RESULTS INTERPRETATION

The last step of the clustering process deals with the representation of the clusters. The ultimate goal of clustering is to provide users with meaningful insights from the original data, so that they can effectively analyze and solve the problems. This is still an untouched area of research.

3 CATEGORIZATION OF CLUSTERING METHODS

There is a difference between clustering method and clustering algorithm. A clustering method is a general strategy applied to solve a clustering problem, whereas a clustering algorithm is simply an instance of a method. As mentioned earlier, no algorithm exist to satisfy all the requirements of clustering and therefore large numbers of clustering methods proposed till date, each with a particular intension like application or data types or to fulfill a specific requirement.

3.1 HIERARCHICAL METHODS

As the name suggests, the hierarchical methods, in general try to decompose the data set of n objects into a hierarchy of a group. This hierarchical decomposition can be represented by a tree structure diagram called as a dendrogram; whose root node represents the whole data set and each leaf node is a single object of the dataset. The clustering results can be obtained by cutting the dendrogram at different levels. There are two general approaches for the hierarchical method: agglomerative (bottom-up) and divisive (top down). An agglomerative method starts with n leaf nodes(n clusters) that is by considering each object in the dataset as a single node(cluster) and in successive steps apply merge operation to reach to root node, which is a cluster containing all data objects. The merge operation is based on the distance between two clusters. There are three different notions of distance: single link, average link, complete link. A divisive method, opposite to agglomerative, starts with a root node that is considering all data objects into a single cluster, and in successive steps tries to divide the dataset until reaches to a leaf node containing a single object. For a dataset having n objects there is $2^n - 1$ possible two-subset divisions, which is very expensive in computation. Two divisive clustering algorithms, DIANA and MONA [3].

3.2 PARTITIONING METHODS

As the name suggests, the partitioning methods, in general create k partitions of the datasets with n objects, each partition represent a cluster, where $k \leq n$. It tries to divide the data into a subset or partially based on some evaluation criteria. As checking of all possible partitions is computationally infeasible,

Relocation based: One approach to data partitioning is to take a conceptual point of view that identifies the cluster with a certain model whose unknown parameters have to be found, can be known as a *probabilistic models or simple model based clustering*. Here, a model assumes that the data comes from a mixture of several populations whose distributions and priors we want to find.

Grid Based: As the name suggests, grid based clustering methods used a multidimensional grid data structure. It divides the object space into a finite number of cells that form a grid structure on which all of the operations for clustering are performed. The representative algorithms based on this method are: STING, Wave Cluster, and CLIQUE[3].

Subspace clustering: Subspace clustering methods are designed with the aim to work with the high dimensional data. To do so the methods generally make use of the subspace of the actual dimension. The algorithms under this category have taken the idea from the number of other methods and thus fall into a number of different categories. The representative

algorithms are: CLIQUE, ENCLUS, MAFLA, PROCLUS and ORCLUS[3].

Density Based: This method has been developed based on the notion of density that is the no of objects in the given cluster, in this context. The general idea is to continue growing the given cluster as long as the density in the neighborhood exceeds some threshold; that is, for each data point within a given cluster; the neighborhood of a given radius has to contain at least a minimum number of points. The density bases algorithms can further classify as: density based on connectivity of points and based on density functional [3].

4 CONCLUSION

Cluster Analysis is a process of grouping the objects, called as a cluster/s, which consists of the objects that are similar to each other in a given cluster and dissimilar to the objects in another cluster. With the application of clustering in all most every field of science and technology, large number of clustering algorithms had been proposed which satisfy certain criteria such as arbitrary shapes, high dimensional database, and domain knowledge and so on. It had been also proved that it is not possible to design a single clustering algorithm which fulfills all the requirements of clustering. Therefore, the number of methods had been proposed such as partitioning, hierarchical, density based, model based and so on. Different algorithms may follow good features of one or more methods and thus it is difficult to categorize them with the solid boundary. In this paper, we had tried to provide a detail categorization of the clustering algorithms from our perspective. Though it had been tried to cover as much clarity as possible, there is still a scope of variation.

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Emergence du phénomène des villas-immeubles dans des quartiers résidentiels: Cas de la ville de Constantine

[Emergence of the phenomenon of villas-buildings in residential districts: Case of the city of Constantine]

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ABSTRACT: Cet article se consacre à préciser les aspects et les fondements d'une nouvelle réalité perçue dans la ville algérienne, il s'agit du phénomène des villas-immeubles et son effet sur l'émergence de nouvelles recomposition socio-spatiale et de nouvelles centralités dans la ville de Constantine. Cette réalité apparaît suite à la naissance de nouvelles activités économiques polarisée dans les quartiers d'habitat individuel, à citer, les lotissements. Notre choix s'est porté sur la ville de Constantine, qui a été depuis l'époque antique, tout au long de la colonisation française et jusqu'à ce jour, capitale de l'est algérien et future capitale de la culture arabe en 2015. Cette importance a été favorable pour attirer des flux migratoires convergents des villes limitrophes, des villes moyennes pour la majorité (Ain-Fakroun, Ain-Mlila...) connues pour être « les villes des importateurs », des villes à grand essor commercial (commerce de gros et détail en vestimentaire, ameublement, électroménagers, pièces détachées consommation...) de ce fait Constantine devient un point de convergence stratégiques à l'échelle de la région de l'est Algérie et cette convergence a largement affecté les espaces stratégiques de la ville à savoir les lotissements à caractère résidentiel.

KEYWORDS: villa-immeuble, recomposition socio-spatiale, centralités, Constantine, activités économiques, lotissements.

1 INTRODUCTION

La ville de Constantine connaît depuis les années 90, une avancée rapide de l'urbanisation générant des dynamiques territoriales considérables. Le rythme de ces dynamiques fut amplifié avec le désengagement de l'état dans les années 90, la promulgation de la loi portant orientation foncière n°90-25 ainsi que à l'ouverture de l'économie algérienne sur les échanges mondiaux à partir des années 2000. On assiste ainsi à l'émergence de nouveaux phénomènes générés par l'apparition de nouvelles activités économiques polarisées dans des villas d'habitat individuel (des lotissements) modifiées pour devenir des villa-immeubles. Ces dernières sont le produit stratégies socio-spatiales des habitants de ces lotissements anciens propriétaires ou nouvellement arrivés, qui à travers un ensemble de compétences, parviennent à modifier la structure de ces quartiers et à générer de nouvelles centralités à travers toute la ville.

Cet article se consacre à préciser les fondements de ce nouveau phénomène polarisé dans les quartiers d'habitat individuel, à citer, les lotissements. Afin de saisir les principaux aspects de cette recherche, nous avons opté pour une approche quantitative et qualitative, en élaborant une enquête sur terrain basée sur des questionnaires, des entretiens exploratoires ainsi que des relevés. Notre intérêt s'est porté sur deux lotissements différents qui se trouvent investis par des habitants originaire de la région ou migrants des petites villes, à citer :

- Le lotissement de SIDI MABROUK, très ancien, datant de l'époque coloniale (années 50) et proche du centre ville, se situant dans la partie nord-est de la ville
- Le lotissement BOUSSOUF, assez récent, crée dans les années 90, suite au désengagement de l'état et la loi portant orientation foncière, se positionnant dans la partie sud-ouest sur un axe important de la ville, la Route Nationale 05.

2 STRATEGIES SOCIO-SPATIALES ET EMERGENCE DE LA VILLA-IMMEUBLE : ASPECTS ET FONDEMENTS

Les stratégies des habitants de ces quartiers, sont si diverses, que l'on ne peut les aborder à travers le seul aspect spatial, leurs fondement est avant tout social, économique et même culturel, tout en étant en pleine entrave à la réglementation en vigueur. Celle-ci limite la hauteur des constructions à 11.5 m, soit 3 niveaux (R.D.C + 2etages+ terrasse accessible), afin de préserver la silhouette générale du cadre bâti et l'homogénéité de l'ensemble.

Cependant, la réalité sur terrain est autre, cette réglementation n'est pas souvent respectée et la fonction résidentielle initiale est détournée en faveur d'une exploitation à rentabilité financière. De ce fait, ces maisons individuelles prennent les formes d'immeuble-villas aux étages multiples, dépassant les 3niveaux réglementaire, conçus sous forme d'appartements superposés. Cet aspect semble être une réalité acceptée dans la mentalité des habitants. Le nombre des niveaux construits dépend du nombre d'appartements prévus et peut atteindre 4 et même 5 niveaux ce qui modifie énormément l'aspect initial de la villa individuelle

Ces différentes formes d'appropriations et stratégies résidentielles sont exprimées par les propriétaires selon des besoins socio-économiques et même culturels. Ces pratiques obéissent à des influences et des changements quotidiens et progressifs qui touchent les attitudes des individus et correspondent parfois, à l'habitus dont parle le sociologue Pierre BOURDIEU (1977) selon lui, l'habitus est d'abord un Produit de l'histoire, il engendre des pratiques, individuelles et collectives conformément aux schémas engendrés par l'histoire, il assure la présence des expériences passées.

Les lotissements analysés au niveau de la ville présentent une silhouette incohérente, une mosaïque de maisons individuelles aux formes et volumes distincts allant de la simple villa individuelle (voir Photo n° 1) à la volumineuse villa polyfonctionnelle dépassant les trois niveaux (voir photo n°2) où le caractère résidentiel disparaît progressivement en faveur d'activités commerciales ou de service installée au R.D.C ou occupant toute la bâtisse.



**Photo n° 1 : Exemple de villas individuelles non modifiée,
Lotissement Sidi Mabrouk**



**Photo n° 2 : Exemple de villa-immeuble devenue bazar,
Lotissement Sidi Mabrouk**

Source ; enquête sur terrain, auteurs, 2011

Le quartier de Sidi Mabrouk a connu une double appropriation; la première assez ancienne, datant de l'époque d'après l'indépendance à travers des stratégies d'appropriation de l'espace par les propriétaires eux même, suite à des besoins socio-économiques. Agrandir l'espace habité devient impératif avec l'agrandissement de la famille ou le mariage des enfants, il faut dire que la conjoncture du pays a imposé cet acte qu'on perçoit à d'ailleurs à travers toute la ville. La seconde mutation apparaît en force dans les années 2000, après l'ouverture de l'Algérie sur l'économie mondiale, ce qui a permis l'investissement des commerçants venant des wilayas limitrophes, connues pour leur essor commercial.

Ces acteurs qu'on peut qualifier de nouveaux riches, ont réussie à modifier l'aspect fonctionnel du quartier à travers des opérations de démolitions-reconstructions tout en multipliant les activités commerciales et de services. La proximité du centre ville a amplifié cette reconfiguration, contrairement au lotissement boussouf. L'enquête sur terrain a révélé que plus

de 70% de l'ensemble des constructions à S.M.K sont à usage mixte, habitation et commerce, 12% sont à usage de service alors que seulement 18% n'ont pas été touchées par les transformations

D'un autre côté, le lotissement de boussouf, plus récent dans sa création (les années 90) connaîtra des actes d'appropriations selon une stratégie moins compliquée et moins intense, les demandes du permis de construire d'une maison individuelle déposées auprès des autorités concernées, sont conçues dès le départ, avec beaucoup de souplesse et dans le respect de la réglementation en vigueur, tout en favorisant toute transformation ultérieure. Ainsi, le permis une fois obtenu, les travaux de modifications sont entamés et la maison individuelle se transforme en faveur d'un bâtiment polyfonctionnel ou de service, sans respect de la réglementation.

Ce lotissement se trouve touché également par ces actes d'appropriation mais de façon moindre que S.M.K, plus que 59.7% de ces constructions est utilisé pour l'habitation, 36.9% ont à usage mixte d'habitation et de commerce, alors et 3.4 % à usage de service

L'analyse de cette réalité a permis de percevoir un autre phénomène ; la démolition / reconstruction qui se trouve perceptible uniquement au lotissement S.M.K ; où la villa devient l'immeuble commercial ou le bazar.

Ces cas reflètent le détournement de la loi et les spéculations de la part des nouveaux migrants des villes limitrophes, qui rachètent des lots de terrains ou des maisons mises en vente à des prix importants pour les démolir et les reconstruire ultérieurement dans un style modernisé et plus rentable. La silhouette du quartier et son image se retrouvent déformées, entre des villas ayant gardé l'aspect initial à hauteur limitée, couverte de toiture inclinée à tuiles rouges caractérisant l'aspect initial du lotissement, et d'autres maisons à hauteurs exagérées écrasant les villas voisines. (voir photo N° 3)



Photo n°3, source Enquête sur terrain, auteurs, 2011

Cependant le souci primordial de cette opération de démolition \ reconstruction est bien la rentabilité financière, ces maisons se transforment en de grands bazars, espaces commerciaux destinés à la vente d'articles de luxe (l'habillement, électroménagers...)

Ces pratiques peuvent toucher également la fonction de toute la construction, en faveur de nouvelles activités de service (clinique, école, banque, siège de société, salle de fêtes...). Cette réalité est perceptible beaucoup plus au lotissement Boussouf (12% à Boussouf contre 3,4% à S.M.K). Dans ce cas, la maison devient un immeuble de service ou même un équipement privé, où l'exploitation de l'espace est maximale et l'emprise au sol souvent dépassée.

Il faut rappeler que dans le cahier des charges des lotissements, les étages sont destinés à l'habitation ; les espaces du R.D.C à l'habitation ou aux garages, or la réalité sur terrain se trouve en contradiction avec la réglementation en vigueur.

Ni la loi 90-29 du 01/12/1990 portant sur l'aménagement et l'urbanisme ni le décret 91/175 du 28/05/1991 portant sur les modalités d'exercice en urbanisme et architecture, n'autorisent ce genre de transgression. Il faut dire que le manque de contrôle judiciaire par les autorités concernées ne fait qu'amplifier ces activités

3 L'ÉMERGENCE DE NOUVELLES CENTRALITÉS COMMERCIALES

Le centre-ville, de la ville de Constantine caractérisé par sa densité, sa bonne accessibilité et l'intensité des services fournis, génère une centralité importante à l'échelle urbaine, un pôle d'attraction incontournable qui attire une clientèle extérieure, considérable. Il regroupe 93% des équipements administratifs (avec la Cour d'Appel) et 14 % des activités commerciales sur la totale du commerce de la ville. Il est à noter que la centralité est perçue avant tout comme " une notion multiforme qui se manifeste à la fois par des spécialisations plus ou moins marquées dans l'usage de l'espace et des

bâtiments et par l'existence de flux de fréquentation ayant chacun leur spécificité temporelle et contribuant à l'animation générale de la ville, prise comme lieu de production de services et de contacts"(CHALINE, 1990) La ville ne peut être dissociée des fonctions urbaines qui la composent, « *une ville n'existent que par les activités humaines qui la traversent* » (BOFIL, 1995) et c'est bien cette interaction fonctionnelle qui génèrent la centralité à tout l'ensemble urbain.

Les nouvelles recompositions socio-spatiales dans les lotissement déjà cités de la villes, ont permis l'apparition de nouvelles dynamique spatio-fonctionnelle dans l'organisation et le fonctionnement de la ville, une nouvelle structure se met en place donnant naissance à de nouvelles centralités secondaires, à caractère commercial localisées dans les lotissements de la ville de Constantine, à savoir, Sidi Mabrouk au nord-est et Boussof au sud-ouest qui étendent leur aire d'influence jusqu'à concurrencer le centre-ville. Notre intérêt dans cette recherche ne porte pas sur le secteur tertiaire ni l'activité commerciale en elle-même, mais beaucoup plus son impact sur la modification de la configuration urbaine de la ville et les nouvelles formes de centralité qu'elle génère.

4 CONCLUSION

Au terme de cet éclairage sur les aspects et les fondements des stratégies socio spatiales des habitants, sur l'émergence d'un nouveau phénomène de villa-immeuble, étrange à nos villes algériennes, la ville de Constantine devient un milieu propice à une nouvelle culture urbaine générant une nouvelle territorialisation,

Ces pratiques spatiales présentent des formes de dépassements et d'entorses à la réglementation sans que le contrôle des autorités ne soit efficace. Le souci majeur de ces nouveaux acteurs privés de la ville, est avant tout la rentabilité financière, la satisfaction de besoins utilitaires et fonctionnels sous l'influence de contraintes socio-économiques, culturelles et d'aspirations personnelles. A travers leurs stratégies, ils parviennent à donner naissance à de nouvelles reconfigurations spatiales et de nouvelles centralités émergentes, et ce sont là d'excellents indicateurs quant à la revendication d'un droit à la ville de Constantine.

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Initiative SAWIS : Une plate forme communautaire pour le partage des données sur l'eau au Maroc

[Initiative "SAWIS": A community platform for sharing data on water in Morocco]

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ABSTRACT: The lack of sharing, organizing and reporting on water are among the obstacles to the implementation of the objectives of a significant number of scientific researches in Morocco. Especially as access to data and information on water held by the administration, is still not open to the general public. In this context the SAWIS Initiative was created to provide a platform for sharing data manages and maintained by a scientific association for the water information (SAWIS) systems. The purpose of this platform is to provide the scientific community, the methods and techniques for sharing data and enrich them with tools Open source GIS and conform to OGC standards (WMS, WFS, CSW). The present work aims to (1) present the context of the birth of SAWIS Initiative, (2) present the service-oriented architecture and functionalities of the platform and (3) present the results of a study cases with data from a pilot area, resulting from scientific work, to achieve a "SWEM Platform for Meknes region".

KEYWORDS: Community Plate form, Open Source GIS, Web Service, Standard OGC Geoportal, catalog, SAWIS, Morocco.

RESUME: L'absence de partage, d'organisation et de la communication de l'information sur l'eau sont parmi les obstacles à la mise en œuvre des objectifs d'un nombre important des travaux de recherche scientifique au Maroc. Par ailleurs l'accès aux données et aux informations sur l'eau détenu par l'administration, n'est toujours pas ouvert au grand public. Dans ce contexte l'Initiative SAWIS a vu le jour pour proposer une plate forme de partage des données, gérée et maintenue par l'association scientifique pour les systèmes d'information d'eau (SAWIS). Le but de cette plate forme, est d'offrir à la communauté scientifique les moyens et techniques pour partager les données et les enrichir grâce à des outils SIG Open source, conformes aux standards OGC (WMS, WFS, CSW). Ce présent travail, à l'objectif de (1) présenter le contexte de la naissance de l'Initiative SAWIS, (2) présenter l'architecture orientée service et les différentes fonctionnalités de la plate forme et (3) présenter les résultats d'une étude de cas, avec les données d'une zone pilote de la région de Meknès au Maroc.

MOTS-CLEFS: Plate forme communautaire, SIG Open Source, Service Web, Standard OGC, Géoportail, Catalogue, SAWIS, Maroc.

1 INTRODUCTION

La collecte et l'intégration des données est une étape primordiale pour la réussite des projets scientifiques, en particulier ceux en relation avec les ressources en eau. A titre d'exemple, les étapes de la réalisation des études de modélisation numérique en hydrologie [1], passe primordialement par la phase de collecte et intégration des données hydrauliques et hydrologiques, avant d'arriver à l'étape de calage du modèle et d'exploitation des résultats. En plus, la qualité des données [2] conditionne la qualité des résultats et la pertinence des interprétations et des décisions.

Par ailleurs, pour mener à terme les travaux de recherche dans le domaine de l'eau, dans la plus part des cas, le chercheur est appelé à réaliser des missions de collecte des données, et d'assurer leur qualité. Ce qui mobilise des efforts considérables pour une longue durée. Dans la plus part des cas, ces données sont déjà produites par les administrations en charge du secteur, exemple des agences des bassins hydrauliques ou les observatoires d'environnement au niveau régional. Néanmoins dans l'absence d'un cadre fixant les modalités d'accès à ces données, le chercheur est confronté à une réalité très contraignante.

Certes, le Maroc a inscrit le droit d'accès à l'information public, dans l'article 27 de sa constitution [3], et une nouvelle version du projet de loi est en cours à fin de détailler les modalités pour exercer ce droit par tout citoyen [4], une fois ce projet de loi est adopté, un nouveau obstacle devrait être relevé, celui de l'accessibilité aux données. En attendant l'amélioration de cette situation, la recherche scientifique dans le domaine de l'eau, serait confrontée à la problématique de la collecte, disponibilité et accessibilité aux données et métadonnées nécessaires pour l'avancement des travaux de recherche.

Dans plusieurs pays, des mécanismes ont été élaborés pour assurer la collecte, le stockage, le traitement et la diffusion des données sur l'eau, ces mécanismes font partie de ce qui est appelé un Système d'Information de l'Eau (SIE) [5], [6] et [7]. Les SIE sont des infrastructures de données spatiales, reposant sur des standards internationaux (Open Geospatial Standard (OGC) [8]) qui facilite l'échange de donnée et l'interopérabilité entre les applications hétérogènes, en exploitant le concept des Services Web [9]. L'architecture de cette infrastructure est ainsi appelé une architecture orienté service [10].

Face à cette situation, d'un côté le retard de l'adoption d'un cadre claire pour l'accessibilité aux données publiques et également l'absence d'un mécanisme facilitant la diffusion de ces données et leurs métadonnées. Une initiative que nous avons nommé « Initiative SAWIS » a vu le jour en 2014, pour proposer une plate forme communautaire de partage des données scientifiques dont les auteurs ont exploité les résultats et qui souhaitent les mettre au profit de la communauté scientifique. Dans cet article nous exposons les différents composants de cette plate forme.

2 MATERIEL ET METHODES

La démarche adoptée pour la mise en place de cette initiative, est constitué des trois étapes suivantes : (1) Cadre de partage des données, (2) Implémentation de la plate forme et (3) Zone pilote. Cette démarche est le résultat d'une étude comparative des différents expériences internationales dans le domaine des systèmes d'information d'eau, qui ont été couronné par l'organisation d'une conférence internationale sur les Systèmes d'Information d'Eau à l'échelle du bassin méditerranéen [11].

2.1 CADRE DE PARTAGE DES DONNÉES

Pour assurer la réussite de cette initiative et la continuité de la plate forme communautaire. D'abord, nous avons créé une entité morale qui aura parmi ces activités le parrainage de cette initiative, il s'agit de l'Association Scientifique pour les Systèmes d'Information d'Eau [12] dont le siège est à la Faculté des Sciences de Rabat. Ensuite, une charte a été élaborée fixant les droits et responsabilités de chaque partie : l'auteur des données, la plate forme et l'utilisateur.

2.2 IMPLÉMENTATION DE LA PLATE FORME

La plate forme est hébergée sur les serveurs de SAWIS : <http://initiative.sawis.org/>, elle repose sur une architecture orientée service à base d'outils SIG open source conformes aux standards OGC. Cette architecture est représentée dans la figure 1:

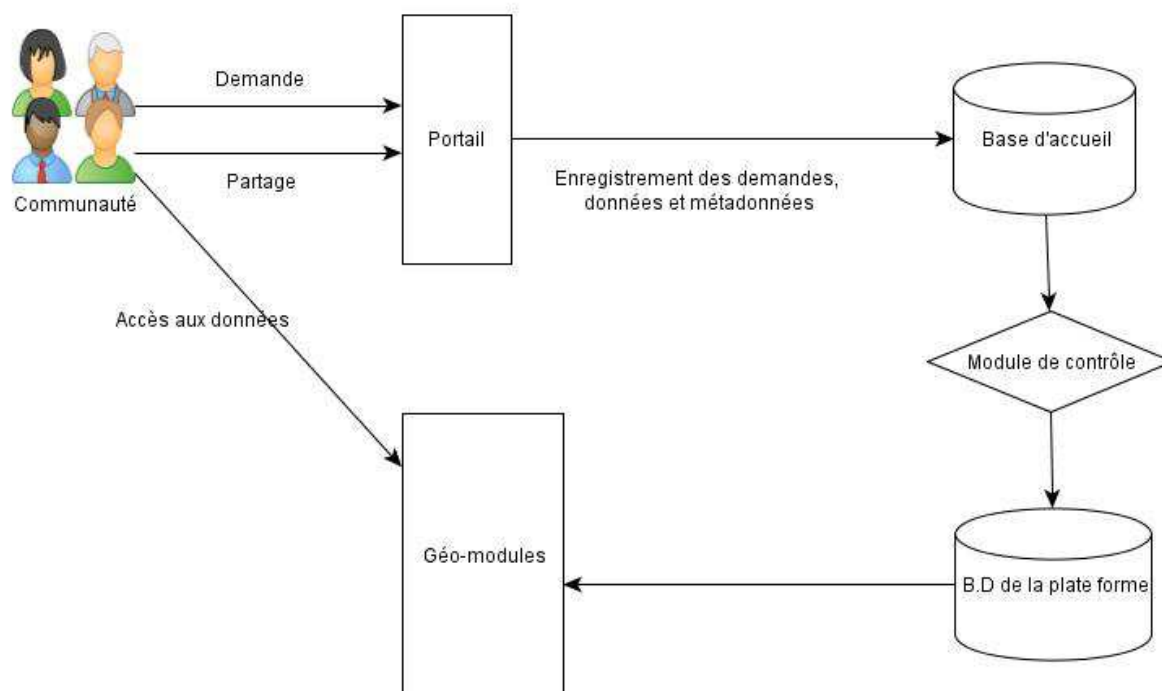


Fig. 1. Architecture conceptuelle de la plate forme « Initiative SAWIS »

Le fonctionnement de cette plate forme est assuré par les différents composants de cette architecture :

- Le portail (<http://initiative.sawis.org/>), est le point d'accès à la plate forme et le premier contact avec la communauté des utilisateurs, il permet d'enregistrer à la fois les demandes et le transfert des données, en remplissant un formulaire descriptif.
- Le module de contrôle est déclenché suite au dépôt des données sur la plate forme, pour vérifier les éléments clés qui décrit une donnée : Auteurs, Dates, Bref description et Etablissement, ce module permet d'évaluer la qualité des données partagées selon un ensemble de critère, en particulier l'origine et droit d'auteur des données, pour attribuer une note pour chaque donnée. Ensuite un seuil a été fixé pour permettre ou non l'intégration de ces données au niveau de la plate forme.
- Géo-modules : Regroupe un ensemble de logiciels SIG open source conformes aux standards OGC, pour assurer les trois fonctionnalités suivantes : (1) Consultation des cartes thématiques, via un géoportail. (2) Consultation des données et métadonnées, via un géo-catalogue et (3) Publication des services web géographique WMS/WFS, pour faciliter le partage des données géo-spatiales publiés sur le serveur cartographique. L'ensemble des outils utilisés pour constituer ces modules sont à base des logiciels SIG Open Source, qui offres en plus de la caractéristique de gratuité, la possibilité d'intégrer de nouvelles fonctionnalités, ainsi pouvoir personnaliser et rendre extensible les fonctionnalités des modules.

L'architecture technique des géo-modules (Figure 2), regroupe un géoportail, le point d'accès aux fonctionnalités de la plate forme SAWIS, un serveur WMS/WFS pour la publication des données géo-spatiales (couches vecteur et raster), puis un serveur CSW pour le catalogage des données conformément à la norme ISO TC 211 pour les métadonnées géo-spatiales [13].

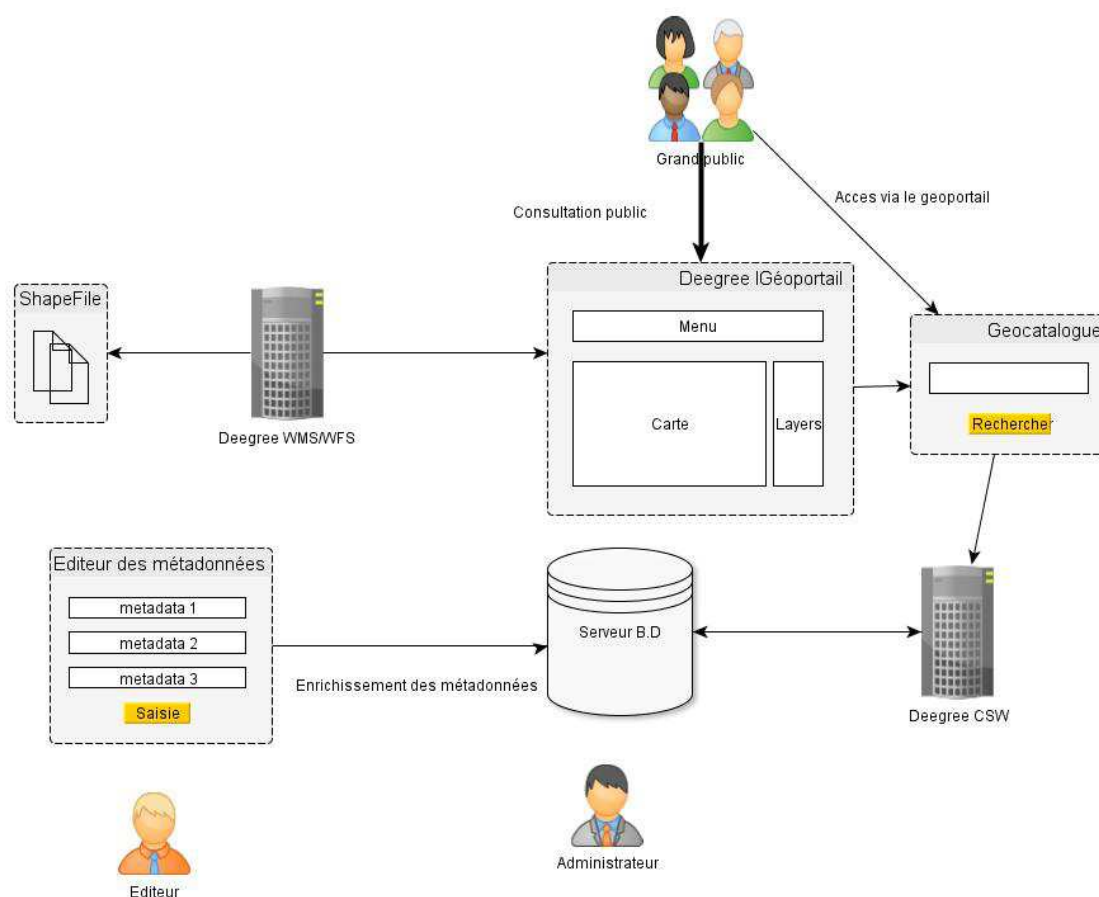


Fig. 2. Architecture technique du bloc « géo-module » de la plate forme

2.3 ZONE PILOTE

Pour lancer cette plate forme, un appel à contribution a été lancé à la communauté à partir du réseau SAWIS, pour choisir les données et métadonnées produites dans le cadre des travaux scientifiques, cet appel a pour objectif l'alimentation de la plate forme à travers les différentes études couvrant le territoire national. Actuellement nous avons commencé par une zone pilote au niveau de la ville de Meknès.

Le choix de cette zone pilote, est justifié par : (1) La volonté de l'auteur pour partager ses données avec l'ensemble de la communauté, tout en permettant de valoriser ses résultats. (2) La qualité des données partagées et (3) L'intérêt des études réalisées et des problématiques approchées.

La nature et format des données partagées, sont divers et variées, on trouve :

- Couches vecteurs : réseau hydrographique, sources et forages, réseau d'eau potable...etc.
- Couches raster : La carte de vulnérabilité des eaux souterraines, carte de potentiel de contamination des eaux superficielles et souterraines par les pesticides et cartes de qualité des eaux superficielles.
- D'autre données non géo-spatiales en format PDF, Word, Image, Excel.

3 RESULTATS

A partir des données partagées dans le cadre de la zone pilote choisie, nous avons procédé à la publication de l'ensemble des couches vecteur et raster au niveau du serveur cartographique, en intégrant leurs métadonnées au niveau du géo-catalogue toute en renseignant le service web associé pour assurer la réutilisation des ces couches à distance. Ce résultat est représenté dans la figure 3:

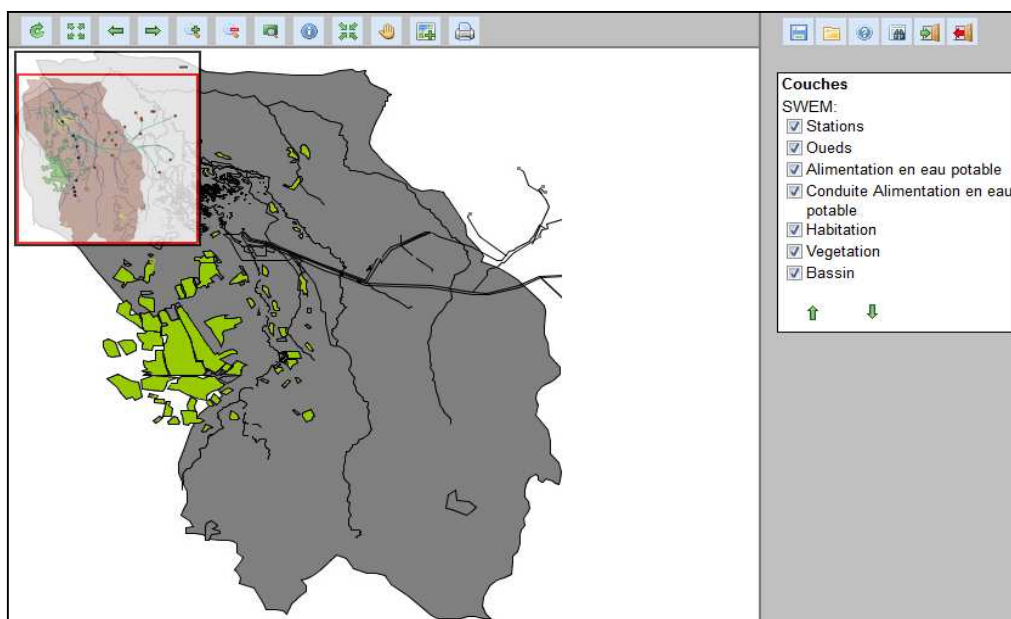


Fig. 3. Interface de la plate forme SWEM

En ce qui concerne les données non géo-spatiales, les fiches descriptives des métadonnées ont été créées pour chacun des documents partagés, en renseignant les informations associées : Le producteur et responsable du document, les dates de création et modification, la zone géographique associée, le descriptif, l'objet du document et l'URL pour télécharger ce document. Cette fonctionnalité est illustrée dans la figure 4:

 The image shows a web form for entering metadata. At the top, there is a search bar and a set of icons. The form is divided into several sections with blue headers: 'general descriptions', 'content of described data', 'spatial description of the dataset', 'temporal setting for a dataset', and 'person/organisation responsible for the resource'. The 'person/organisation responsible for the resource' section is expanded, showing fields for 'Responsible Parties' (a dropdown menu), 'name (person):', 'organisation:', 'role:', 'address:' (with sub-fields for street/number, city, postal code, and country), 'voice number:', 'facsimile number:', and 'email address:'. Each field has a corresponding input box or dropdown. At the bottom, there is a section for 'distribution information'.

Fig. 4. Interface du module de renseignement des fiches descriptives

Une fois les informations descriptives des données et couches de la zone d'étude ont été intégrées dans la base de la plate forme, l'utilisateur peut à l'aide du module de recherche (Figure 5), consulter les détails des données et pouvoir télécharger les documents associés ou réutiliser le service web relative à une couche vecteur ou raster :

Simple Search	Detailed Search
start Here you can start a simple search. Please insert one ore more search strings (separated by comma or semicolon) into the form field.	The detailed search offers the possibility to narrow a search by choosing criteria for content, time and space.

Fig. 5. Interface du module de recherche par mot clé, pour consulter les données de la base

4 DISCUSSION

La conception et la réalisation d'une plate forme SWEM est le fruit d'une collaboration de l'association SAWIS et les chercheurs universitaires dans le cadre des travaux de doctorat. Plusieurs services sont offerts par la plate forme SWEM, elle permet la manipulation et la publication dans un environnement Web des données cartographiques selon les formats des principaux éditeurs de SIG du marché (Exemple, ESRI Mapinfo) ainsi que des images raster (Jpeg, Tiff, ECW et d'autre formats reconnus) [14]. D'autre part, il est à noter que les besoins de fonctionnalités SIG simples [15] comme les outils de navigation, d'impression ou de consultation, sont satisfaits par cette plate forme.

En effet, SWEM est dotés d'une interopérabilité permettant de réaliser une carte unique à partir des données issues de différents serveurs [15], tout en permettant une diffusion aisée de l'information et des données sur l'eau. C'est une contribution à la résolution pour le partage des données entre différents acteurs concernés par la gestion d'eau.

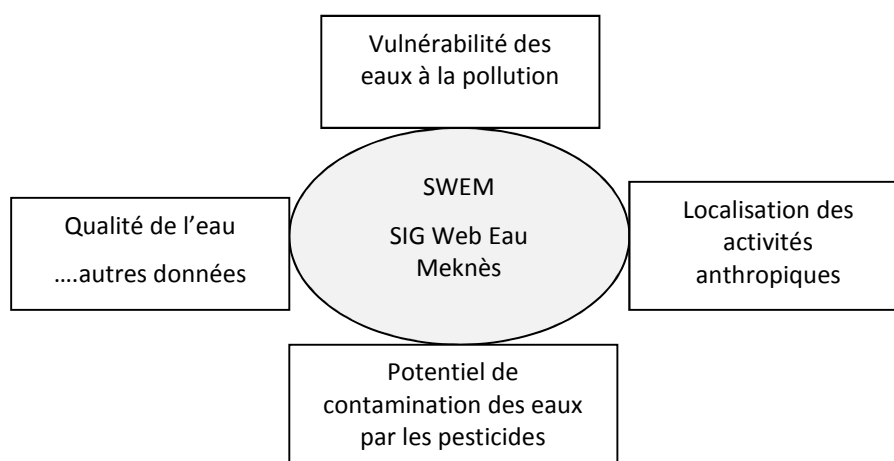


Fig. 6. Les utilités et services offerts par la plate forme SWEM

Par ailleurs il y a trois manières d'appréhender les potentialités offertes par cette plate forme, en termes d'information, cet outil permet un accès dynamique, interactif et multimédia à un grand nombre d'informations relatives à l'eau dans le territoire d'étude. La consultation du géo-portail du SWEM offre aux utilisateurs l'accès aux différentes cartes et données mises en ligne sur la ville de Meknès, elle permet ainsi une aide à la décision par l'intermédiaire de cartographie dynamique.

Au Maroc des portails proposent de consulter et télécharger des données et documents, comme le portail du Centre National de Documentation, du Haut Commissariat au Plan (HCP) <http://www.abhatoo.net.ma/>, ou encore le centre virtuel de documentation de l'observatoire national de développement humain <http://www.albacharia.ma/>, et le moteur de

recherche des thèses <http://toubkal.imist.ma/>, ces trois portails proposent de chercher à base de mot clé et à partir du fond documentaire associé à chaque portail. En plus de ces portails, la plate forme de l'Open Data marocain <http://data.gov.ma>, a été lancé en mars 2011, pour pouvoir consulter les données de l'administration mises à disposition du public.

Malgré l'importance des portails cités précédemment, pour retrouver une information de qualité, dont l'ensemble des éléments descriptifs des données, ont été pris en considération ; l'ensemble de ces portails n'offrent pas la possibilité de consulter des données géo-spatiales, et plus encore, ils ne permettent pas de réutiliser ces données via des services web géographiques conformes aux standards OGC. Aussi, vu la nature de ces portails, ils n'offrent pas une documentation spécialisée sur l'eau, mais plutôt un fond documentaire général, dont la documentation sur l'eau, est une partie.

D'où l'intérêt de l'initiative SAWIS, qui repose sur deux piliers, l'esprit de collaboration, d'initiative et d'ouverture de la communauté scientifique travaillant dans le domaine de l'eau, et le second pilier : une plate forme technique, pris en charge par l'association SAWIS, et qui exploite les avancées enregistrées en matière des infrastructures des données spatiales.

Pour la réalisation de cette initiative, les développeurs se sont ouvert sur les expériences internationales avec les Systèmes d'Information d'Eau, comme l'expérience française eaufrance.fr, l'expérience de l'USGS waterdata.usgs.gov, ou encore l'expérience servicios2.marm.es/sia, pour le système d'information d'eau en Espagne. En plus cette plate forme, exploite les avantages offerts par les outils dites FOSS4G (Free Open Source Software for Geo-spatial) dont un ensemble des études comparatives des caractéristiques de ces outils ont été largement utilisées [16-22], le résultat de la synthèse établit à partir de ces études, a conduit à une grille d'évaluation pour le choix de la solution technique adéquate à la plate forme. Cette démarche a été nécessaire pour bâtir les fondements de cette initiative.

L'initiative SAWIS a pour objective d'offrir à la communauté scientifique la possibilité de réutiliser les données produites dans le cadre des travaux de recherche dans le domaine de l'eau, néanmoins cette initiative ne peut arriver à l'aboutissement, sans un réel esprit de collaboration et de partenariat, de part la communauté scientifique ou encore les institutions et acteurs du domaine.

5 CONCLUSION ET PERSPECTIVES

En guise de conclusion le système SWEM, développé dans le cadre de l'initiative SAWIS permet de visualiser des cartes thématiques sur une interface Web, et de consulter les données attributaires associées via un géocatalogue. Ainsi l'exercice mené dans le présent travail est une contribution notable en matière d'accès aux données et aux informations sur les ressources en eau à Meknès. Il est également un premier pas vers le développement d'un système d'information scientifique sur l'eau (SISE). Au sein de la plate forme SWEM, il est à signaler qu'il y a possibilité de faire des mises à jour et de programmer d'autres modules et de les ajouter au géo-portail. Ces modules peuvent être des modules statistiques, de simulation ou de modélisation.

Pour finir, l'initiative SAWIS se veut comme une contribution vers le développement d'un système d'information scientifique sur l'eau (SISE) à l'échelle national, en proposant ce prototype qui prend en considération les différents volets nécessaires : L'acteur représenté par l'association SAWIS, la charte d'utilisation, les fonctionnalités techniques et les données scientifiques. Le cas pilote de la ville de Meknès sera bientôt capitalisé et généralisé sur le territoire national, et ce chantier sera piloté par l'association SAWIS en collaboration avec les chercheurs intéressés par l'ouverture de leurs données scientifiques, mais aussi les différents départements concernés par la thématique.

REMERCIEMENT

Ce travail a été réalisé dans le cadre des activités de l'association scientifique pour les systèmes d'information d'eau SAWIS, co-fondé par Mr. Mohamed NEHMADOU et Mr. Aniss MOUMEN, dont le siège est à la Faculté des Sciences de Rabat. Les auteurs tiennent à remercier l'ensemble des contributeurs pour la réalisation de ce travail.

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Touchless Fingerprint recognition using MATLAB

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ABSTRACT: Fingerprint recognition is the reliable and oldest biometrics used for personal identification. Many sensors were developed for fingerprint recognition systems in which the user's finger print is placed on a sensor. Due to this contact the input fingerprint from the same finger can be different and there can be fingerprint issues which can lead to forgery and hygienic problem. For this reason touchless fingerprint recognition has been developed in which the fingerprint is acquired using a high resolution webcam. The acquired images are subjected to pre-processing steps and the region of interest is extracted. Minutia features are extracted from the fingerprint image and matching is based on the number of minutia pairings among two fingerprints to be matched. The project is coded in Matlab.

KEYWORDS: Biometric, Fingerprint, Minutia, Crossing Number, FAR, FRR.

1 INTRODUCTION

Human beings possess psychological and behavioural characteristics. The measure of these characteristics is called Biometrics. Biometrics is used for personal identification and verification. Voice, lip movements, hand geometry, face, odour, gait, iris, retina, fingerprint are the most commonly used authentication methods. Biometrics is actively growing area of research. The driving force of the progress in this field is, above all, the growing role of the Internet and electronic transfers in modern society. The biometrics has a significant advantage over traditional authentication techniques namely passwords, PIN numbers, smartcards etc. due to the fact that biometric characteristics of the individual are not easily transferable, are unique of every person, and cannot be lost, stolen or broken. The choice of Biometrics depends on accuracy, user acceptance, cost and implementation time and level of security required.

Of all the biometric based recognition systems, fingerprint based recognition systems is one of the oldest and most reliable biometric used for personal identification. A fingerprint is the pattern of friction ridges on a human finger, which provides increased friction for gripping. A fingerprint consists of ridges and valleys. Fingerprints are not distinguished by ridges and furrows but by minutia which are abnormal points on the ridges. Among the variety type of minutia, two are mostly significant and in heavy usage: one is called termination, which is the immediate ending of a ridge; the other is called bifurcation, which is the point on the ridge from which two branches derive. The characteristics of fingerprint are:

- i. A fingerprint is an individual characteristic: No two persons, even identical twins does not have similar fingerprint pattern. The probability of two fingers being same is 1 in 1.9×10^{15} [1, 2, and 3].
- ii. Fingerprints remains unchanged during a lifetime. Only a very deep cut would result in changes in a fingerprint.
- iii. Fingerprint has general ridge patterns that permit them to be classified.

Current fingerprint verification techniques can be broadly classified as Minutiae-based, ridge feature-based, correlation-based and gradient-based. Fingerprint images that are acquired using web camera consist of certain constraints such as low contrast between the ridges and the valleys, defocus and motion blurriness. The paper is organized as follows. In next section we discuss the system development followed by performance analysis and results.

2 SYSTEM DEVELOPMENT

A Touchless fingerprint verification system comprising of hardware and software elements is proposed. An Xpro 20 Mpixel webcam was used to capture fingerprint. This is the main input device for data acquisition. The software architecture of the system involves the use of MATLAB version 11.0. MATLAB was used to perform the pre-processing, feature extraction and verification processes.

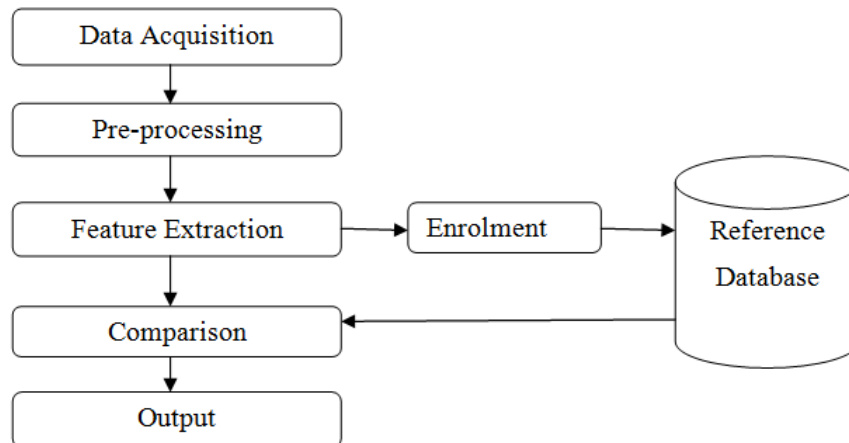


Figure1. Block Diagram of system

2.1 IMAGE ACQUISITION

The fingerprints are acquired using webcam. Then the raw data are sent to a microcomputer through an USB port. An XPRO night vision 20Mp webcam with crystal clear motion and special effects is used as data acquisition device. Data acquisition process is a process where the real time inputs of fingerprint from the webcam are read into the CPU for processing and to store the fingerprint in the database which is called fingerprint database.

2.2 FINGERPRINT PRE-PROCESSING

The images acquired for touchless fingerprint recognition may have problems like low contrast between ridges and valleys, noise, etc. These problems can be removed with the help of pre-processing. The purpose of fingerprint pre-processing step is to make fingerprint images standard and ready for feature extraction. Preprocessing is a necessary step to improve the accuracy of Feature extraction and Verification.



Figure2: Original Fingerprint Image

Pre-processing algorithm used in this work includes steps like image enhancement, binarization and segmentation.

2.2.1 IMAGE ENHANCEMENT

Image enhancement is done to improve the image quality for further operations. It increases the contrast between ridges and valleys. In our work, we have done the enhancement by histogram equalization and FFT. Histogram equalization improves the global contrast of image by adjusting the intensity distribution on a histogram.



Figure3: Enhanced mage after histogram equalization

Enhancement of image after FFT can connect falsely broken points on ridges and remove spurious connections between ridges. In FFT the image is divided into small processing blocks of 32x32 pixels and then perform the fourier transform according to the equation.

$$F(u, v) = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x, y) \times \exp \left\{ -j2\pi \times \left(\frac{ux}{M} + \frac{vy}{N} \right) \right\} \quad (1)$$

for $u = 0, 1, 2, \dots, 31$ and $v = 0, 1, 2, \dots, 31$.

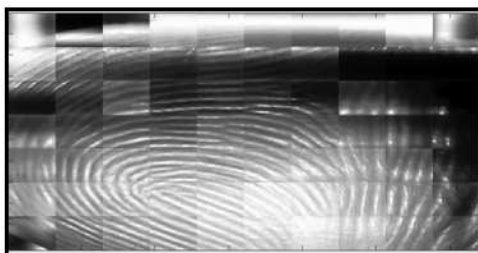


Figure 4: Enhanced image after FFT

2.2.2 IMAGE BINARIZATION

Fingerprint image binarization is to transform the 8-bit gray fingerprint image to a 1-bit image with 0-value for ridges and 1-value for valleys. A locally adaptive binarization method is performed to binarize the fingerprint image.



Figure5: Binarized image

2.2.3 IMAGE SEGMENTATION

The region of interest is useful for fingerprint image. The area without effective ridges and valleys is discarded as it is background information. For extracting region of interest, two steps are used. The first one is block direction estimation and the second is based on morphological methods in which morphological operations called OPEN and CLOSE are adopted. Open operation can expand images and remove peaks because of background noise. Close operation can shrink images and eliminate small cavities.

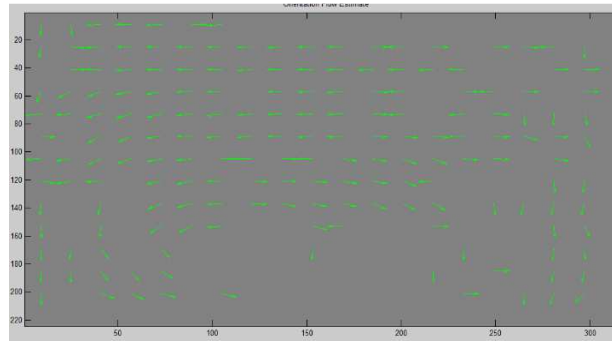


Figure6: Block Direction Estimation



Figure7: Region of interest+Bound

2.3 FEATURE EXTRACTION

Minutia features are extracted from the fingerprint image in our work. For minutia extractions, following process are done.

i. Ridge Thinning: Ridge Thinning is to eliminate the redundant pixels of ridges till the ridges are just one pixel wide [4,5]

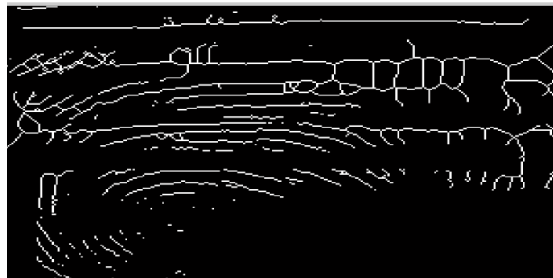


Figure8: Ridge Thinned image

ii. Minutia Marking: Minutia Features are extracted by the concept of Crossing Number(CN). Rutovitz's definition of crossing number for a pixel P is given by equation (2)

$$C_n(P) = \left(\frac{1}{2}\right) \sum_{i=1}^8 |P_i - P_{i+1}| \quad (2)$$

where P_i is the binary pixel value in the neighborhood of P with $P_i = (0 \text{ or } 1)$ and $P_1 = P_9$.

If $C_n(P) = 1$ it's a ridge end and if $C_n(P) = 3$ it's a ridge bifurcation point. There is no need to consider $C_n(P) > 3$ because it's a crossing point.

2.4 MINUTIA MATCHING

Minutia Matching Algorithm determines whether the two minutia sets are from the same fingerprint image or not. Alignment based match algorithm derived from [6] is used for matching of fingerprints. It includes two consecutive stages: one is alignment stage and second is match stage.

i. Alignment stage: If two fingerprints are to be matched choose any one minutia from each image; calculate the similarity of the two ridges associated with the two referenced minutia points. If the similarity is larger than a threshold, then transform each set of minutia to a new coordination system whose origin is at the referenced point and whose x-axis is coincident with the direction of the referenced point.

ii. Match stage: After the set of transformed minutia points is derived, the elastic match algorithm is used to count the matched minutia pairs by assuming two minutia having nearly the same position and direction are identical.

3 PERFORMANCE ANALYSIS AND RESULTS

For performance analysis, we considered fingerprint database consisting of 77 images. The performance of a fingerprint verification system is measured in certain standard terms. These are False Acceptance Rate (FAR), False Rejection Rate (FRR) and Equal Error Rate (EER). FAR is the ratio of number of unauthorized user's attempts accepted by the biometric system to the total number of verification attempts made. FRR is the ratio of number of authorized user's attempts rejected by the biometric system to the total number of verification attempts made. EER is a point where FAR and FRR are same. MATLAB version used is MATLAB 7.10.0.499 (R2011a).

False Acceptance Rate: When a fingerprint of an individual matches with the different fingerprint individual than it is called as false acceptance rate.

False Rejection Rate: When a fingerprint is not completely matches with the different fingerprint individual than it is called as false rejection rate.

Threshold - It is a value at which true or false will be considered. If value of matching equals to or greater than threshold then accepted otherwise rejected. I have set threshold as 600 for fingerprint matching.

Table 1: False Acceptance Rate Vs Threshold variance

Sr. No.	Threshold variance	Number of forged signatures Accepted (out of 100)	FAR (%)
1	100	3	3
2	200	5	5
3	300	6	6
4	400	8	8
5	500	12	12
6	600	15	15
7	700	18	18
8	800	20	20
9	900	27	27
10	1000	35	35

Following graph gives false acceptance rate against threshold variance for proposed fingerprint recognition systems.

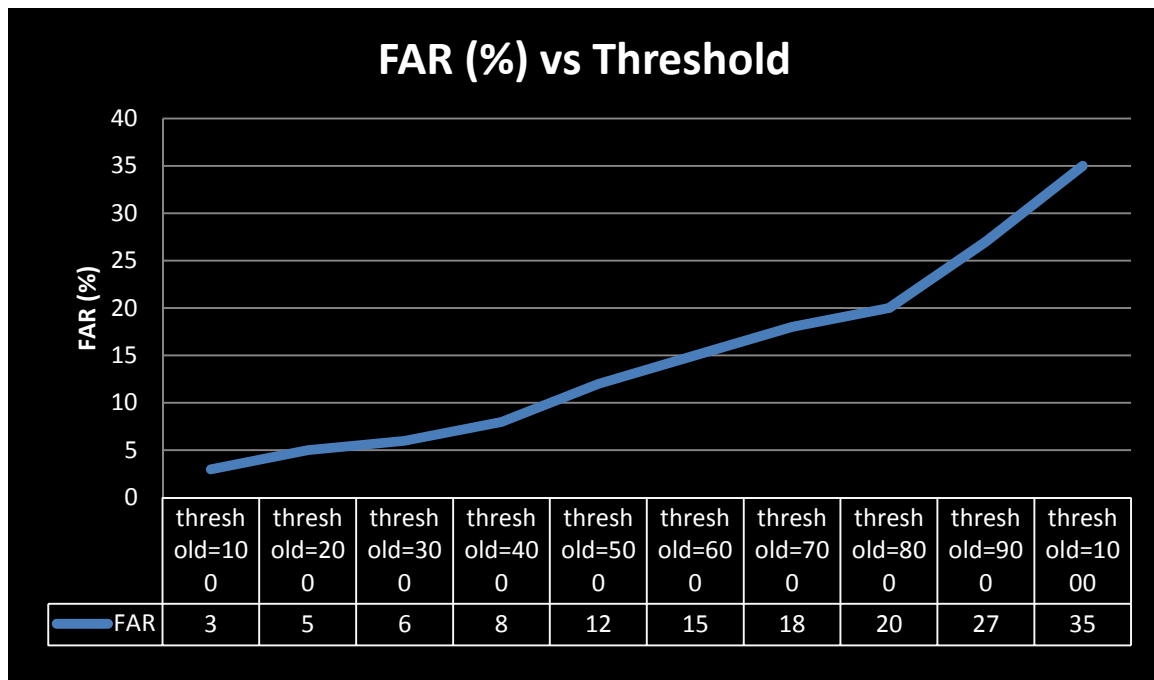


Figure 9: False acceptance rate Vs Threshold variance

Following table gives false rejection rate against threshold variance for proposed fingerprint recognition system.

Table 2: False Rejection Rate Vs Threshold variance

Sr. No.	Threshold Variance	Number of genuine signatures Rejected(out of 100)	FRR (%)
1	100	40	40
2	200	35	35
3	300	32	32
4	400	30	30
5	500	25	25
6	600	20	20
7	700	18	18
8	800	12	12
9	900	10	10
10	1000	5	5

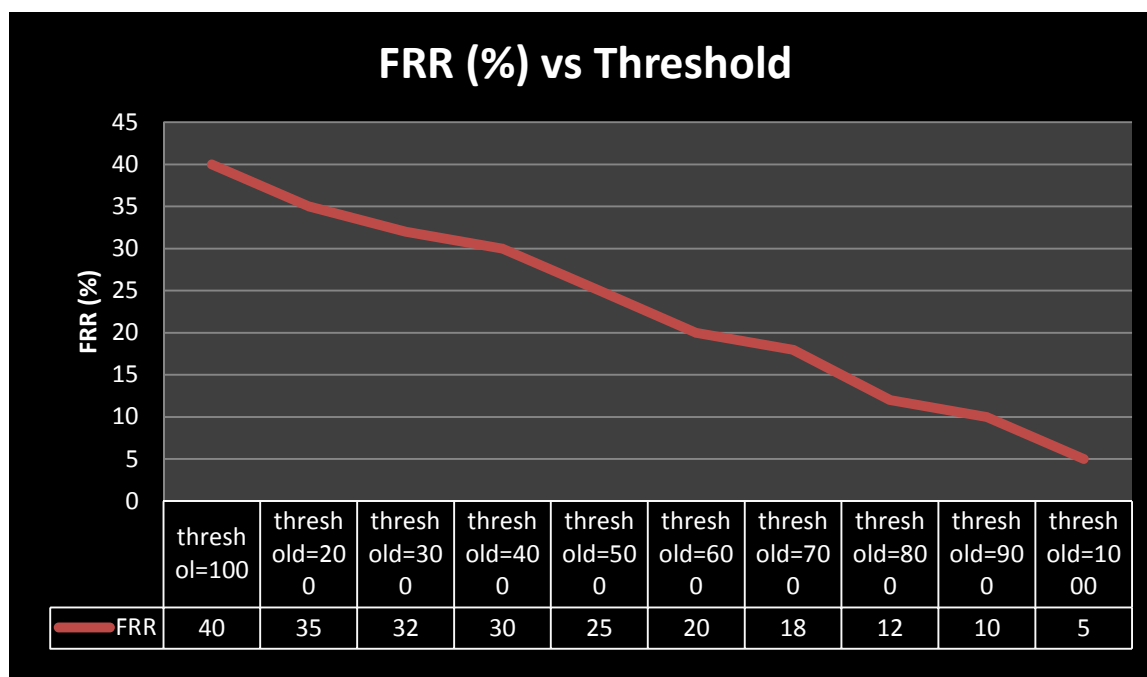


Figure 10 : False rejection rate Vs Threshold variance

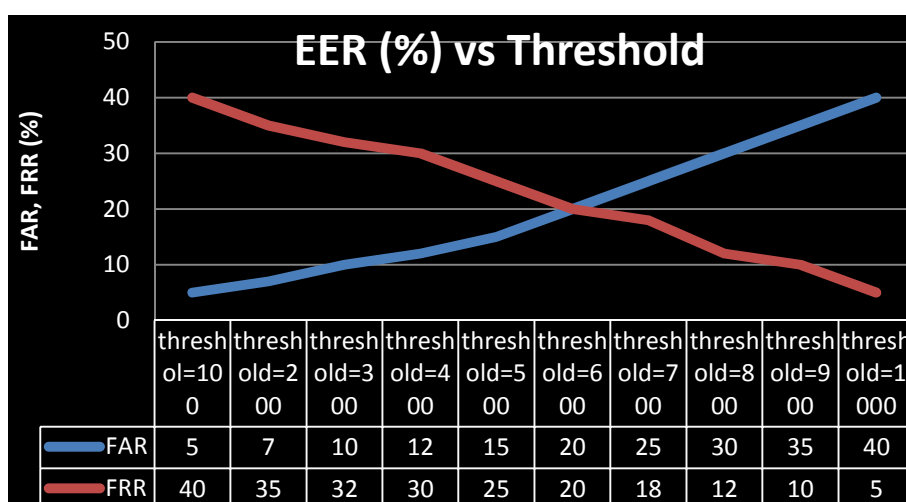


Figure 11: Equal Error Rate Vs Threshold variance

Generally fingerprint verification system shall have an acceptable trade-off between a low FAR and a low FRR. EER is a point at which false acceptance rate and false rejection rate is same. Following graph shows that equal error rate occurs at threshold variance = 600 at which FAR is 20% and FRR 20%.

4 CONCLUSIONS AND FUTURE WORK

Of all biometric technologies, whether biological or non-biological, proposed fingerprint verification offers most potential in terms of adaptability and implementation. This holds true from a number of perspectives i.e. ease of use, low implementation cost and the ease of embedding the system in an organization, without excessively affecting existing operations. . Our project can be used in any Employee Management Attendance System. There is a scope of further improvement in terms of efficiency and accuracy which can be achieved by improving the hardware (biometric) to capture the image.

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MODELLING AND SIMULATION OF ENERGY FORECASTER FOR GRID CONNECTED & STANDALONE PV SYSTEMS

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ABSTRACT: Modeling and Simulation of a solar based energy generation system is a significant tool in predicting the performance of both grid-connected and standalone PV systems. There are multiple ways by which a PV system can be connected to the grid. However, the output of PV systems varies due to change of solar irradiation, ambient temperature, wind speed and other climatic conditions, that makes the real field prediction becomes complicated. Hence we need better tools to predict the real field performance of PV power stations. Herein, we developed a MATLAB/Simulink model that can accommodate all field parameters to make a better prediction. The PV array model has been implemented through an embedded MATLAB model. The maximum power point tracking algorithm is implemented to DC/DC converter to operate PV arrays at maximum power point. The incremental conductance algorithm is employed to control the boost converter. The inverter controlled by the boost converter is interfaced with the grid. Finally, system performance is analyzed under various conditions. The system validation is also carrying out using the real power plant data. Simulations performed with field conditions at various locations. The model is helpful for optimizing the power output of a PV system as well as achieving cost effectiveness by incorporating different PV system types.

KEYWORDS: PV on-grid, Standalone, Power prediction, MPPT, DC/DC Converter.

1 INTRODUCTION

Photovoltaic is the technology used to harvest the sun's energy and make it useable. One hour of solar energy that hits the surface of the planet is equivalent to an entire year of electric energy consumed by the world. The cost of energy is on the rise due to its growing demand and therefore photovoltaic system is a promising cheaper and cleaner alternative to conventional systems. The encumbrance factor is its high installation cost and low conversion efficiency. Therefore our aim is to increase the efficiency and power output of the system. It is also required that constant voltage is supplied to the load irrespective of the variation in solar irradiance and temperature. PV arrays consist of parallel and series combination of PV cells that are used to generate electrical power depending upon the incidence sunlight. Photovoltaic arrays are used in many applications such as water pumping, street lighting in rural town, battery charging and grid connected PV systems. Computer modeling is a powerful tool by which we can predict the performance of the PV panel under real field conditions and hence to optimize the power production.

2 MODELLING OF PV ARRAY

The building block of PV arrays is the solar cell, which is basically a p-n junction that directly converts light energy into electricity: it has an equivalent circuit as shown below in Figure 1.

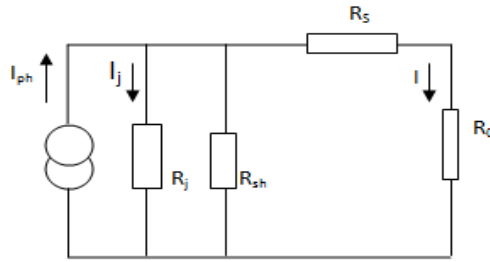


Fig. 1 Equivalent circuit of a PV cell

The current source I_{ph} represents the cell photo current; R_j is used to represent the non-linear impedance of the p-n junction; R_{sh} and R_s are used to represent the intrinsic series and shunt resistance of the cell respectively. Usually the value of R_{sh} is very large and that of R_s is very small, hence they may be neglected to simplify the analysis. PV cells are grouped in larger units called PV modules which are further interconnected in series-parallel configuration to form PV arrays or PV generators. The PV mathematical model used to simplify our PV array is represented by the equation [1]

$$I = n_p I_{ph} - n_p I_{rs} \left[e^{\left(\frac{q}{KTA} \cdot \frac{V}{n_s} - 1 \right)} \right]$$

where I is the PV array output current; V is the PV array output voltage; n_s is the number of cells in series and n_p is the number of cells in parallel; q is the charge of an electron; k is the Boltzmann's constant; A is the p-n junction ideality factor; T is the cell temperature (K); I_{rs} is the cell reverse saturation current.

The cell reverse saturation current I_{rs} varies with temperature according to the following equation:

$$I_{rs} = I_{rr} \left[\frac{T}{T_r} \right]^3 \left[e^{\left(\frac{qE_g}{KA} \cdot \frac{1}{T_s} - \frac{1}{T} \right)} \right]$$

Where T_r is the cell reference temperature, I_{rr} is the cell reverse saturation temperature at T_r and E_g is the band gap of the semiconductor used in the cell.

The temperature dependence of the energy gap of the semi-conductor is given by

$$E_g = E_g(0) - \frac{\alpha T^2}{T + \beta}$$

The photo current I_{ph} depends on the solar radiation and cell temperature as follows:

$$I_{ph} = [I_{scr} + Ki(T - T_r) \frac{S}{100}]$$

where I_{scr} is the cell short-circuit current at reference temperature and radiation, Ki is the short circuit current temperature coefficient, and S is the solar radiation in mW/cm². The PV power can be calculated using equation as follows.

$$P = IV = n_p * I_{ph} * V \left[\left(\frac{q}{KTA} * \frac{V}{n_s} \right) - 1 \right]$$

3 BOOST CONVERTER

The maximum power point tracking is essentially a load matching problem. A DC to DC converter is required for changing the input resistance of the panel to match the load resistance by varying the duty cycle[2]. There are four topologies for the DC to DC regulators: boost converter, buck converter, buckboost converter, cúk converter. Since our project work deals with the boost converter, further discussions will be centred on this one.

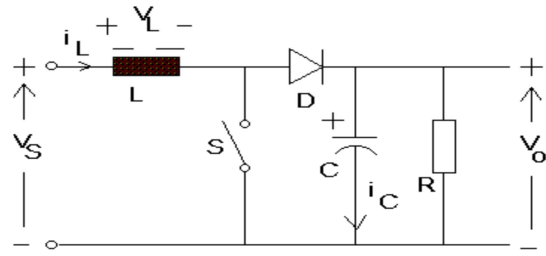


Fig. 2 Boost Converter Circuit Diagram

MODE 1 OPERATION OF BOOST CONVERTER

When the switch is closed the inductor is charged through the battery or from PV array and stocks the energy. In this mode, inductor current increases exponentially but for ease we assume that the charging and the discharging of the inductor are linear. The diode blocks the flow of current and so the load current remains constant which is being supplied due to the discharging of the capacitor.

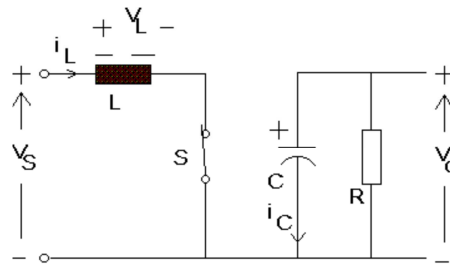


Fig. 3 Mode 1 Operation

MODE 2 OPERATION OF BOOST CONVERTER

In mode 2 the switch is open and so the diode becomes short circuited. The energy stored in the inductor gets discharged through opposite polarities which charge the capacitor. The load current remains constant throughout the operation.

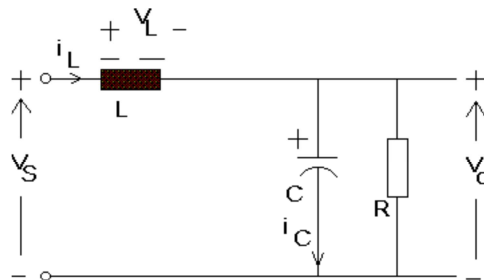


Fig. 4 Mode 2 Operation

Simulink Model – Boost converter

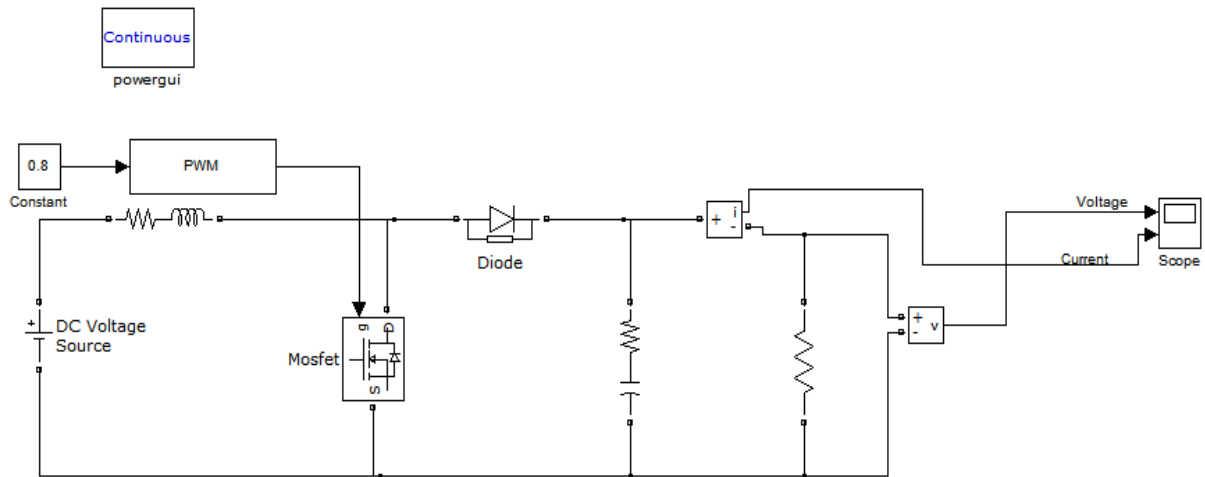


Fig. 5 Boost Converter

Voltage output from the inverter

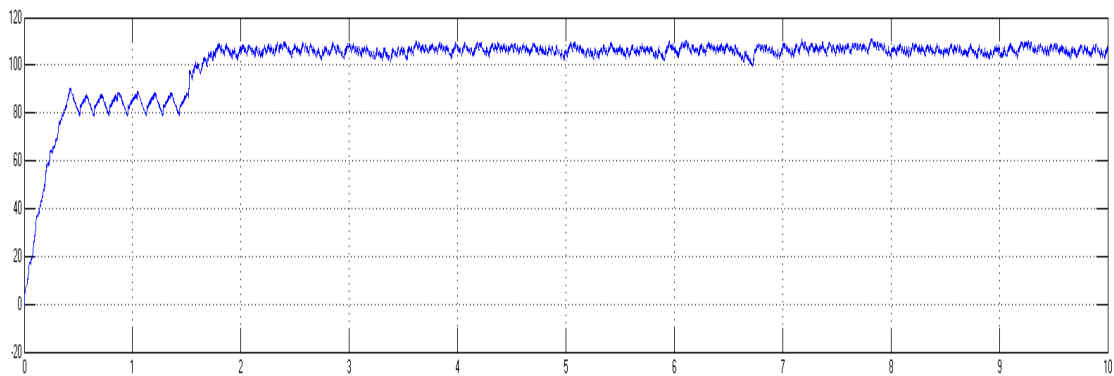


Fig. 6 Voltage output from the inverter

4 MPPT ALGORITHM

INCREMENTAL CONDUCTANCE METHOD

The Incremental Conductance (IC) algorithm is based on the observation that the following equation holds at the MPP $(dIPV/dVPV) + (IPV/VPV) = 0$ where IPV and VPV are the PV array current and voltage, respectively [3]. When the operating point in the P - V plane is to the right of the MPP, it is verified $(dIPV/dVPV) + (IPV/VPV) < 0$, whereas when it is to the left of the MPP this $(dIPV/dVPV) + (IPV/VPV) > 0$.

The MPP can thus be tracked by comparing the instantaneous conductance IPV/VPV to the incremental conductance $dIPV/dVPV$. Therefore, if the quantity $(dIPV/dVPV) + (IPV/VPV)$ is more than ϵ , its sign means a power production decrement and indicates the correct direction of perturbation leading to the MPP. Once MPP has been reached, the operation of PV array is maintained at this point and the perturbation stopped unless a change in $dIPV$ is noted. In this case, the algorithm decrements or increments the PV array voltage VPV to track a new MPP. The increment size determines how fast the MPP is tracked [4].

The IC method offers good performance under rapidly changing atmospheric conditions. The classic IC algorithm requires the measurement of the PV array voltage VPV and current IPV in order to determine the correct perturbation direction.

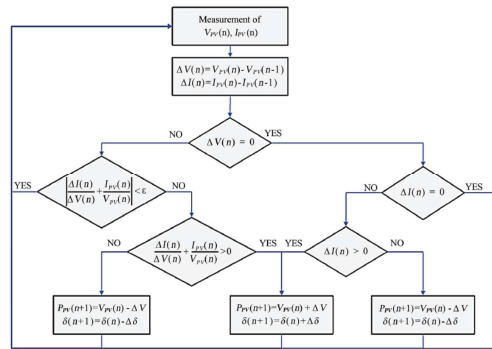


Fig. 7 Flow Chart of incremental conductance method

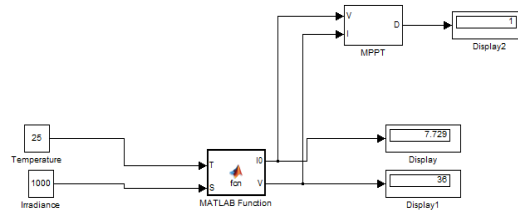


Fig. 7 Pulse generated from MPPT

5 GRID CONNECTED SYSTEM

GRID CONNECTED SYSTEM

The duty cycle from the MPPT is given to the converter circuit and this is given to the inverter. And an external pulse is given to the inverter. We are using a three phase load and a three phase source a V-I measurement will measure the voltage and the current. It will synchronize the power to the grid.

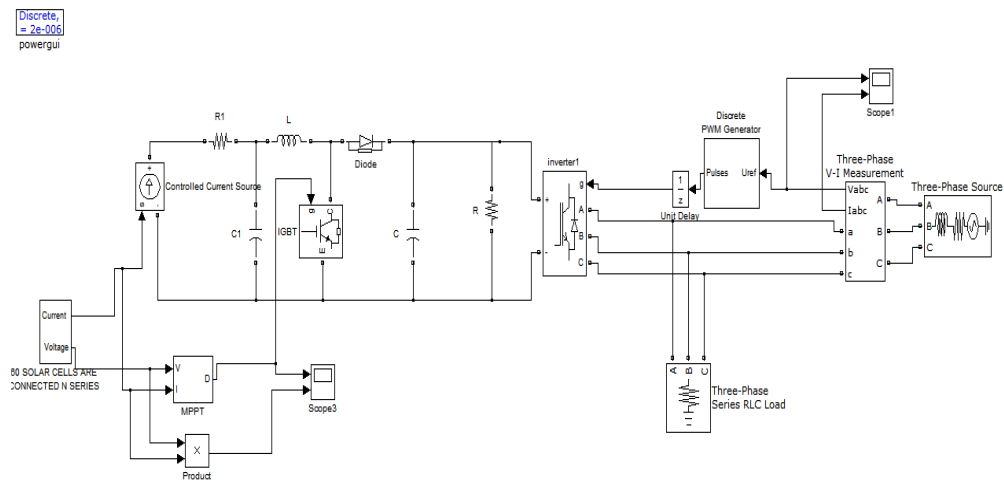


Fig. 8 Grid connected System

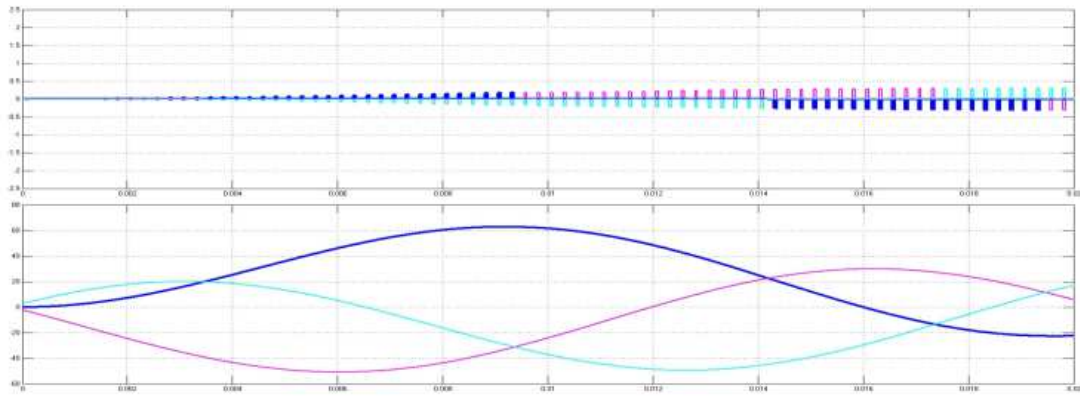


Fig. 9 Voltage and Current output of the grid

6 STANDALONE PV SYSTEM

Standalone PV system is a type of PV system that operates autonomously and supplies power to electrical loads independently of the electric utility. A stand alone photovoltaic (PV) system is an electrical system consisting of an array of one or more PV modules, conductors, electrical components, and one or more loads. But a small-scale PV system does not have to be attached to a roof top or building structures for domestic applications, they can be used for camper vans, RV's, boats, tents, camping and any other remote location [5].

Components of Standalone PV System:

Batteries: Batteries are an important element in any stand alone PV system but can be optional depending upon the design. Batteries are used to store the solar-produced electricity for night time or emergency use during the day. Depending upon the solar array configuration, battery banks can be of 12V, 24V or 48V and many hundreds of amperes in total.

Charge Controller: A charge controller regulates and controls the output from the solar array to prevent the batteries from being over charged (or over discharged) by dissipating the excess power into a load resistance. Charge controllers within a standalone PV system are optional but it is a good idea to have one for safety reasons.

Fuses and Switches: Fuses and isolation switches allow the PV system to be protected from accidental shorting of wires and allow power from the PV modules and system to be turned "off" when not requires saving energy and improving battery life.

Inverter: The inverter can be another optional unit in a standalone system. Inverters are used to convert the 12V, 24V or 48 Volts direct current (DC) power from the solar array and batteries into an alternating current (AC) electricity and power of either 120 VAC or 240 VAC for use in the home to power AC mains appliances such as TV's, washing machines, freezers, etc.[6]

Wiring: The final component required in and PV solar system is the electrical wiring. The cables need to be correctly rated for the voltage and power requirements.

SIMULINK MODEL STANDALONE PV SYSTEM

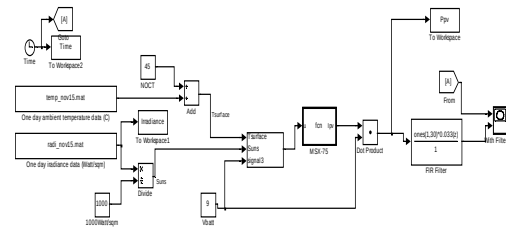


Fig. 10 Simulink model for generating estimated power for the panel

This simulink model has the following main parts:

1. Ambient Temperature data input block
2. Irradiance data input block
3. MSX-75 embedded MATLAB program
4. FIR Filter

MSX-75 is an embedded function. It includes an embedded program inside it which is being written using the information provided for the specification of the 75W panel. The following information is used in the program:

Open-Circuit Voltage (Voc): 21.6
Short-Circuit Current (Isc): 4.87
Nominal Operating Cell Temperature (NOCT): 45+/-2⁰C
Temperature Coefficient of Voc: -0.34%/°C
Temperature Coefficient of Isc: 0.050%/°C
Number of Cells, Ns: 36

EMBEDDED MATLAB PROGRAM

```
function Ipv = fcn(u)
% This block supports an embeddable subset of the MATLAB language.
% See the help menu for details.
TaC=u(1); Suns=u(2); Va=u(3); Ia=0;

if Va<0
    Va=0
end

k=1.38e-23;
q=1.60e-19;

A=1.2; Vg=1.12; Ns=36;

T1=273+25;
Voc_T1=21.6/Ns;
Isc_T1=4.87;

T2=273+75;
Voc_T2=17.93/Ns;
Isc_T2=4.99;

TaK=273+TaC;
TrK=273+25;
```

```

lph_T1=lsc_T1*Suns;
a=(lsc_T2-lsc_T1)/lsc_T1*1/(T2-T1);
%/a=(lsc_T2-lsc_T1)/(T2-T1);
lph=lph_T1*(1+a*(TaK-T1));

Vt_T1=k*T1/q;
lr_T1=lsc_T1/(exp(Voc_T1/(A*Vt_T1))-1);
lr_T2=lsc_T2/(exp(Voc_T2/(A*Vt_T1))-1);

b=Vg*q/(A*k);
lr=lr_T1*((TaK/T1)^(3/A))*exp(-b*(1/TaK-1/T1));

X2v=(lr_T1/(A*Vt_T1))*exp(Voc_T1/(A*Vt_T1));
dVdl_Voc=-1.15/Ns/2;
Rs=-dVdl_Voc-1/X2v;

Vt_Ta=A*k*TaK/q;

Vc=Va/Ns;
A1=lph-la-lr*(exp((Vc+la*Rs)/Vt_Ta)-1);
A2=-1-lr*(exp((Vc+la*Rs)/Vt_Ta)-1)*(Rs/Vt_Ta);
la=la-A1/A2;

%if (la<0)
% la=0.0001
%end

lpv=la;

```

SIMULATION RESULT

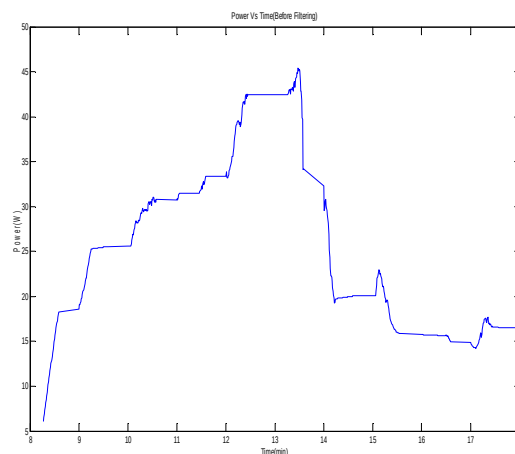


Fig. 11 Power Output before filtering

In order to achieve a smooth power graph output the power data is being filtered by using **Finite Impulse Response Filter (FIR Filter)**.

The Discrete FIR Filter block independently filters each channel of the input signal with the specified FIR filter[7]. The block can implement static filters with fixed coefficients, as well as time-varying filters with coefficients that change over

time. The coefficients of a static filter during simulation can be tuned also. This block filters each channel of the input signal independently over time, treating each element of the input as an individual channel. The output dimensions equal those of the input, except in single-input/multi-output mode.

This block has **Numerator Coefficient** parameter which specifies the vector of numerator coefficients of the filter's transfer function. For smoothening the power curve 30 samples have been taken for averaging.

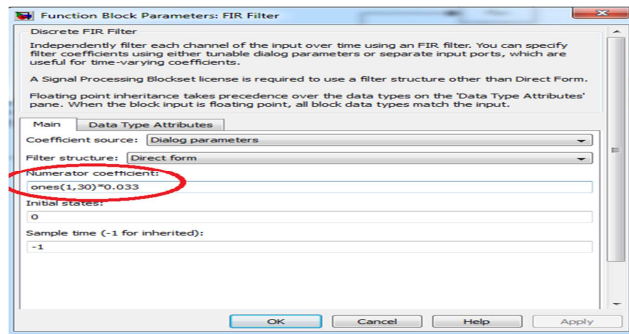


Fig. 12 Changing the numerical coefficient as per the requirement of the filtering.

Hence, the filtered output appears like following:

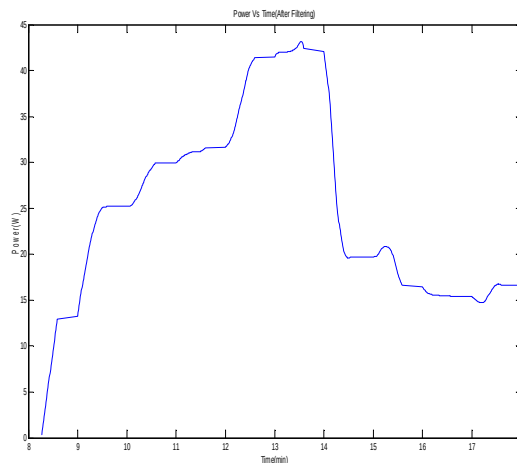


Fig. 13 Power Output after filtering

7 CONCLUSION

A PV electrical model is presented and demonstrated in MATLAB with various field data as the input and from it can predict the power at the particular location for any commercially available panel type from the field conditions such as solar insolation, temperature etc. The model has been validated with different filed data. This article is the first step to develop a complete solar photovoltaic power electronic conversion system simulation model. The performance of such model can be promoted by including various other parameters like wind, humidity and other climatic conditions.

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A Study on the concentration of Rural Taluk Population in Tamil Nadu State

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ABSTRACT: This study presents the concentration of rural Taluk population using probabilistic model. Taluk size Distribution and the concentration of rural population in the Taluk are related. Taluk sizes are increased in both ways, population and area. Pareto and Exponential probabilistic model were used to describe the Taluk size Distribution. Gini's concentration ratio and Pietra index were used to study the amount of concentration of rural population. This study includes all Taluks of Tamil Nadu and their population as per 2011 census for an empirical analysis. As per this study, the concentration of the rural male population in the rural Taluk area is less than the concentration of the rural female population and the Exponential model is more suitable than the Pareto model for the study of variability in Taluk size Distribution using Gini's concentration ratio and Pietra index.

KEYWORDS: Exponential Model, Gini's coefficient, Lorenz Curve, Maximum Likelihood Estimation, Pareto model, Pietra Index.

1 INTRODUCTION

Rural area is the complement form of urban area. Taluk size is the population of the Taluk. Taluk size distribution is the distribution of Taluk with respect to their population. Taluk size undergoes changes over time and space. The growth of rural population attracts Demographers, planners, etc to study the changes in size and the structure of the rural population. Variation in the sizes of rural population influences the changes in size and structure of the rural population. Atkinson (1970) showed that rules for ordering risk prospects are written in terms of Lorenz curves. Sen (1976) used the Lorenz curves in the field of finance. Lorenz curves of cumulative electricity consumption has been studied by Jacoboson and kammen (2005). Sadras and Bongiovanni (2004) used Lorenz curve and Gini index to assess the yield inequality. Arnold, B.C (2008) used the Gini index and Pietra index as the measures of inequality in income distribution. Sarabia, J.M (2008) used Lorenz curve and Gini index to measure the inequality in income distribution. No one has done the study on the concentration of rural Taluk Population in Tamil Nadu State. An attempt has been made to study the concentration of rural Taluk population using Pareto and Exponential probabilistic model. Parameters of these models can be estimated by using the Method of Maximum Likelihood. The concentration of rural population in all taluks of Tamil Nadu State is to be studied using Gini's concentration ratio and Pietra index.

The Lorenz curve, is the graph based on cumulative proportion (or percentage) of total population of Taluks against the cumulative proportion (or percentage) of number of Taluks having its population. The Gini Index(GI) named after its originator Gini(1912) is twice the area between the L(p) and the diagonal segment joining the points (0,0) and (100,100).The line segment joining the two points (0,0) and (100,100) is known as line of equal distribution or egalitarian line. The alternative names for Gini index are Lorenz concentration, Gini coefficient and Gini concentration ratio. Pietra index is twice

the area of the largest triangle which can be inscribed in the area of concentration. Here, the Gini coefficient can be interpreted as twice the area of concentration between the Lorenz curve and the 45 degree line of perfect equality and the Pietra index is twice the area of the largest triangle which can be inscribed in the area of concentration.

2 OBJECTIVE

To study the concentration of rural population in all Taluks of Tamil Nadu state by developing Gini's concentration ratio and Pietra index using probabilistic model.

3 METHOD OF ESTIMATING GINI'S CONCENTRATION RATIO

3.1 LORENZ CURVE

Lorenz Curve is a powerful tool for analyzing the Taluk size concentration. The graph of the function $q = f(p)$ is called Lorenz curve, where p and q are defined as

$$\begin{aligned} p_x &= P[X \leq x] \\ &= \int_{(0,x)} f(x) dx \\ &= \frac{\text{Number of Taluks size} \leq x}{N} \\ q_x &= \frac{\int_{(0,x)} x f(x) dx}{\int_{(0,\infty)} x f(x) dx} \\ &= \frac{\text{Total Population of the Taluks with size} \leq x}{\text{No. of Taluks}} \end{aligned}$$

The Lorenz function $q = f(p)$ was graphed by taking values of p on x axis and the values of q on y -axis with suitable scale. The resulting graph was represented in figures. The line of equal distribution indicates the equality in the distribution of Taluks with respect to their populations. When the Lorenz curve deviates from the line of equal distribution, there will be observed the variations in the TSD. Gini's concentration ratio is a technique used to measure the degree of variation in the TSD.

3.2 GINI'S CONCENTRATION RATIO

Dispersion in the Taluk size distribution is measured by using co-efficient of variation, Relative mean deviation and Gini's concentration ratio. Gini's concentration ratio is an ideal measure for studying the variation in the TSD. A method of developing Gini's concentration ratio is described with probabilistic models.

3.2.1 PARETO MODEL

The Taluk size x is assumed to follow Pareto distribution $f(x;a)$, where $f(x;a)$ is described as

$$f(x;a) = \frac{ax^{*a}}{x^{a+1}}, \quad a > 0, x \geq x^*$$

Where x^* is the threshold Taluk size. Parameters a and x^* are estimated by using the Method of Maximum Likely hood (Rao C.R. 1973)

$$\begin{aligned} \hat{a} &= \left[\frac{\sum \log xi}{n} - \log x^* \right]^{-1} \\ \hat{x} &= \min_{i \leq 1} (xi) \end{aligned}$$

The expressions for p and q are obtained as follows.

$$\begin{aligned} P_x &= F_x(x) \\ &= \int_{x^*}^x \frac{ax^{*a}}{t^{a+1}} dt \\ P_x &= 1 - (x^*/x)^a \end{aligned} \tag{1}$$

$$q_x = \int_{x^*}^x t f(t, a) dt / \int_{x^*}^{\infty} t f(t, a) dt .$$

$$= l_1 / l_2$$

where

$$l_1 = \int_{x^*}^x t f(t, a) dt$$

$$= \int_{x^*}^x \frac{ax^{*a}}{t^{a+1}} dt$$

$$= \left(\frac{a}{a-1} \right) x^* \left[\left(\frac{x^*}{x} \right)^{a-1} - 1 \right]$$

where

$$l_2 = \int_{x^*}^{\infty} t f(t, a) dt$$

$$= \int_{x^*}^{\infty} \frac{ax^{*a}}{t^{a+1}} dt$$

$$= \left(\frac{a}{a-1} \right) (-x^*)$$

therefore

$$q_x = l_1 / l_2$$

$$= \frac{\left(\frac{a}{a-1} \right) x^* \left[\left(\frac{x^*}{x} \right)^{a-1} - 1 \right]}{\left(\frac{a}{a-1} \right) (-x^*)}$$

$$q_x = 1 - \left(\frac{x^*}{x} \right)^{a-1} \quad (2)$$

The function $q = f(q)$ has been obtained by using (1) & (2)

$$1 - p_x = \left(\frac{x^*}{x} \right)^a$$

$$\frac{x^*}{x} = (1 - p_x)^{\frac{1}{a}} \quad (3)$$

$$1 - q_x = \left(\frac{x^*}{x} \right)^{a-1}$$

$$\frac{x^*}{x} = (1 - q_x)^{\frac{1}{a-1}} \quad (4)$$

$$(3) = (4) \Rightarrow (1 - q_x)^{\frac{1}{a-1}} = (1 - p_x)^{\frac{1}{a}}$$

i.e., $1 - q_x = (1 - p_x)^{(a-1)/a}$

Since the TSD is known, $q = f(p)$ is obtained by eliminating x on both sides

$$\text{i.e., } q = 1 - (1 - p)^{(a-1)/a}, \quad 0 \leq p \leq 1$$

The graph of the function $q = f(p)$ is Lorenz curve representing the variation in the size of the Taluks. Gini's concentration ratio is stated as,

$$\rho = \frac{\text{Area between the Lorenz curve and the line of equal distribution}}{\text{Total area under diagonal}}$$

$$\rho = 1 - 2A, \text{ where } A \text{ is the area under the Lorenz curve}$$

$$A = \int_0^1 f(p) dp$$

$$A = \int_0^1 [1 - (1 - p)]^{(a-1)/a} dp$$

$$A = \frac{a-1}{2a-1}$$

$$\rho = 1 - \frac{2(a-1)}{(2a-1)}$$

$$\rho = \frac{1}{(2a-1)}$$

Gini's concentration for Taluk size using Pareto model was developed as

$$\rho = \frac{1}{(2a-1)}$$

3.2.2 EXPONENTIAL MODEL

Let x be the Taluk size and it follows an exponential distribution $f(x, \lambda)$ is described as

$$f(x, \lambda) = \lambda e^{-\lambda x}, x > 0.$$

The parameter λ is estimated by using the Method of Maximum Likely hood

$$i.e., \hat{\lambda} = \frac{1}{\bar{x}}$$

where,

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

Expression for p and q are obtained as follows

$$\begin{aligned} P_x &= F_X(x) \\ p_x &= \int_0^x \lambda e^{-\lambda t} dt \\ p_x &= 1 - e^{-\lambda x} \\ q_x &= \frac{\int_0^x t \lambda e^{-\lambda t} dt}{\int_0^\infty t \lambda e^{-\lambda t} dt} \\ q_x &= \frac{I_1}{I_2} \end{aligned} \tag{1}$$

$$where, I_1 = \int_0^x t \lambda e^{-\lambda t} dt$$

$$I_1 = \frac{\lambda \left[\frac{t e^{-\lambda t}}{-\lambda} \right]_0^x + \frac{1}{\lambda} \int_0^x e^{-\lambda t} dt}{-\lambda}$$

$$I_1 = \frac{1}{\lambda} - \frac{1}{\lambda} e^{-\lambda x} - x e^{-\lambda x}$$

$$\begin{aligned} \text{where } I_2 &= \int_0^\infty t \lambda e^{-\lambda t} dt \\ &= \lambda [t e^{-\lambda t} / (-\lambda)]_0^\infty + \frac{1}{\lambda} \int_0^\infty e^{-\lambda t} dt \\ &= \frac{1}{\lambda} \end{aligned}$$

Therefore, $q_x = I_1 / I_2$

$$\begin{aligned} &= \left[\frac{1}{\lambda} - \frac{1}{\lambda} e^{-\lambda x} - x e^{-\lambda x} \right] / \frac{1}{\lambda} \\ q_x &= 1 - e^{-\lambda x} - \lambda x e^{-\lambda x} \\ q_x &= p_x - \lambda x e^{-\lambda x} \end{aligned} \quad \text{because of (5)}$$

Since the distribution of x is known $q = f(p)$ is obtained by eliminating x

$$i.e., q = p - \lambda e^{-\lambda}$$

Gini's concentration ratio, based on the function $q = p - \lambda e^{-\lambda}$, is obtained as follows.

i.e., $\rho = 1 - 2A$ where A is the area under Lorenz curve.

$$A = \int_0^1 f(p) dp$$

$$= \int_0^1 [p - \lambda e^{-\lambda}] dp$$

$$A = 1/2 - \lambda e^{-\lambda}$$

Therefore, $\rho = 1 - 2(1/2 - \lambda e^{-\lambda})$

$$\rho = 2\lambda e^{-\lambda}$$

Using exponential model, Gini's concentration ratio for rural size was obtained as

$$\rho = 2\lambda e^{-\lambda}$$

3.3 PIETRA INDEX

The Pietra index which can be defined as

$$P_X = \frac{E[|X - E(X)|]}{2E(X)}$$

$$P_X = \frac{M.D}{2E(x)}$$

also has a Lorenz curve interpretation (Pietra, 1932). It can be viewed either as the maximal vertical deviation between the Lorenz curve and the egalitarian line or, equivalently, as two times the area of the maximal triangle that can be inscribed between Lorenz curve and the egalitarian line. The Gini coefficient can be interpreted as twice the area of concentration between the Lorenz curve and 45 degree line of perfect equality. Thus, Pietra Index is less than or equal to Gini Index or Gini Coefficient.

3.3.1 PIETRA INDEX FOR PARETO MODEL

Consider the mean of pareto distribution,

$$\text{Mean}, E(x) = \int x f(x) dx$$

$$= \int_{x^*}^{\infty} x \frac{ax^{*a}}{x^{a+1}} dx$$

$$= ax^{*a} \int_{x^*}^{\infty} \frac{x}{x^{a+1}} dx$$

$$= ax^{*a} \int_{x^*}^{\infty} x^{-a} dx$$

$$\text{(i.e.) Mean} = \frac{ax^*}{a-1}, \quad a > 1 \tag{1}$$

$$\text{Mean deviation about mean (M.D)} = \int_{x^*}^{\infty} \left| x - \frac{ax^*}{a-1} \right| f(x) dx$$

$$\text{Mean deviation about mean (M.D)} = \int_{x^*}^{\infty} \left| x - \frac{ax^*}{a-1} \right| \frac{ax^{*a}}{x^{a+1}} dx$$

$$= 2 \int_{\frac{ax^*}{a-1}}^{\infty} \left[x - \frac{ax^*}{a-1} \right] \frac{ax^{*a}}{x^{a+1}} dx$$

$$= 2ax^{*a} \int_0^{\infty} \frac{t}{\left[t + \frac{ax^*}{a-1} \right]^{a+1}} dt$$

$$= 2ax^{*a} \int_0^{\infty} \frac{t}{\left[\frac{ax^*}{a-1} \right]^{a+1} \left[\frac{t(a-1)}{ax^*} + 1 \right]^{a+1}} dt$$

$$\begin{aligned}
&= \frac{2ax^*}{\left[\frac{ax^*}{a-1}\right]^{a+1}} \int_0^\infty \frac{t}{\left[1 + \frac{t(a-1)}{ax^*}\right]^{a+1}} dt \\
&= \frac{2ax^*}{\left[\frac{ax^*}{a-1}\right]^a} \int_0^\infty \frac{t \left(\frac{a-1}{ax^*}\right)}{\left[1 + \frac{t(a-1)}{ax^*}\right]^{a+1}} dt \\
&= 2a^{(1-a)}(a-1)^a \int_0^\infty \frac{t \left(\frac{a-1}{ax^*}\right)}{\left[1 + \frac{t(a-1)}{ax^*}\right]^{a+1}} dt
\end{aligned}$$

$$i.e., M.D = 2a^{(1-a)}(a-1)^a \int_0^\infty \frac{x}{[1+x]^{a+1}} dx \left(\frac{ax^*}{a-1}\right)$$

$$i.e., M.D = 2ax^*a^{(1-a)}(a-1)^{a-1}\beta(2, a-1)$$

$$i.e., M.D = 2ax^* \left[\frac{a-1}{a}\right]^{a-1} \frac{\Gamma a-1 \Gamma 2}{\Gamma a-1+2}$$

$$i.e., M.D = \frac{2x^*}{a-1} \left[\frac{a-1}{a}\right]^{a-1}$$

$$i.e., M.D = 2x^*(a-1)^{-1} \left(1 - \frac{1}{a}\right)^{a-1} \quad (2)$$

$$Pietra \text{ index}, (p_x) = \frac{Meamdeviation}{2[E(x)]}$$

Using equations (1) and (2) , we get,

$$p_x = \frac{2x^*(a-1)^{-1} \left(1 - \frac{1}{a}\right)^{a-1}}{\left[2 \frac{ax^*}{a-1}\right]}$$

$$(i.e.) p_x = \frac{(a-1)^{a-1}}{a^a}$$

3.3.2 PIETRA INDEX FOR EXPONENTIAL MODEL

Consider the mean of exponential distribution,

$$\begin{aligned}
\text{Mean}, E(x) &= \int x f(x) dx \\
&= \int_0^\infty x \lambda e^{-\lambda x} dx = \frac{1}{\lambda}
\end{aligned}$$

$$\text{Mean deviation about mean}(M.D) = \int_0^\infty \left|x - \frac{1}{\lambda}\right| f(x) dx$$

$$\begin{aligned}
\text{Mean deviation about mean}(M.D) &= \int_0^\infty \left|x - \frac{1}{\lambda}\right| \lambda e^{-\lambda x} dx \\
&= 2 \int_{\frac{1}{\lambda}}^\infty \left[x - \frac{1}{\lambda}\right] \lambda e^{-\lambda x} dx \\
&= 2\lambda \int_0^\infty t e^{-\lambda(t+\frac{1}{\lambda})} dx \\
&= \frac{2}{\lambda e} = \frac{2}{e} S.D
\end{aligned}$$

$$(i.e.). \text{Mean deviation about mean}(M.D) = \frac{2}{e} S.D$$

$$Pietra \text{ index}, (p_x) = \frac{Meamdeviation}{2[E(x)]} \quad (i.e.). \quad p_x = \frac{\left[\frac{2}{\lambda e}\right]}{\left[\frac{2}{\lambda}\right]} = 1/e = e^{-1}$$

EMPIRICAL RESULTS

The populations of all Taluks in Tamil Nadu state as per 2011 census were used for estimating Gini's concentration ratio. Taluks are polytomized into ten classes as per 2011 census classes are I: 0 -28616; II: 28616 – 57232; III: 57232-85848; IV:85848-114464; V:114464-143080; VI: 143080-171696; VII: 171696-200312; VIII: 200312-228928; IX: 228928-257544; X: 257544 – 286160. The TSD for rural male population in Tamil Nadu state has been formulated and presented in table (1)

Table 1. Taluk size distribution of Rural Male Population

Taluk size interval	No. of Taluks
0-28616	15
28616-57232	48
57232-85848	63
85848-114464	40
114464-143080	19
143080-171696	16
171696-200312	10
200312-228928	2
228928-257544	1
257544-286160	1

Since TSD for rural male population has the skew nature, Skew models were used to present the TSD. The Pareto distribution is one of the skew models. It has been proposed to measure the Gini's concentration ratio using the TSD in given table(1).

The estimates of the parameters and Gini's concentration ratio are obtained as follows:

The estimates of the parameter is,

$$\hat{a} = \left[\frac{\sum f \log xi}{\sum f} - \log x^* \right]^{-1}, \text{ where } x^* = \min(x) \text{ and } x = \text{mid value}$$

$$\hat{a} = \left[\frac{1044.98}{215} - 4.15 \right]^{-1} = 1.41$$

$$\text{Gini's concentration ratio, } p = \frac{1}{2a-1} = 0.556$$

$$\text{Pietra index, } p_{x=\frac{(a-1)a^{-1}}{a^a}}$$

$$\text{(i.e.) } p_x = 0.4274$$

Since $p = 0.556$ and $p_x = 0.4274$, this indicates the concentration of the male rural population in Taluk size distribution. The Lorenz curve of the function $q = f(p)$ are drawn by using the cumulative values of p and q . The observed values of p and q and estimated values of p and q are obtained and presented in table (2) and table (3).

Table 2. P and q value based on empirical TSD of rural male population

Taluk size interval	Taluk size X	% cumulative value of x (P)	Observed No of Taluks	% of Cumulative Observed No of Taluks (q)
0-28616	14308	1	15	6.97
28616-57232	42924	4	48	29.3
57232-85848	71540	9	63	58.6
85848-114464	100156	16	40	72.21
114464-143080	128772	25	19	86.05
143080-171696	157388	36	16	93.49
171696-200312	186004	49	10	98.14
200312-228928	214620	64	2	99.07
228928-257544	243236	81	1	99.53
257544-286160	271852	100	1	100

The distribution function of the pareto variable x is stated as follows:

$$F_X(x) = 1 - \left[\frac{x^*}{x} \right]^{\hat{a}}, \text{ Where, } \hat{a} = 1.4; x^* = 14308$$

The value of F(x) are obtained and presented in table (3)

Table 3. P and q value based on expected TSD of rural male population (pareto)

Taluk size X	Distribution function of x (p)	Cumulative No of Taluks Expected	% of cumulative No of Taluks Expected by Pareto Model(q)
14308	0	0	0
42924	0.7852	168.8	79.8
71540	0.8949	192.4	90.96
100156	0.9344	200.8	94.94
128772	0.9539	205.08	96.96
157388	0.9652	207.5	98.10
186004	0.9724	209.06	98.84
214620	0.9774	210.141	99.35
243236	0.9811	210.9	99.71
271852	0.9838	211.5	100

The TSD for rural female population in Tamil Nadu state has been formulated and presented in table (4).

Table 4. Taluk size distribution of Rural Female Population

Taluk size	No.of Taluks
0-28616	14
28616-57232	45
57232-85848	63
85848-114464	43
114464-143080	18
143080-171696	17
171696-200312	12
200312-228928	1
228928-257544	1
257544-286160	1

The estimates of the parameters and Gini's concentration ratio for Taluk size distribution of rural female population are obtained as follows:

The estimates of the parameter is,

$$\hat{a} = \left[\frac{\sum f \log xi}{\sum f} - \log x^* \right]^{-1} \text{ where, } x^* = \min(x) \text{ and } x = \text{mid value}$$

$$\hat{a} = \left[\frac{1047.227}{215} - 4.1556 \right]^{-1} = 1.38$$

$$\text{Gini's concentration ratio, } \rho = \frac{1}{2a-1} = 0.5682$$

$$\text{Pietra index, } p_{x=\frac{(a-1)a-1}{a^a}}$$

$$(i.e) p_x = 0.4439$$

The Gini's concentration ratio, $\rho = 0.5682$ and Pietra index, $p_x = 0.4439$ shows the concentration of the female rural population in Taluk size distribution. The Lorenz curve of the function $q = f(p)$ are drawn by using the cumulative values of p and q . The observed values of p and q and estimated values of p and q are obtained and presented in table (5) and table (6).

Table 5. P and q value based on empirical TSD of rural female population

Taluk size interval	Taluk size X	% cumulative value of x (p)	Observed No of Taluks	% of cumulative Observed No of Taluks (q)
0-28616	14308	1	14	6.51
28616-57232	42924	4	45	27.44
57232-85848	71540	9	63	56.74
85848-114464	100156	16	43	76.74
114464-143080	128772	25	18	85.11
143080-171696	157388	36	17	93.02
171696-200312	186004	49	12	98.60
200312-228928	214620	64	1	99.06
228928-257544	243236	81	1	99.53
257544-286160	271852	100	1	100

The distribution function of the pareto variable x is stated as follows:

$$F_X(x) = 1 - \left[\frac{x^*}{x} \right]^{\hat{a}}, \text{ Where, } \hat{a} = 1.38, x^* = 14308$$

The value of $F(x)$ are obtained and presented in table (6)

Table 6. P and q value based on expected TSD of rural female population (Pareto Model)

Taluk size X	Distribution function of x (p)	Cumulative No of Taluks Expected	% of cumulative No of Taluks Expected by pareto (q)
14308	0	0	0
42924	0.7804	167.7860	79.4065
71540	0.8915	191.6725	90.7111
100156	0.9318	200.3370	94.8116
128772	0.9518	204.6370	96.8467
157388	0.9636	207.1525	98.0372
186004	0.9718	208.7650	98.7993
214620	0.9762	209.8830	99.3294
243236	0.98	210.7	99.7160
271852	0.9828	211.3	100

EXPONENTIAL MODEL

The estimates of parameter for rural male population can be obtained as,

$$\lambda = 0.0000115$$

Gini's concentration ratio, $\rho = 0.000023$

$$\text{Pietra index}, P_x = (2.7174)^{-1} = 0.3680$$

The distribution function of the exponential variable X is stated as follows

$$F_X(x) = 1 - e^{-\lambda x}, \text{ where, } \lambda = 0.0000115$$

The value of F(x) are obtained and presented in table (7)

Table 7. P and q value based on expected TSD of rural Male Population (Exponential Model)

Taluk size	Distribution function(p)	Cumulative No of Taluks expected	% of cumulative No of Taluks Expected by Exponential Model
14308	0.1456	31.3040	15.3312
42924	0.3763	80.9045	39.6230
71540	0.5448	117.1320	57.3655
100156	0.6677	143.5555	70.3064
128772	0.7574	162.8410	79.7515
157388	0.8229	176.9235	86.6484
186004	0.8708	187.222	91.6921
214620	0.9057	194.7255	95.367
243236	0.9311	200.1865	98.0415
271852	0.9497	204.1855	100

The estimates of parameter for rural female population can be obtained as,

$$\lambda = 0.0000118$$

Gini's concentration ratio, $\rho = 0.000024$

$$\text{Pietra index}, P_x = (2.7174)^{-1} = 0.3680$$

The distribution function of the exponential variable X is stated as follows

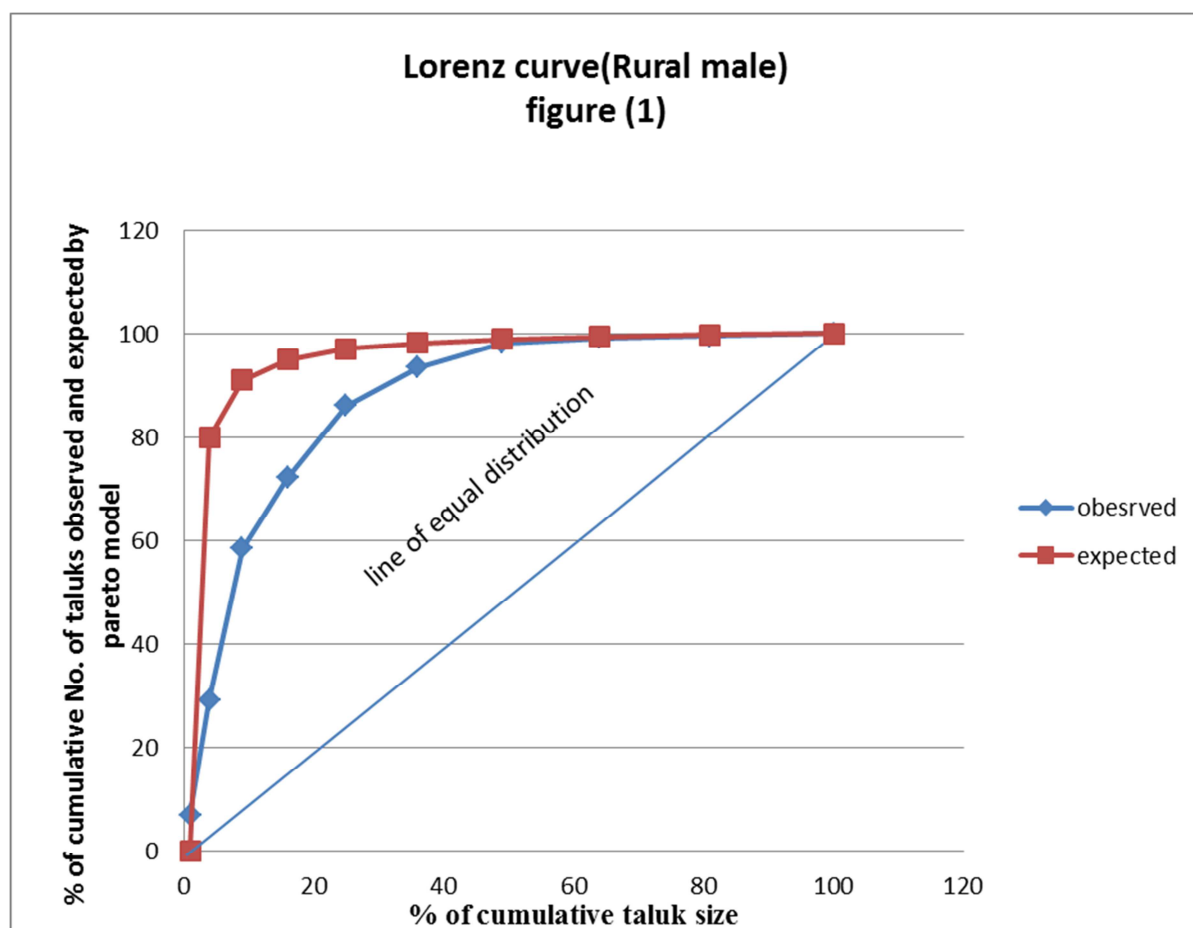
$$F_X(x) = 1 - e^{-\lambda x}$$

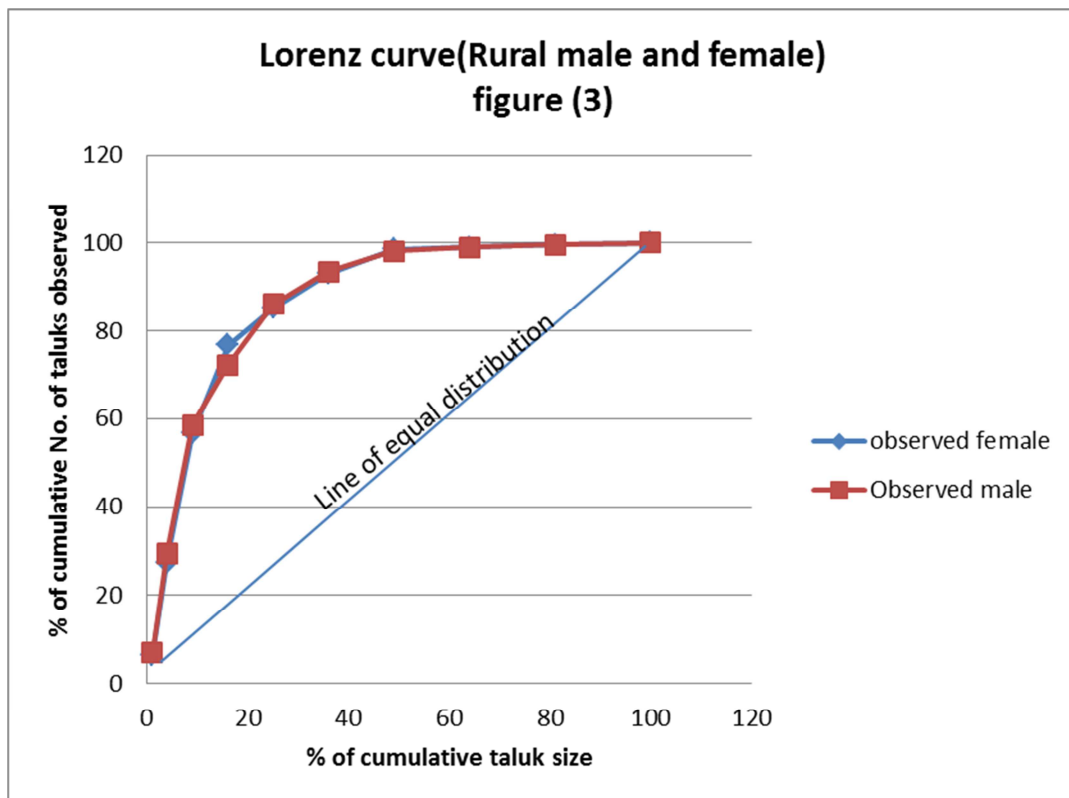
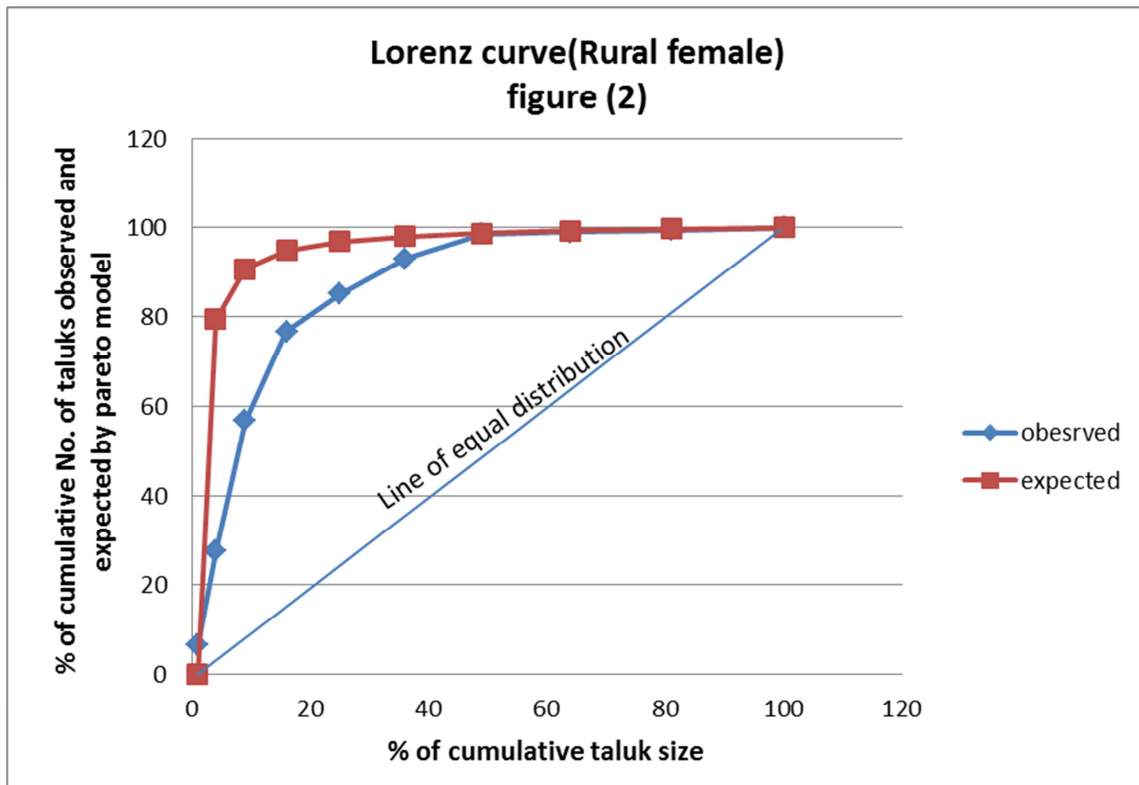
where, $\lambda = 0.0000118$

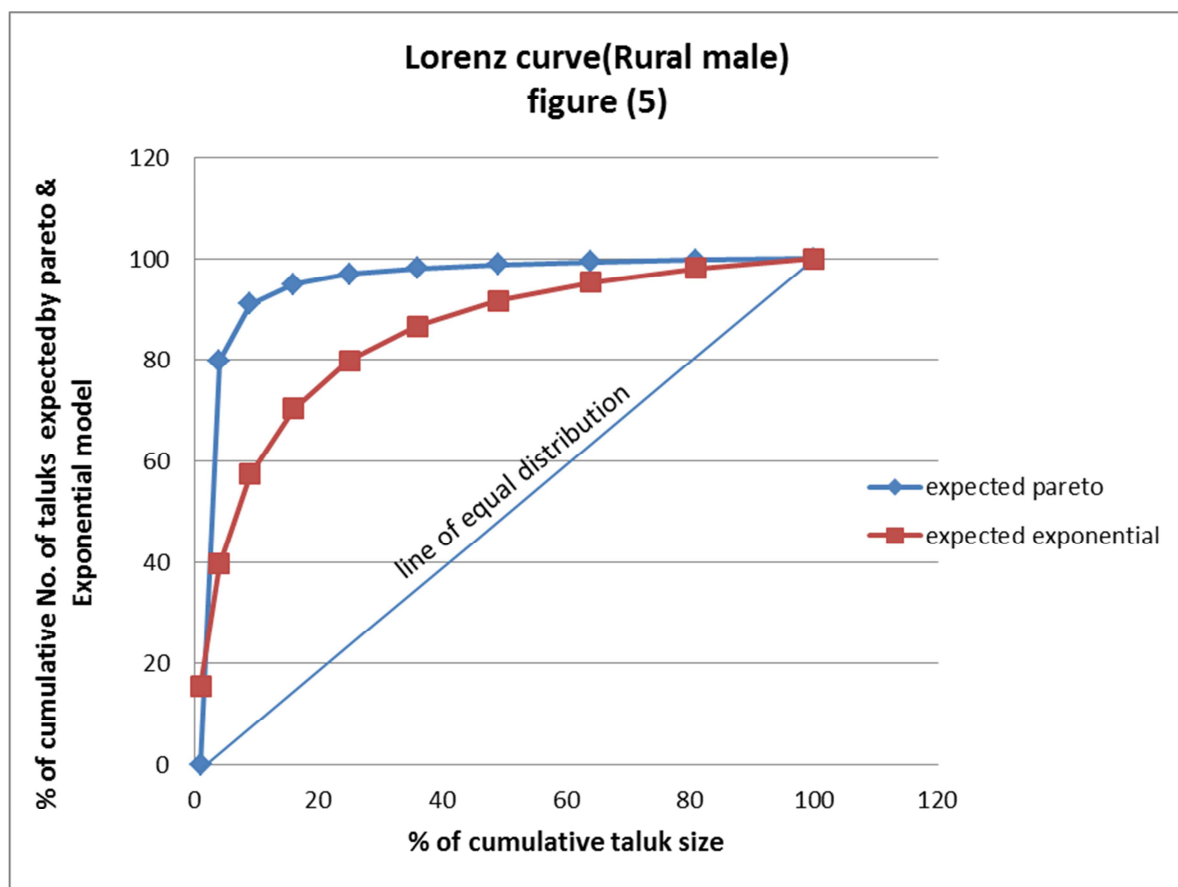
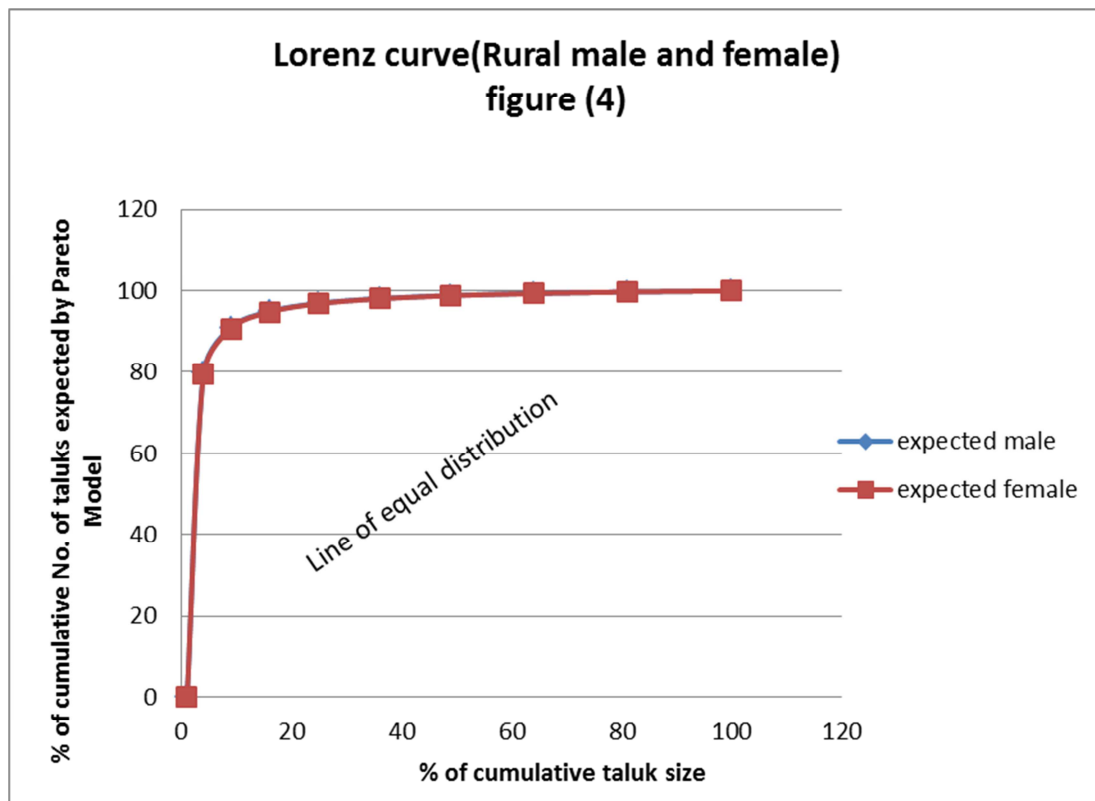
The value of F(x) are obtained and presented in table (8)

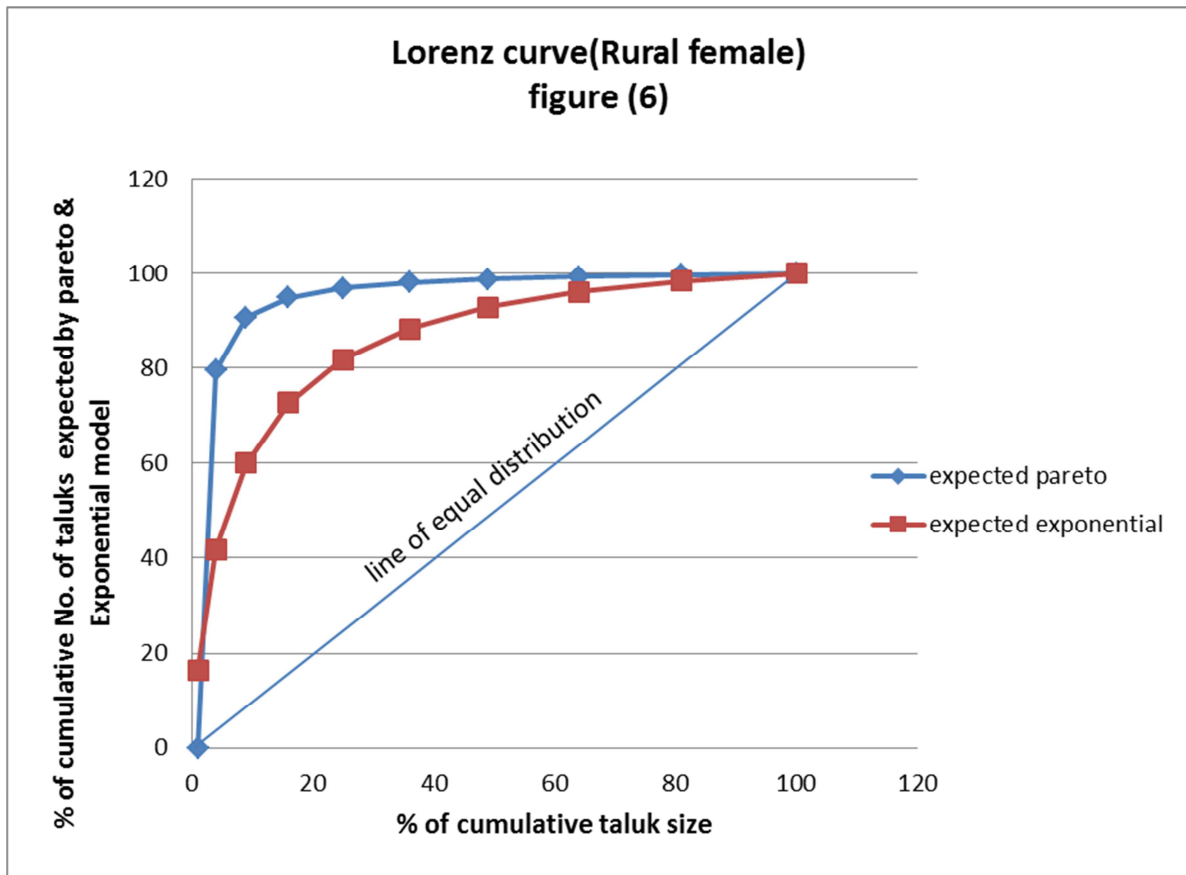
Table 8. P and q value based on expected TSD of rural female Population (Exponential Model)

Taluk size	Distribution function (p)	Cumulative No of Taluks expected	% of cumulative No of Taluks Expected by Exponential Model (q)
14308	0.1578	33.927	16.4084
42924	0.4026	86.559	41.8634
71540	0.5770	124.055	59.998
100156	0.6994	150.371	72.7254
128772	0.7867	169.1405	81.8031
157388	0.8487	182.4705	88.250
186004	0.8927	191.9305	92.8252
214620	0.9239	198.6385	96.0695
243236	0.9460	203.39	98.3675
271852	0.9617	206.7655	100









4 DISCUSSION

The size of rural Taluk population is gradually increasing in nature. It creates the disequilibrium between the existing resources and rural population. Variation in the Taluk size influences the changes in the size and structure of the rural population. Pareto model and Exponential Model were applied to analyse the concentration of Taluk size of rural population using Gini's concentration ratio and Pietra index.

All the revenue Taluks as per 2011 census of India were considered for an empirical study. The results of the study are described as follows.

4.1 ESTIMATES OF THE PARAMETERS-PARETO MODEL

Parameter	Male	Female	Interpretation
x^*	14308	14308	Thresholds level in both the population same.
$\hat{a}$	1.41	1.38	The estimate based on male population is more than the estimate based on female.
Gini's concentration ratio, ρ	0.556	0.5682	The value of ρ for rural female population is greater than the value of ρ for rural male population. It shows TSD for female population has more concentrated than the TSD for male population.
Pietra Index, (P_x)	0.4274	0.4439	The value of P_x for rural female population is greater than the value of P_x for rural male population. It shows TSD for female population has more concentrated than the TSD for male population.

4.2 ESTIMATES OF THE PARAMETERS- EXPONENTIAL MODEL

Parameter	Male	Female	Interpretation
Λ	0.0000115	0.0000118	The estimate based on male population is more than the estimate based on female population.
Gini's concentration ratio, p	0.000023	0.000024	The value of p for rural female population is greater than the value of p for rural male population. It shows TSD for female population has more concentrated than the TSD for male population.
Pietra Index, (P_x)	0.3680	0.3680	The value of P_x for rural male population is equal to the value of P_x for rural female population. It shows that both male and female populations have equally concentrated in TSD.

4.3 BASED ON GRAPH

Figure (1) has been drawn based on p and q values given in table (2) and table (3). It shows that the observed Lorenz curve and the expected Lorenz curve by Pareto are deviated from the line of equal distribution in the case of male population. It indicates the variability in the Taluk size distribution of male population. But the differences between the observed and expected Lorenz curves existed visible level.

The value of p and q given in table (5) and table (6), the figure (2) has been drawn. It shows that the observed Lorenz curve and the expected Lorenz curve by Pareto are deviated from the line of equal distribution in the case of female population. It indicates the variability in the Taluk size distribution of female population. But the differences between the observed and expected Lorenz curves existed visibly.

Figure (3) has been drawn based on p values given in table (2) and table (5). It shows that the observed Lorenz curve for the empirical distribution of both male and female are deviated from the line of equal distribution. It indicates the variability in the Taluk size distribution of male and female population. But there is a little differences between the observed Lorenz curves existed visibly for both male and female population.

Figure (4) has been drawn based on q values given in table (3) and table (6). It shows that the expected Lorenz curves of TSD for male and female population are deviated from the line of equal distribution. But the difference between the two Lorenz curves approaches to zero level.

Figure (5) has been drawn based on q values given in table (3) and table (7). It shows that the expected Lorenz curve of TSD for male population by both Pareto and exponential model are deviated from the line of equal distribution. But expected Lorenz curve by exponential model is close to the line of equal distribution than Pareto model. It indicates the variability in the Taluk size distribution of male population existed visibly and exponential model is more suitable than the Pareto model for the study of variability in Taluk size distribution.

The value of q given in table (6) and table (8), the figure (6) has been drawn. It shows that the expected Lorenz curve of TSD for female population by both Pareto and exponential model are deviated from the line of equal distribution. But expected Lorenz curve by exponential model is close to the line of equal distribution than Pareto model. It indicates the variability in the Taluk size distribution of female population existed visibly and exponential model is more suitable than the Pareto model for the study of variability in Taluk size distribution.

5 CONCLUSION

A study on the concentration of Rural Taluk population of Tamil Nadu State has been studied using Pareto and Exponential model by considering 2011 census. In this study, Exponential model is more suitable than the Pareto model for the study on concentration of rural Taluk size distribution in Tamil Nadu state using Gini's concentration ratio and Pietra index. The concentration of the rural male population in the rural Taluk area is less than the concentration of the rural female population. Because the rural male populations migrate to the nearest cities/urban areas for their employment. The migratory moment of male population to the urban area may be minimized by adapting certain remedial measures such as creating employment opportunity and motivating agricultural activities in rural area.

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Occurrence of Fungi Associated with Stored Wheat Grains (*Triticum aestivum*) in Shashemene and Arsi Negelle Districts, Ethiopia

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ABSTRACT: Storage fungi damage grains in several ways: they reduce germinability, produce undesirable odour and kernel discoloration, reduce the nutritional value and also produce mycotoxins injurious to the health of the consumers. A study was conducted to assess the prevalence of fungi associated with stored wheat grains under the storage conditions of farmers in Shashemene and Arsi Negelle districts from June to July, 2013. Stratified random sampling technique was used to collect wheat grains from the study sites of Arsi Negelle and Shashemene districts. Two peasant associations from each district and 10 House Holders from each of the peasant associations, with a total of 40 House Holders were purposively drawn for sample collection. A Malt Extract and Potato Dextrose Agar were used for the isolation of fungi. Fungi were identified based on the microscopic examination of spore morphology and culture characteristics of the isolates. A total of 898 fungal isolates belonging to five genera and three unidentified taxa were obtained. The isolated mycoflora were dominated by the morphotaxa of *Aspergillus* (45.54%) and *Penicillium* (29.18%), respectively. It was concluded that stored wheat from the study areas could be contaminated by storage fungi and therefore, awareness creation and training should be given to the farmers on better and improved storage techniques.

KEYWORDS: Contamination, Fungi, Prevalence, Wheat - grain

1 INTRODUCTION

Wheat plants at all stages of growth are subject to numerous injuries and stresses, which interfere with their normal functioning and development. Each year about 20% of the wheat that otherwise would be available for food and feed is lost due to diseases [1]. Seed health plays an important role for successful cultivation and yield exploitation of a crop species. Among various factors that affect seed health, the most important are the seed borne fungi that lower seed germination and reduce seed vigor resulting in low yield [2]. Healthy seed plays an important role not only for successful cultivation but also for increasing yield of crop. Seed-borne pathogens of wheat are responsible to cause variation in plant morphology and also reducing yield up to 15-90 % if untreated seeds are grown in the field [3].

Wheat (*Triticum aestivum*) is cultivated worldwide. Globally, it is a food grain with the highest production among the cereal crops after rice [4]. Wheat grain is a staple food used to make flour for leavened, flat and steamed breads; cookies, cakes, breakfast cereal, pasta, noodles; and for fermentation to make beer, alcohol, vodka or even biofuel . Among cereals, wheat grains provide more food to over one thousand million human beings of the earth than any other plant or animal products [5].

The post harvest loss of wheat grain has been found to be the highest during storage [6]. Stored grains can have losses in both quantity and quality. Losses occur when the grain is attacked by microorganisms and other organisms including insects,

mites, rodents and birds [7]. It is therefore, very appropriate to protect wheat grains at all stages of handling, from the time of harvest, through storage, transportation and processing, up to the time they are ready to be consumed [8].

Post harvest spoilage by filamentous fungi (moulds) is one of the most important threats to processed and stored food products worldwide. Discolorations, deterioration in quality, reduction in commercial value and mycotoxin production have been linked to mould contaminated foods [9]. This situation is made worse in the tropics where the warm and humid climates provide these micro-organisms with favourable conditions for their spread and subsequent establishment in numerous substrates. Over sub-Saharan Africa, the phenomenon could be of great concern, especially in areas where food shortages have compelled people to consume low grade food items, even if moulds are visible as contaminants [10].

Post harvest handling of staple grains and the prevailing environmental factors are key determinants of the impacts fungi may have on the grain quality including germinability. It is important to remember that harvested grain and contaminating fungi are alive and respiring slowly even under dry, safe storage conditions [11]. Consequently, they produce metabolites that are toxic to animals and humans under favourable conditions; the ingestion of which poses significant health risks to humans and animals [12].

About 5% of the world's grain harvest is lost during storage but in developing countries such losses may reach 30% or more. Fungi are important causes of such losses, not only through loss of dry matter but also through loss in quality, by decreasing nutritional value and through their ability to produce mycotoxin [13]. In addition, estimated losses of grain, especially of staple food grains in store, from all causes varies widely. They may amount to 10% worldwide [14] but can reach 50% in tropical regions [15].

Three genera, *Fusarium*, *Penicillium* and *Aspergillus*, all potential mycotoxin producers, could be considered the most significant toxigenic fungi growing in processed and stored foods [10]. Due to their capability to develop in a wide range of environmental conditions, fungi in the genus *Aspergillus* are comparatively more widespread than others [16]. Fungal growth and mycotoxin production in cereals is influenced by various factors. Climatic conditions, especially temperature and humidity, play a very important role in this process [17]. Microscopic fungi and their metabolites, mycotoxins, are often found as contaminants in agricultural products before or after harvest as well as during transportation or storage.

In Ethiopia, most of wheat production takes place in relatively cooler areas of Arsi and Bale zones followed by Shashemene and Arsi Negelle districts. In these areas, most of the harvested wheat grains are generally stored in sacks of different sizes and quality. Wheat grains are often contaminated with many kinds of fungal agents before or after harvesting and depending on the storage conditions and prevailing environmental factors. A lot of information is available regarding the mycoflora associated with harvested wheat grains based on reports from several countries including Germany [18]; Nigeria [19]; Poland [20] and Russia [21].

However, information concerning the magnitude of mycoflora associated with stored wheat grains in Shashemene and Arsi Negelle districts is scarce. Furthermore, assessment of the prevalence of the storage fungi associated with wheat grains under the storage conditions practiced by farmers would generate important information. Therefore, this study was conducted to assess the prevalence of fungi associated with stored wheat grains under the storage conditions of farmers in Shashemene and Arsi Negelle districts.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The study was conducted at two geographic locations, namely, Shashemene and Arsi Negelle districts, both of which are located in the West Arsi Zone, Oromia National Regional State.

Shashemene district is bordered by Seraro in the west, Arsi Negele in the north and north east, Arsi zone in the east and Southern Peoples' Regional State in the South and the South East. The district lies within the geographic coordinates of 7° 05' - 7° 19' N and 38° 23' - 38° 41' E. It covers an area of 768.88 km² with the altitudinal range of 500 to 1700m above sea level and the farmers in the district practice mixed crop-livestock production system [22]. The major crops in the district are maize, wheat and barley from among the cereals, horse beans and haricot beans from Pulses and potatoes from vegetables. The district receives an annual rainfall of 700–950 mm, and has an annual temperature range of 12–27°C. The total human population of the district is 285,176 [23].

Arsi Negelle district is bordered on the South by Shashemene, on the southwest by Lake Shala which separates it from Seraro district, on the West, on the North by Adami Tullu and Jido Kombolcha districts with which it shares the shores of Lakes Abijatta and Langano, and on the East by the Arsi Zone. The district lies within longitudes and latitudes of 7° 19'N to 7°

40°N and 38° 30'E to 38° 53'E. Arsi Negelle district lies within the altitudinal range of 500 to 2000m above sea level, and agricultural practices are mainly mixed crop-livestock production system [22]. Maize and wheat are the most important cereal crops grown in the district. It has erratic type of bimodal rainfall. The district receives an annual rainfall of 500-760 mm and an annual temperature of 10-25 °C [23].

2.2 SAMPLING STRATEGY AND SAMPLE COLLECTION

2.2.1 SAMPLING STRATEGY

Stratified random sampling technique was used to collect samples of wheat grains from the study sites of Arsi Negelle and Shashemene districts. Two peasant associations (PAs) from each district namely Edola Burka (EB) and Ebicha (E) of Shashemene district and Ali Wayo (AW) and Adaba Tita (AX) of Arsi Negelle district were selected. The selection of the districts, the PAs and the households (HHs) was based on accessibility and the presence of surplus producing farmers. From each PA, 10 HHs and a total of 40 HHs who were known to produce surplus wheat grains and thus save grains after harvest for at least five to six months were purposively selected for sample collection. The selection of the PAs and HHs in both the districts was facilitated by key informants composed of experts in the respective district offices of Agricultural Development and development agents (DAs) of each PA. PAs that produce wheat as major cereal crop were identified by the key informants.

2.2.2 SAMPLE COLLECTION

Collection of wheat grain samples was conducted from June to July, 2013. In both districts, it was observed that farmers stored their wheat grains in sacks. In each of the PAs, 5% of the storage sacks of each HHs were sampled [24]. The storage sacks for sample collection were randomly selected by the researcher followed by sampling by hand in order to obtain primary samples. Primary samples were obtained by taking handful of grains from the different depths (top, middle and bottom) of the sacks by inserting the hand into the sack with open palm and then closing once at the point of sampling and then withdrawing as closed. The number of primary samples obtained from a HH varied according to the number of storage sacks found in the store of the HH. Sample drawn from the different storage sacks in a HH were combined to form a composite sample from the HH. Then study samples were drawn from the composite sample. Grain samples were collected in air tight plastic sacks immediately upon drawing them in order to prevent alteration of moisture content of the seeds. The samples were transported to the laboratory of Wondo Genet College of forestry and Natural resource and stored at 25°C until analyses were performed.

2.3 MEDIA PREPARATION

Malt Extract Agar (MEA) and Potato Dextrose Agar (PDA) were used to isolate fungi. Before pouring plates streptomycin was added at a concentration of 50 mg /L of the medium to suppress the growth bacteria.

2.4 ISOLATION OF FUNGI

From each grain sample, twenty wheat kernels were randomly picked and surface sterilized in 34% H₂O₂. Before the actual surface sterilization, the kernels were briefly sprayed with 70% ethanol in order to reduce surface contaminants of the kernels. Then, the kernels were transferred to a Petri dish with 34% H₂O₂ for 3 min with constant stirring [25]. Then they were rinsed three times in sterile water followed by blotting on sterile filter paper under aseptic condition. Five surface sterilized seeds were then randomly picked and placed on MEA and PDA. Plates were labeled and incubated upright at 25°C for 6- 10 days to allow growth of fungal colonies on the medium. Plates were inspected daily for the growth of fungi beginning a few days after incubation. Fungi that grew out of each grain were isolated and purified on to sterile plates of MEA and PDA. During isolation, data on the frequency of isolation and sampling site were recorded. Pure cultures of the isolates were maintained on MEA slants at 4 °C.

2.5 IDENTIFICATION OF FUNGI

Identification of the fungal isolates was based upon culture characteristics and spore morphology. The cultural characteristics included the color of the upper and reverse sides of the cultures, mycelial color formation such as green, dark, brown, grey, yellow or other colors, colony diameter, shape of colony margin, mycelial growth patterns such as fluffy aerial

hyphae, appressed or submerged hyphae, formation of aerial hair-like tufts of hyphae. Identification was based on the International manual on the identification of fungi of agricultural and environmental significance [26] were used to provisionally identify the isolates to the genus level. Lacto phenol cotton blue staining solution was used for staining of non-pigmented fungal spore for microscopic examination purpose. Conidial morphological characteristics used for the microscopic identification include origin of conidia, shape and color of the spores, septation, presence or absence of specialized appendages on the spores.

Based on culture characteristics and spore morphology, the isolated fungi were categorized into morphotaxa identified to the genus level, while those which could be separated into distinct groups based on culture characteristics but could not be identified to any of the known genera were recognized as unidentified taxa. Morphotaxa within the genus were designated as morphotaxa 1, 2, 3, etc.

2.6 DATA ANALYSIS AND INTERPRETATION

Data obtained from the research work was presented using tables as percentages. The relative frequency (RF, expressed as a percentage) was calculated as the total number of isolate from a single taxa divided by the total number of isolates from taxa obtained from all seeds incubated [27]. It was used to determine the most frequently isolated taxa among the rest of the taxa.

$$RF = \frac{\text{Number of isolates of a taxon}}{\text{Total number of isolates of all taxon obtained from all incubated seeds}} \times 100$$

3 RESULTS AND DISCUSSION

3.1 GENERA OF FUNGI ISOLATED FROM STORED WHEAT GRAINS

A total of 31 morphotaxa belonging to five genera and three unidentified morphotaxa were identified from the isolates. In relation to their prevalence, the dominant genera were *Aspergillus* (45.54%), followed by *Penicillium* (29.18%), *Alternaria* (12.14%), *Fusarium* (9.69%) and *Bipolaris* (1%), respectively (Table 1). The unidentified morphotaxa were comprised of 21 isolates and accounted for only 2.45% of the total collection of fungi isolated (Table 1).

According to the current study, the most prevalent genus was *Aspergillus* (45.54%) and followed by *Penicillium* (29.18%). This result is in agreement with the study conducted by Simerda [29]. The high prevalence of these genera might be due to their diversified, capacity to grow on all possible substrates and a wide range of temperature and humidity [5]. However, *Bipolaris* and the taxon that remained unidentified were the least prevalent. *Bipolaris* was solely isolated from grain samples collected from the PAs of Shashemene district. *Alternaria* and *Fusarium* were also distributed across all the PAs although their prevalence was more in Shashemene district than in Arsi Nagelle district (Table 1). The variation could be related to the differences in environmental factors. In this regard, Shashemene receives more rainfall and thus more relative humidity in the air and in the store, which preferable for occurrence of *Bipolaris*. Moreover, the PAs that were selected lie towards the highest part of the district and might be more humid and wetter than the lower parts of the Arsi Nagelle district.

3.2 FUNGAL ISOLATES FROM STORED WHEAT GRAINS AND THEIR DISTRIBUTION

The distribution of the storage fungal isolates between the two sampling districts showed that higher number of isolates (558 or 62.14%) were recovered from Shashemene district while lower number of isolates (340 or 37.86%) were obtained from Arsi Nagelle district (Table 1).

Among the PAs of Shashemene district, the highest number of fungal isolates was recovered from Edola Burka (321 or 35.7%) while the lowest number of isolates were obtained from Adaba Tita (167 or 18.04%). At both district and PAs levels, more number of isolates was recovered from Shashemene and its two PAs while lower number was recovered from Arsi Nagelle and its two PAs. Within district variation in terms of the number of fungal isolates was also higher between the two PAs from Shashemene (84) than between those of Arsi Nagelle (16) (Table 1).

The difference in the number of fungal isolates between the two districts could be related to the differences in environmental factors that influence the association of fungi with the grains both in the field and in the store. In this regard, Shashemene receives more rainfall and thus more relative humidity in the air and in the store. Moreover, the PAs that were

selected lie towards the highest part of the district and might be more humid and wetter than the lower parts of the district. On the other hand, Arsi Nagelle receives less amount of precipitation and therefore relatively drier and less humid than Shashemene, thus explaining the lower number of fungal isolates than from Shashemene. Likewise, the PAs of the district selected for sample collection lie relatively at lower elevation and thus drier than sample PAs from Shashemene thereby explaining lower number of isolates recovered; this is concur with the study of [28] as altitude increases diversity also decreases and vice versa.

Table 1. Fungal genera obtained from stored wheat grains collected from the study area

Genera	No of morphotaxa	Origin and distribution of isolates				Total No of isolates	Relative Frequency (%)
		Shashemene		Arsi Negelle			
		Edola Burka	Ebicha	Ali Wayo	Adaba Tita		
<i>Aspergillus</i>	12	122	98	108	81	409	45.54
<i>Penicillium</i>	10	91	85	33	53	262	29.18
<i>Alternaria</i>	5	52	27	25	5	109	12.14
<i>Fusarium</i>	3	37	16	12	22	87	9.69
<i>Bipolaris</i>	1	6	3	-	-	9	1
<i>Unidentified groups</i>	3	12	8	-	1	21	2.45
Total	34	321 (35.7%)	237 (26.4%)	178 (19.82%)	162 (18.04%)	898	
	Total	558 (62.14%)		340 (37.86%)			100

4 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

In this study, a total of 31 morphotaxa of fungi belonging to five genera and three unidentified morphotaxa were identified. The prevalence of the morphotaxa of each genus was highly variable across the districts and PAs that were considered for sample collection. *Aspergillus* and *Penicillium* were the dominant genera of storage fungi, respectively where as *Bipolaris* were the least prevalent encountered on stored wheat grains collected from the study area. Most of the morphotaxa encountered during the current study occurred in more than one PAs while a few were confined to one or two of the sampled PAs. In this regard, Edola Burka of Shashemene district was the most diverse PA. According to the results of this study, it was concluded that stored wheat grain from the study area could be contaminated by storage fungi.

4.2 RECOMMENDATIONS

According to the results of the current study the authors recommended that awareness creation and training should be given to the farmers on better and improved storage techniques. The author also recommended further investigation in this area should look into how the diversity and prevalence of storage fungal communities on stored food grains changes in time and space. Further study should be also focus on the investigation of toxin produced by these storage fungi and in relation to the health status of human being in the study area.

ACKNOWLEDGMENT

Researchers acknowledge to Hawassa University Department of Biology for financial support. They also greatly acknowledge to W/ro Woinshet Afework and Getachow Birhanu for their support during laboratory work.

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Performance Analysis of Proactive OLSR and Reactive DSR, AODV protocols for MANET

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ABSTRACT: Mobile ad-hoc-network is the future network, because it can be developed easily, automatically configurable, flexible and don't depend on any network structure. It means MANET do not need already existing network infrastructure. A routing infrastructure requisite to establish in distributed controlled system. Various protocols for MANETs in routing have proposed and several evaluated work had conducted. A large amount of anticipated routing protocols and estimation made complicated to maintain the expansion and to acquire an impression of the strength and limitations of the protocols. The analyze evaluation techniques from the past and describes common problems to evaluate of routing protocols for MANETs and how to resolve them. A wide-spread MANET protocols have studied. They are categorized according their similarities and their results are deduced and eventually presented. The main goal of the work was to examine the recital of protocols, OLSR that was table driven DSR, AODV discovering average delay in packet sending and receiving, the average number of entries in the routing table: varying suspension time and different amount of nodes. An experiment was conducted to examine the recital of these protocols with OPNET 14.5 and NS2.

KEYWORDS: Average packet transmission delay, throughput, end-to-end delay, OPNET, MANET, FTP.

1 INTRODUCTION

MANET is a wireless network in which nodes are free to move, it do not depends on any infrastructure. In this system nodes automatically configure itself. Someone also called it is a mesh network, due to this reason that all nodes can communicate to each other. MANET network contained nodes, router and communication devices. Wireless devices are transmitter, receiver and antennas. Antenna devices may be of any type and the node also may be fixed or free to move. Here the node term referred to as a moveable node in any direction. Nodes may be a Personal Digital Assistance (PDA), notebook, cell phone or personal computer (PC) etc and location of these nodes might be in cars, airplanes or along with people having such type of devices. These nodes connect each other at random and make any topology and exchange data

with each other. Due to the capability of self configurability of MANET, it can be used in emergency situations like earthquake and in rainy season or flood areas [1].

A MANET is defined as: "MANET do not depend on any infrastructure, in this network, mobile nodes are free to move and work as router, by blending of nodes make a non uniform graph. Because the nodes movement is free, they automatically configure itself, structure changes quickly and it is not predictable. Such a network might be stimulate in stand-alone manner or could be associated to superior Internet. Various attributes such as distributed organizations, multi-hop routing, well structured and inadequate resources etc. Mobile nodes organize association and disconnection the distance among them and the enthusiasm to collaborate through the configuration of medium size networks [2].

1.1 CLASSIFICATION OF ROUTING PROTOCOLS IN ADHOC NETWORK

There are many routing technique in MANET, so these techniques are categorized in proactive, hybrid and reactive according to their behavior. Reactive is called on-demand protocol, due to on demand path is only created and maintain when acquired. Route to source or destination may be destroyed or remain if needed Proactive routing protocol: as well as table driven *i.e.* They keep the information of all routes that are part of the network [3]. As hybrid is mixture of both protocols, so it has combine properties. Example of hybrid is ZRP.

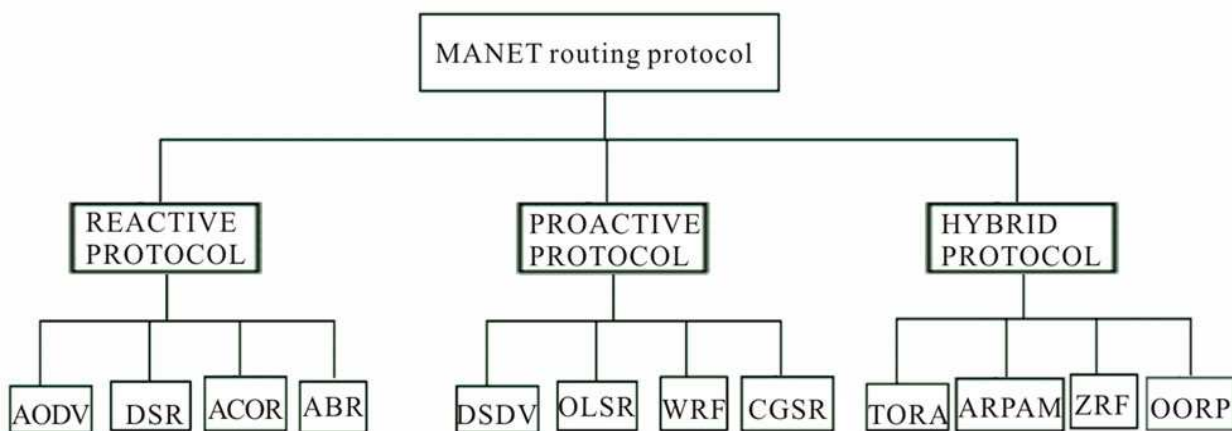


Fig 1: Classification of MANET protocols

1.1.1 OPTIMIZED LINKED STATE ROUTING PROTOCOL

An OLSR is a proactive link state protocol, that link-state protocol select most excellent path by formative a variety of properties as load on link load, holdup, bandwidth etc. These routes are more dependable, stable and precise in determining finest route and more complex that node count. To update topological information in each node that protocol was designed to work autonomously from other protocols. Theoretically, OLSR include three general fundamentals: first one is to find its neighbor, a technique for competent flooding of organizing passage and a condition how to choose and disperse adequate infrastructure information inside the network in order to establish finest routes. OLSR organize a multi-point Relays (MPRs), which reduce the flooding through establish the links of neighbor inside its MPRs as a replacement of other links. It can also be realized in every MANET. OLSR also supports protocol extension such as sleep mode operation, multicast routing etc. there are fundamental message types that must be observed in the OLSR implementation and must maintain compatibility with old implementation if any additional message type is to be implemented in OLSR [4].

1.1.2 DYNAMIC SOURCE ROUTING PROTOCOL

Dynamic Source protocol belongs to the family of reactive routing protocol and named as on-demand protocol, simple and efficient protocol due to source protocol and used in multi-hop ad-hoc network, it is self-governing protocol, two routing techniques used by this protocol, *i.e.* route discovery and maintenance. It periodically keep info up-to-date its cache for new easy routes, and find any new route then send data packet to new one, and packet knows new direction of the route, because the info of the route is set in the packet. This info will help it to avoid the periodic loop, and find route. Two messages are sent for finding new route, route request and route reply. The routing info about the network is maintained at each and every node in their cache, first node take a look in its cache to find the desired route if find then it will not

retransmit the message in the network, and reduce the memory burden, and simply transmit the request packet to the destination, this will be the first packet from sender to destination and it have the complete info about the path, and the node on which route is find will send the reply message to the source, containing the complete info about the route [5].

1.1.3 ADHOC ON DEMAND DISTANCE VECTOR

On-demand protocol, the algorithm use in this protocol easily finds the link status in network whenever change comes. This is explained here through an example, if any link goes down in the network, the notification of down link is only sent to the nodes that are directly affected by the down status of link, and all the routes that are affected by this node will be vanished, and the network usage will be minimum due to the uni-cast traffic. Because routes will be construct on-demand so that traffic overhead will be minimum. AODV definitely will not permit the route information about those routes that are or not in use, vanish them, if any two nodes desire to communicate; it is the AODV responsibility to make a route by multi-hop. It is a loop free that is achieved by destination sequence number (DSN), and also the main feature of the protocol. Whenever a node required route, it send request to its neighbor along with dsn's also sent, containing all information about routing, and select the shortest path that is selected by the dsn's number [6].

2 RELATED WORK

Author[7] discuss performance comparison of DSR and AODV by considering the avg. energy-consumption and routing energy-consumption using NS-2 simulator. Their behavior on graph shows that DSR consumed very low energy when no of nodes in network are less, but AODV use greater energy than DSR. They concluded that the protocols are used in MANET need some exertion that can make the MANET life great and reduce energy-consumptions factors. The author [3] performed the comparison of SEAD and Ariadne protocols, analysis was done on the basis of performance parametric not on the security parameters. Their performance shows that Ariadne give excellent results in all metrics but when pause time was very low SEAD gives excellent results, this is only due to the routing procedure in protocols. SEAD summarized the routing information in the tables that's why it gives remarkable results than Ariadne at low pause time. Ariadne has a notify feature that it has less control overhead than SEAD, therefore it has superior scalability than the SEAD. But Ariadne may face the problem of lengthy delays to find the routes for sending the packets. So Ariadne is not a good for related applications. Their comparison shows that performance depends on the need of routing system.

The author performs the comparison of DSR with DSR using Ant Algorithm. Here the researcher describes the behavior of ant that they find the nearest route from their nest to food. He implements that idea in DSR and named it as DSR-ant. Author fined the results on different implemented scenarios and concludes that ant-DSR give better results than the original DSR. The results shows that ant-DSR give results in the improving terms of source to destination delay, their throughput and the number of nodes that counterpart in the route. Author results shows 48% delay was less than original DSR, 1.37 times less it contains nodes and its throughput was 3.6 times great. There is only the one drawback with ant-DSR was that it have 58 % more overhead than original DSR [8].

Author stated that there are lot of many various types of routing protocols in the MANET. The consideration of using which particular protocol in the MANET depends upon many factors which one should observe like the network size in which they want to use, how much load they require, how much movement of node is, etc. They analyse the three protocols(DSDV,AODV,DSR) by using the NS-2 simulator tool. They consider following parameters to check the QoS (PDR, Avg-Delay, throughput and delay) and conclude the performance of MANET by normalized the routing and MAC load by changing the speed of the nodes. Simulation fallout shows that DSDV that is a proactive protocol and is appropriate when number of nodes are limited and their moving speed is also low due to the storage space of routing information in the routing table at each node. However, DSR utilize source routing and route cache, but there is an overhead in each packet will be increase whenever network infrastructure change. So, DSR is the best suitable for temperate traffic with temperate mobility. For the robust scenario where movement is high, nodes are much in count, the traffic is more, the AODV achieve better among all the protocols that are under consideration. They concluded that the AODV perform well in the all kinds of network but not the best due to some shortcomings in it [9].

Author stated that in the current scenario, MANET has achieve very much significance and reputation in the research. The technique by which recital of MANETs can be estimate is use of various simulation tools. A MANET is fundamentally set of distributed nodes where each and every node whether it is transmit or getting data, acts as host as well as router. It is a dynamic wireless network that can be shaped not including any pre-existing structure. They explained the results which tell about protocols on the foundation of different recital metrics. AODV performs enhanced than DSDV and ZRP on the foundation of limit like routing overhead, average end- to- end delay, network overload and packet. delivery ratio. The

simulation was about three protocols of MANETs by having invariable number of nodes and using different parameters like routing overhead, Average End- to -End delay, Network Overload and Packet .Delivery ratio (PDR). The first three parameters discussed are in favor of AODV and last one is in the favor of ZRP. So, the analysis concludes that AODV is counted better routing protocol from DSDV and ZRP on the basis of the performance metrics used [10].

Author stated that Wireless Mesh Networks is one of the most talented wireless techniques of the future. Its patience factor against the network breakdown, expediency of set-up and administer ability are one of its key reward. Although WMNs are very alike to ad-hoc wireless networks, the structural design and protocols designed for ad-hoc networks carry out very deprived when practical in WMNs. The cause of their deprived recital is that the ad- hoc networks are planned for elevated mobility while the WMNs are planned for either a fixed or partial mobility. WMNs are typically rich in assets distinct ad-hoc wireless networks. One of the main issues in WMNs is the source organization that acting a vital function in any network's recital. The research has primarily paying attention on the assessment of routing protocols to be used in WMNs. Recital parameters that were used for investigation and study are throughput, holdup and network consignment as these are critical for given that assured End-to-End Quality of Service (QoS) [4].

Author [7] stated that estimate the recital of FSR and DSR protocols in QualNet 6.1, that is a simulator tool, by fixing the packet size of 512 Byte. FSR uses the hierarchical table-driven policy whereas DSR uses the reactive on demand routing approach with dissimilar routing methods. They experiential that the on the whole recital of DSR protocol in the simulation showed that DSR achieve better in provisos of Throughput, End-to-End Delay and Jitter in association of FSR protocols. The simulation was the comparison of FSR and DSR with CBR traffic. They also take into count mobility. Their results shows that DSR is more suitable for big mobile networks where movement is sky-scraping .Researcher examined [5]the recital study of OLSR protocol with the help of OPNET simulator. Their analysis was done in the arbitraly moving environment containing 30,40,and 50 nodes and area was 10000 sq m. Their findings was that OLSR has achieve maximum performance in all aspects of the network. [11]presents the comparison analysis of protocols that support video streaming and their performance metrics that they considered in their research were throughput, PDR, wlan delay. Their findings showed that TORA has performed his best in all aspects.

Author presented [12]their work about DSR, under consider the following metrics end-to-end delay, pdr and routing load. Their findings was that DSR performance will be very good when nodes movement will be low and network traffic also will be low.[13] stated the negative aspects of vanet routing protocols. They stated that hybr is an unicast along multipath routing technique, and is a protocol which is topology base and apply where network load or density is very rich. [14]studied the AODV and DSR protocol with the help of qualnet 5.0, is a simulator. Their consideration aim was to examine these protocols by considering the wormhole attack also compare their recital without considering it. Their findings was that by considering wormhole protocols recital goes down. [15] studied the OLSR AODV in vanet using the ns3, that is a simulator. Their findings was that PDR of AODV is very small than the OLSR but OLSR has much better throughput than AODV. However the delay was high than standards delay that was set in simulation as 1.

3 SIMULATION PARAMETERS USED IN OLSR, DSR AND AODV PROTOCOLS SCENARIO

Sim ul a t o r P a r a m e t e r s	
Protocols	OLSR, DSR, AODV
Simulator Model	OPNET 14.5
MAC Protocol	IEEE 802.11
Traffic Type	FTP
Node Speed	10, 20, 30 m/s
Pause Time	100, 200, 300 sec
No of Nodes	15, 30, 45
Topology	Radom Way Point
Simulation Time	3600 sec
Mobility Speed	10 m/s
Area Size X	1500 meters
Area Size Y	1500 meters
Node Mobility	Randomly

Fig 2: Simulation Parameters

3.1 OLSR, DSR AND AODV THROUGHPUT VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the throughput of OLSR, DSR and AODV routing protocols. In the first scenario throughput of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario throughput is observed by varying pause time (10,20, 30 meter per second). The following figure shows the throughput of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the throughput of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

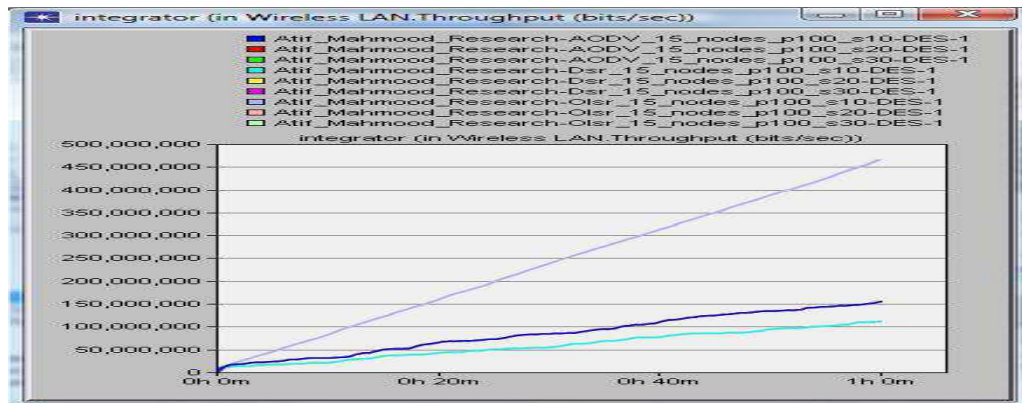


Fig 3: OLSR, DSR and AODV Throughput vs node speed

As shown in fig 3, it is clearly declared by graph that, OLSR throughput is maximum, when node speed is 10 and pause time is 100 seconds.



Fig 4, 5: OLSR, DSR and AODV Throughput vs pause time and no of nodes respectively

As shown in fig 4,5; it is clearly declared by graph that, OLSR throughput is maximum , when number of nodes are 45 in both figures and pause time is 100 seconds and node speed is 10 m/s respectively same in both figures.

3.2 OLSR, DSR AND AODV NETWORK LOAD VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the network load of OLSR, DSR and AODV protocols. In first scenario network load of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario network load is observed by varying pause time (10,20, 30 meter per second). The following figure shows the network load of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the network load of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

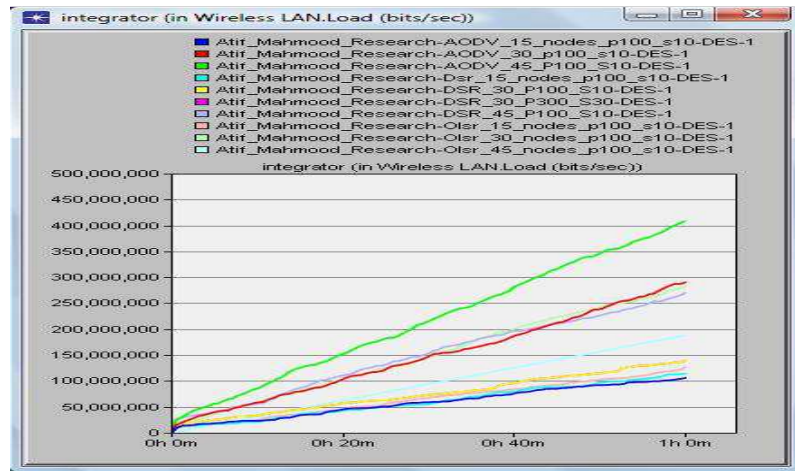


Fig 6: OLSR, DSR and AODV Network Load vs no of nodes

The performance of AODV increases as the nodes increases in count, and the performance of OLSR and DSR are near about same.

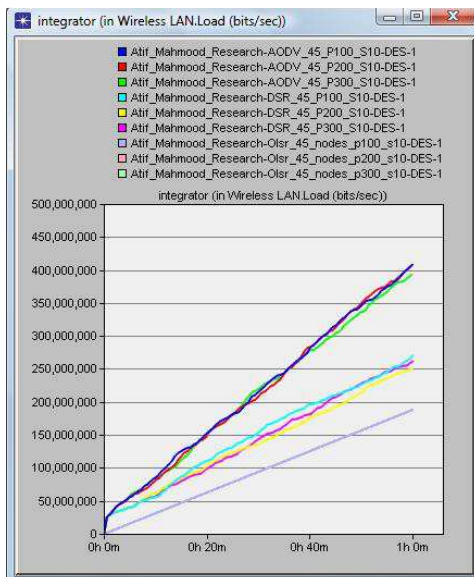


Fig 7: OLSR, DSR and AODV Network Load vs pause time

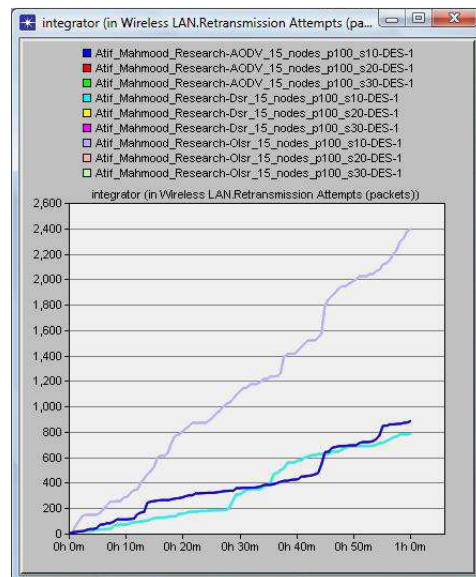


Fig 11: OLSR, DSR and AODV Network Load vs node speed

As shown in figure 7 and 8, it is clear that AODV performance is overlapping in graph versus pause time, and in figure 8 OLSR performance is best with respect to others protocols.

3.3 OLSR, DSR AND AODV RETRANSMISSION ATTEMPT VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the retransmission attempt of OLSR, DSR and AODV protocols. In first scenario retransmission attempt of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario retransmission attempt is observed by varying pause time (10,20, 30 meter per second). The following figure shows the retransmission attempt of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the retransmission attempt of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

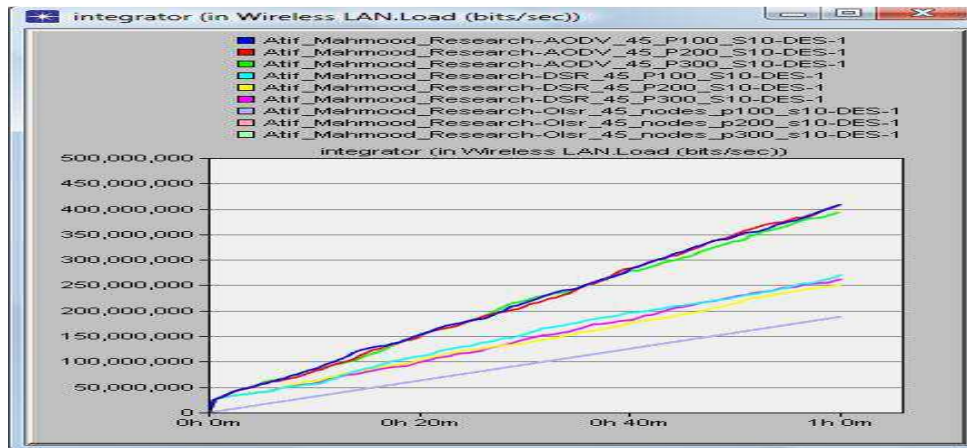


Fig 9: OLSR, DSR and AODV Network Load vs Pause Time

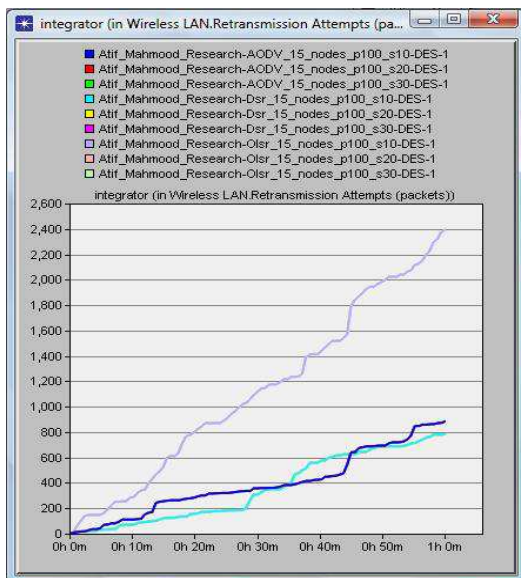


Fig 10: OLSR, DSR and AODV Retransmission Attempt vs Node speed

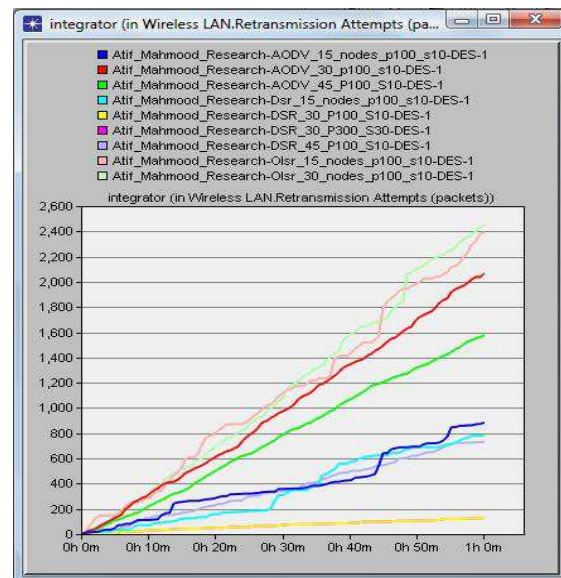


Fig 11: OLSR, DSR and AODV Retransmission Attempt vs # Nodes

Figure shows that the retransmission attempt of OLSR, DSR and AODV. Retransmission attempt is observed by varying nodes speed. The retransmission attempt of AODV is shown in figure by varying nodes speed. It is observed that by increasing nodes speed in the network the retransmission attempt of AODV is decreases. Retransmission attempt is low for high nodes speed.

3.4 OLSR, DSR AND AODV MEDIA ACCESS DELAY VS NODE SPEED, PAUSE TIME AND NO OF NODES

Three scenarios are generated to assess the media access delay attempt of OLSR, DSR and AODV protocols. In first scenario media access delay of OLSR, DSR, and AODV is compared against varying numbers of mobile nodes 15,30,and 45. In second scenario media access delay is observed by varying pause time (10,20, 30 meter per second). The following figure shows the media access delay of OLSR, DSR, and AODV protocol with respect to number of nodes. To analyze the media access delay of OLSR ,DSR and AODV protocol against varying number of nodes from 15, 30 and 45 nodes.

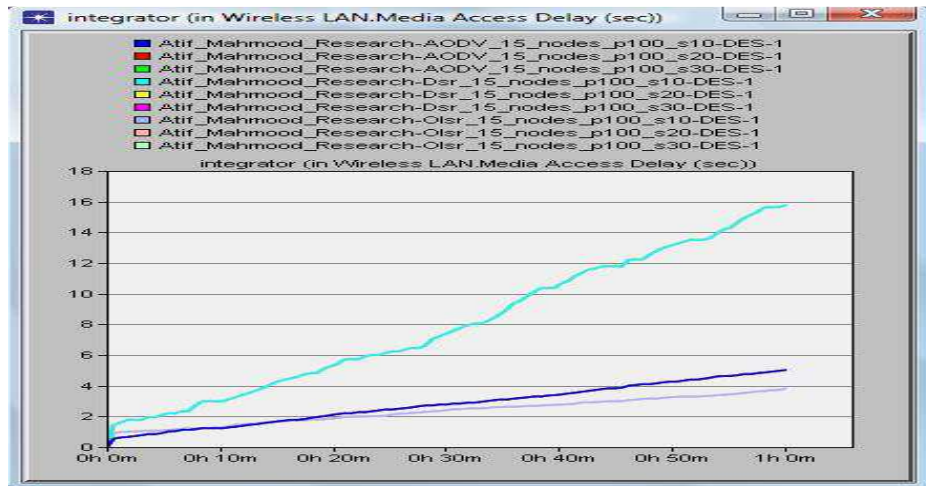


Fig 12: OLSR, DSR and AODV Media Access Delay Vs Node Speed

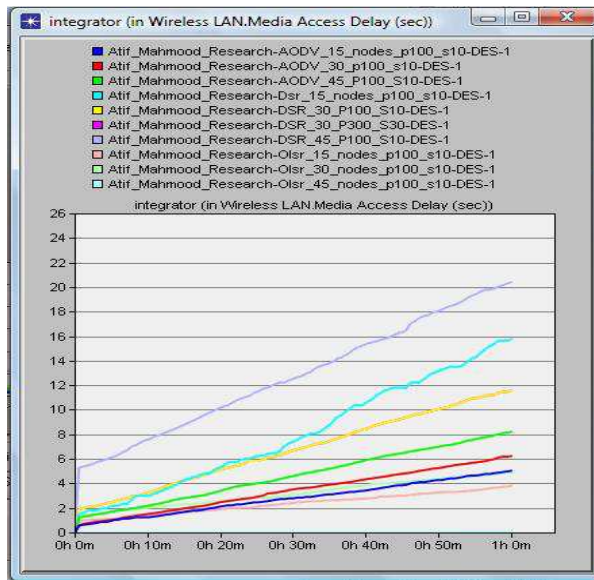


Fig 13: OLSR, DSR and AODV Media Access delay vs no of nodes

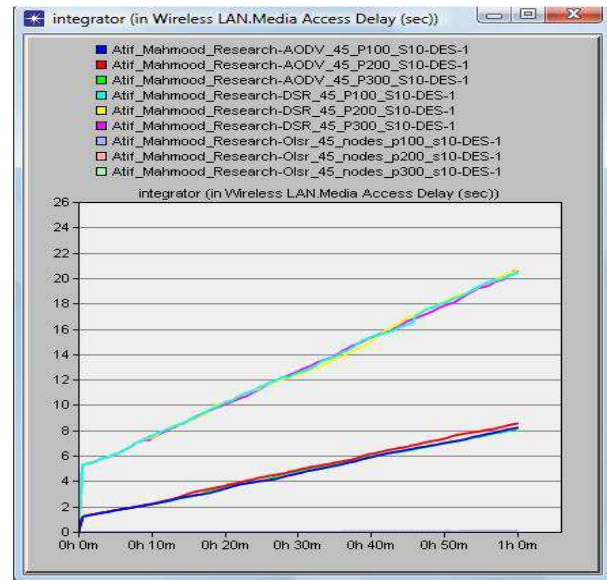


Fig 14: OLSR, DSR and AODV Media Access delay vs pause time

In figure 12 to 14 media access delay is analyzed against various parameters. In figure 12 OLSR perform well, in figure 13 OLSR recital is well when nodes are 45 and in figure 14 OLSR performance overlapping in graph is shown, fist its graph goes towards y-axis then continuously increasing upward toward x-axis.

4 CONCLUSION

Research investigation was based on concrete data concerning functioning and evaluating OLSR, DSR and AODV with OPNET 14.5. MANET being the essentially functional and consistent network for statement with distinctive application, it is essential to examine the recital of proffered MANET routing protocols over FTP traffic. It made a vital position in MANET application. Wireless network encompass an enormous benefit of maintaining huge network infrastructure. In significant section akin to catastrophe, military attacks, flood and hurricane, trembling etc. MANET could be developed easily, automatically configurable, flexible and don't depend on any network structure. It means MANET do not need already existing network infrastructure. A large amount of anticipated routing protocols and estimation made complicated to maintain the expansion and to acquire an impression of the strength and limitations of the protocol. OLSR performance in

throughput regarding all parameters is excellent. In retransmission attempt AODV take maximum network load, and in media access delay scenario DSR performance is excellent.

5 FUTURE DIRECTIONS

This research work may help someone to choose protocol in the MANET. This study may be extended in future for further study with more parameters and protocols, and might develop more complex environments.

ACKNOWLEDGEMENT

Special and many thanks go to my parents and brothers, who support me in every moment of my life. I also thanks to my friends who motivate me and give enormous facilities during my stay in hostel.

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SUSTAINABLE DEVELOPMENT IN THE FIELD OF ENERGY BY PROCESSING RECURRING WASTES IN DIFFERENT WAYS

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ABSTRACT: With the alarming rate of enormous increase in the quantum and diversity of waste materials generated by myriad human activities, and their potentially harmful effects on the general environment and public health, there arises an invariable need of increasing awareness about an urgent need to adopt scientific methods for safe disposal of wastes. While there is an obvious need to minimize the generation of wastes and to reuse and recycle them, the technologies for recovery of energy from wastes can play a vital role in mitigating the problems. Besides, the education on how they can use it for generating a renewable and sustainable source of energy and the ways to generate would become utmost important and mandatory. Besides recovery of substantial energy, these technologies can lead to a substantial reduction in the overall waste quantities requiring final disposal, which can be better managed for safe disposal in a controlled manner while meeting the pollution control standards. So, this direction of research would yield multiple benefits and the world can even end up with a very minimum expenditure on new energy resources. So this paper mainly focuses on the types of wastes that can be processed to energy, and the ways in which it can be processed to energy, which is the ultimate requirement of the world today!

KEYWORDS: waste materials, disposal, renewable, sustainability energy, renewable source.

1 INTRODUCTION

Generally, Waste generation rates are affected by socio-economic development, degree of industrialization, and climate. Again these parameters widely vary across the globe and even across the states and cities in a country. Generally, the greater the economic prosperity and the higher percentage of urban population, the greater the amount of solid waste produced. They are linked as directly proportional. Reduction in the volume and mass of solid waste is a crucial issue especially in the light of limited availability of final disposal sites in many parts of the world. Although numerous waste and byproduct recovery processes have been introduced, anaerobic digestion¹ has unique and integrative potential, simultaneously acting as a waste treatment and recovery process. After reduction in volume, they can readily be classified, pretreated and processed to energy.

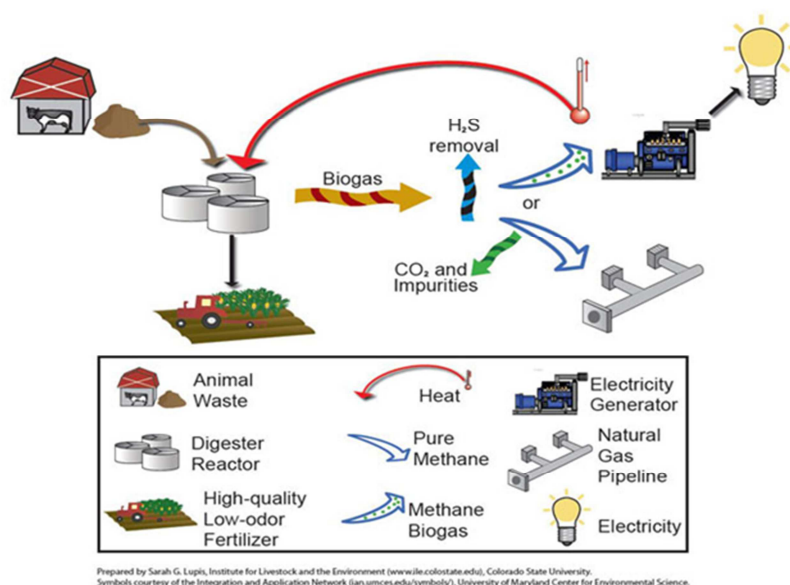


Figure 1 shows anaerobic digestion

2 A GLANCE ON THE TYPES OF WASTES THAT CAN BE USED FOR ENERGY PRODUCTION

2.1 INDUSTRIAL WASTES

The food industry produces a large number of residues and by-products that can be used as biomass energy sources. These waste materials are generated from all sectors of the food industry with everything from meat production to confectionery producing waste that can be utilised as an energy source. Solid wastes include peelings and scraps from fruit and vegetables, food that does not meet quality control standards, pulp and fibre from sugar and starch extraction, filter sludges and coffee grounds. These wastes are usually disposed of in landfill dumps.

Liquid wastes are generated by washing meat, fruit and vegetables, blanching fruit and vegetables, pre-cooking meats, poultry and fish, cleaning and processing operations as well as wine making. These waste waters contain sugars, starches and other dissolved and solid organic matter. The potential exists for these industrial wastes to be anaerobically digested to produce biogas, or fermented to produce ethanol, and several commercial examples of waste-to-energy conversion already exist.

2.2 MUNICIPAL SOLID WASTE (MSW)

Millions of tonnes of household waste are collected each year with the vast majority disposed of in landfill dumps. The biomass resource in MSW comprises the putrescibles, paper and plastic and averages 80% of the total MSW collected. Municipal solid waste can be converted into energy by direct combustion, or by natural anaerobic digestion in the landfill. At the landfill sites the gas produced by the natural decomposition of MSW (approximately 50% methane and 50% carbon dioxide) is collected from the stored material and scrubbed and cleaned before feeding into internal combustion engines or gas turbines to generate heat and power. The organic fraction of MSW can be anaerobically stabilized in a high-rate digester to obtain biogas for electricity or steam generation.

2.3 SEWAGE

Sewage is a source of biomass energy that is very similar to the other animal wastes. Energy can be extracted from sewage using anaerobic digestion to produce biogas. The sewage sludge that remains can be incinerated or undergo pyrolysis to produce more biogas. Figure 2 shows MSW digester.

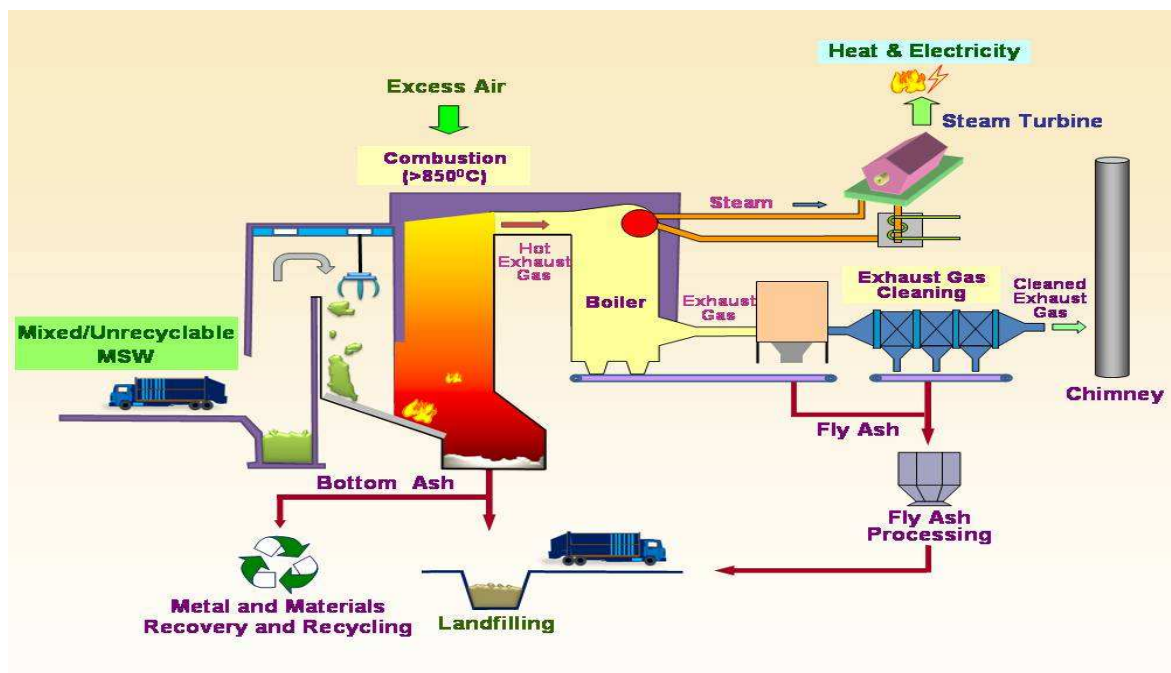


Figure 2.

2.4 BLACK LIQUOR

Pulp and Paper Industry is considered to be one of the highly polluting industries and consumes large amount of energy and water in various unit operations. The wastewater discharged by this industry is highly heterogeneous as it contains compounds from wood or other raw materials, processed chemicals as well as compound formed during processing. Black liquor can be judiciously utilized for production of biogas using anaerobic UASB technology.

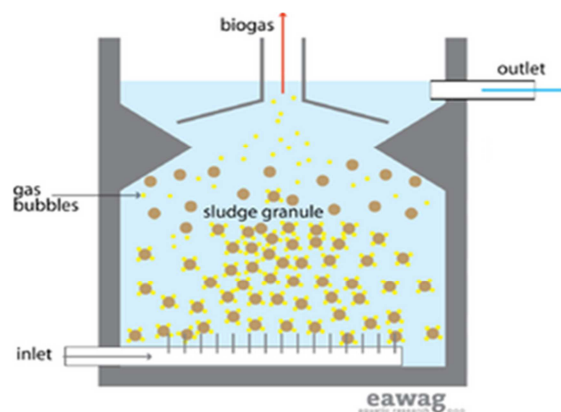


Figure 3. shows UASB reactor.(Upflow Aerobic Sludge Blanket reactor)

2.5 AGRICULTURAL RESIDUES

Large quantities of crop residues are produced annually worldwide, and are vastly underutilised. The most common agricultural residue is the rice husk, which makes up 25% of rice by mass. Other residues include sugar cane fibre (known as bagasse), coconut husks and shells, groundnut shells, cereal straw etc. Current farming practice is usually to plough these residues back into the soil, or they are burnt, left to decompose, or grazed by cattle. A number of agricultural and biomass studies, however, have concluded that it may be appropriate to remove and utilise a portion of crop residue for energy production, providing large volumes of low cost material. These residues could be processed into liquid fuels or combusted/gasified to produce electricity and heat. The waste may also be incinerated to energy.

2.6 ANIMAL WASTE

There are a wide range of animal wastes that can be used as sources of biomass energy. The most common sources are animal and poultry manures. In the past this waste was recovered and sold as a fertilizer or simply spread onto agricultural land, but the introduction of tighter environmental controls on odour and water pollution means that some form of waste management is now required, which provides further incentives for waste-to-energy conversion. The most attractive method of converting these waste materials to useful form is anaerobic digestion which gives biogas that can be used as a fuel for internal combustion engines, to generate electricity from small gas turbines, burnt directly for cooking, or for space and water heating. Food processing and abattoir wastes are also a potential anaerobic digestion feedstock.

2.7 SUGAR INDUSTRY WASTES

The sugar cane industry produces large volumes of bagasse each year. Bagasse is potentially a major source of biomass energy as it can be used as boiler feedstock to generate steam for process heat and electricity production. Most sugar cane mills utilise bagasse to produce electricity for their own needs but some sugar mills are able to export substantial amount of electricity to the grid.

2.8 FORESTRY RESIDUES

Forestry residues are generated by operations such as thinning of plantations, clearing for logging roads, extracting stem-wood for pulp and timber, and natural attrition. Wood processing also generates significant volumes of residues usually in the form of sawdust, off-cuts, bark and woodchip rejects. This waste material is often not utilized and often left to rot on site. However it can be collected and used in a biomass gasifier to produce hot gases for generating steam.

3 FACTORS AFFECTING ENERGY RECOVERY FROM WASTE

The two main factors which determine the potential of recovery of energy from wastes are the quantity and quality (physico-chemical characteristics) of the waste. Some of the important physico-chemical parameters requiring consideration include:

1. Size of constituents
2. Density
3. Moisture content
4. Volatile solids / Organic matter
5. Fixed carbon
6. Total inerts
7. Calorific value

Often, an analysis of waste to determine the proportion of carbon, hydrogen, oxygen, nitrogen and sulfur (ultimate analysis) is done to make mass balance calculations, for both thermochemical and biochemical processes. In case of anaerobic digestion, the parameters C/N ratio (a measure of nutrient concentration available for bacterial growth) and toxicity (representing the presence of hazardous materials which inhibit bacterial growth), also require consideration.

3.1 SIGNIFICANCE OF WASTE-TO- ENERGY (WTE) PLANTS

While some still confuse modern waste-to-energy plants with incinerators of the past, the environmental performance of the industry is beyond reproach. Studies have shown that communities that employ waste-to-energy technology have higher recycling rates than communities that do not utilize waste-to-energy. The recovery of ferrous and non-ferrous metals from waste-to-energy plants for recycling is strong and growing each year. In addition, numerous studies have determined that waste-to-energy plants actually reduce the amount of greenhouse gases that enter the atmosphere.

Nowadays, waste-to-energy plants based on combustion technologies are highly efficient power plants that utilize municipal solid waste as their fuel rather than coal, oil or natural gas. Far better than expending energy to explore, recover, process and transport the fuel from some distant source, waste-to-energy plants find value in what others consider garbage. Waste-to-energy plants recover the thermal energy contained in the trash in highly efficient boilers that generate steam that can then be sold directly to industrial customers, or used on-site to drive turbines for electricity production. WTE plants are highly efficient in harnessing the untapped energy potential of organic waste by converting the biodegradable fraction of the

waste into high calorific value gases like methane. The digested portion of the waste is highly rich in nutrients and is widely used as bio fertilizer in many parts of the world.

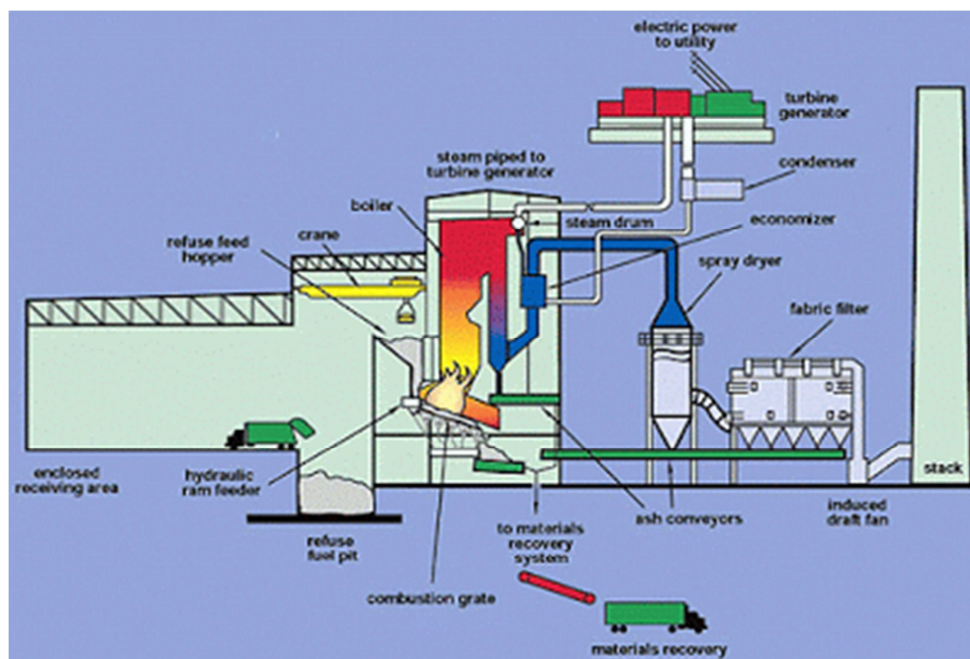


Fig 3. A typical waste to energy plant.

3.2 WASTE-TO-ENERGY AROUND THE WORLD

To an even greater extent than in the United States, waste-to-energy has thrived in Europe and Asia as the preeminent method of waste disposal. Lauding waste-to-energy for its ability to reduce the volume of waste in an environmentally-friendly manner, generate valuable energy, and reduce greenhouse gas emissions, European nations rely on waste-to-energy as the preferred method of waste disposal. In fact, the European Union has issued a legally binding requirement for its member States to limit the land filling of biodegradable waste.

According to the Confederation of European Waste-to-Energy Plants (CEWEP), Europe currently treats 50 million ton of wastes at waste-to-energy plants each year, generating an amount of energy that can supply electricity for 27 million people or heat for 13 million people. Upcoming changes to EU legislation will have a profound impact on how much further the technology will help achieve environmental protection goals.

4 WAYS TO PROCESS WASTE INTO ENERGY

A host of technologies are available for realizing the potential of waste as an energy source, ranging from very simple systems for disposing of dry waste to more complex technologies capable of dealing with large amounts of industrial waste. There are three main pathways for conversion of organic waste material to energy – thermo chemical, biochemical and physicochemical.

4.1 THERMO CHEMICAL CONVERSION

Combustion of waste has been used for many years as a way of reducing waste volume and neutralizing many of the potentially harmful elements within it. Combustion can only be used to create an energy source when heat recovery is included. Heat recovered from the combustion process can then be used to either power turbines for electricity generation or to provide direct space and water heating. Some waste streams are also suitable for fueling a combined heat and power system, although quality and reliability of supply are important factors to consider.

Thermo chemical conversion, characterized by higher temperature and conversion rates, is best suited for lower moisture feedstock and is generally less selective for products. Thermo chemical conversion includes incineration, pyrolysis and gasification. The incineration technology is the controlled combustion of waste with the recovery of heat to produce steam

which in turn produces power through steam turbines. Pyrolysis and gasification represent refined thermal treatment methods as alternatives to incineration and are characterized by the transformation of the waste into product gas as energy carrier for later combustion in, for example, a boiler or a gas engine.

4.2 BIOCHEMICAL CONVERSION

The bio-chemical conversion processes, which include anaerobic digestion and fermentation, are preferred for wastes having high percentage of organic biodegradable (putrescible) matter and high moisture content. Anaerobic digestion is a reliable technology for the treatment of wet, organic waste. Organic waste from various sources is composted in highly controlled, oxygen-free conditions circumstances resulting in the production of biogas which can be used to produce both electricity and heat. Anaerobic digestion also results in a dry residue called digestate which can be used as a soil conditioner.

Alcohol fermentation is the transformation of organic fraction of biomass to ethanol by a series of biochemical reactions using specialized microorganisms. It finds good deal of application in the transformation of woody biomass into cellulosic ethanol.

4.3 PHYSICO-CHEMICAL CONVERSION

The physico-chemical technology involves various processes to improve physical and chemical properties of solid waste. The combustible fraction of the waste is converted into high-energy fuel pellets which may be used in steam generation. Fuel pellets have several distinct advantages over coal and wood because it is cleaner, free from incombustibles, has lower ash and moisture contents, is of uniform size, cost-effective, and eco-friendly.

5 CONCLUSIONS

Energy conversion plants offer two important benefits of environmentally safe waste management and disposal, as well as the generation of clean electric power. Waste into energy facilities produce clean, renewable energy through thermochemical, biochemical and physicochemical methods. The growing use of waste-to-energy as a method to dispose off solid and liquid wastes and generate power has greatly reduced environmental impacts of municipal solid waste management, including emissions of greenhouse gases. Waste into energy conversion reduces greenhouse gas emissions in two ways. Electricity is generated which reduces the dependence on electrical production from power plants based on fossil fuels. The greenhouse gas emissions are significantly reduced by preventing methane emissions from landfills. Moreover, energy conversion plants are highly efficient in harnessing the untapped sources of energy from a variety of wastes.

An environmentally sound and techno-economically viable methodology to treat biodegradable waste is highly crucial for the sustainability of modern societies. A transition from conventional energy systems to one based on renewable resources is necessary to meet the ever-increasing demand for energy and to address environmental concerns.

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CHICKEN FEATHER MEAL AS BIOFUEL AND HYDROGEN CARRIER

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ABSTRACT: It is known that around 11 billion pounds of waste from poultry industry accumulates every year, we also have endless appetite for chicken and other poultry products. The feathers cannot be just kept only in pillows, but we need to utilize it as under grade feed for animal. An environmentally safe process is created for converting feather meal of chicken into biofuel. It is also found that feather meal consists of blood, innards apart from processed chicken feather. So, this way of research, would save much of the fuel input cost for many industries, by using the chicken feather as their energy input. It is a multi beneficial way of processing them into biodiesel, because we have significantly huge amount of feather every year and it's also found protein rich and easy to convert into fuel form. In this paper we preliminarily discuss how chicken feather meal is processed further. Also we will discuss how it may be considered having a potential for an alternative energy in different forms. Apart from using it as energy, how can we use it for other value added products such as holdup of hydrogen, is also discussed.

KEYWORDS: Biofuel, Chicken feather meal, Innards, Poultry, Protein.

INTRODUCTION

Today the world is in demand of energy. The more the development takes place, the more will be the energy requirements. According to International energy outlook 2013, world energy consumption will grow by 56 percent between 2010 and 2040. Every countries development is measured in the quantum of energy it produces and uses for its industries and domestic purposes. Thus finding the alternate and new energy resources right from now would be of great help. One such kind of the source is Chicken feather meal. It can be processed to biofuels or it can even be used for other energy sources. It can be best understood from the below passages.

PROCESS SCHEME OF PROCESSING CHICKEN



PICTURE SHOWING STAGES OF CONVERSION OF CHICKEN FEATHER TO FEATHER MEAL

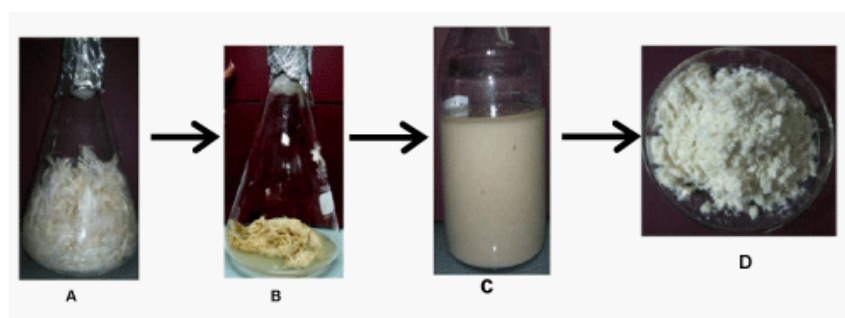


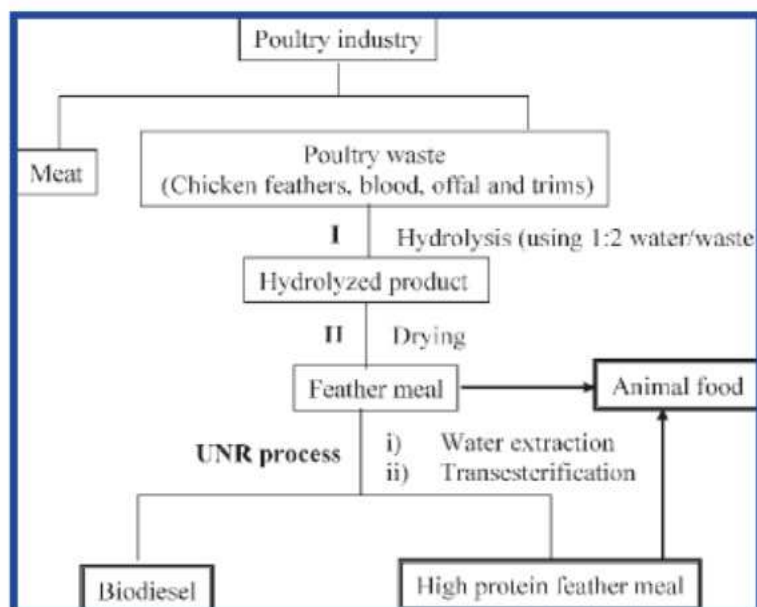
Figure 3: Various step of conversion of feather to feather meal.

A. 25g feather before pre-soaking and boiling, **B.** Feather after pre-soaking and boiling, **C.** Feather meal after 12h with 12,000U enzyme treatment, **D.** Dried feather meal.

SIGNIFICANCE OF CHICKEN FEATHER MEAL AS A RAW MATERIAL FOR BIODIESEL

Chicken feather meal is processed at higher temperatures with steam, and it can be used as animal feed and also as fertilizer. It has high percentage of protein and nitrogen. Earlier, the focus wasn't there on the 12% fat content of the chicken feather meal. Later it is concluded that feather meal has potential as an alternative, for the production of biofuel and also it's a non-feed stock for it. Fat is extracted from chicken feather meal using boiling water and later it is processed into biodiesel. Additionally there are two advantages of extracting fat from feather meal, It provides both a higher-grade animal feed besides a better nitrogen source for fertilizer applications.

Schematic representation of biodiesel production from poultry waste



11

SOME INTERESTING STATISTICS

By statistics, if we consider feather meal produced from the poultry each year, we could produce a huge sum of 153 million gallons of biodiesel per year in the U.S, and accordingly 593 million gallons across the world. There is a significant amount of cutoff of the energy resource, which otherwise might be spent on fossils and non-renewable energy sources, which ultimately have impact on environment. So, it's two way benefit to us and the environment. It also contains stronger and more absorbent keratin fiber compared to wood, which is a valuable fossil.

USES OF THE FEATHER

Another interesting thing is that, carbonized chicken feathers which bear resemblance to highly versatile and small carbon nanotubes, which can be utilized to store hydrogen for fuel-cell vehicles. Observably, we notice that very tiny natural sponges of chicken feathers have a huge weight advantage over metal hydride storage.

In addition, feathers can also be used to manufacture a variety of products such as storm resistant roofing materials, car parts and computer circuit boards .

APPLICATION OF CHICKEN FEATHER AS HYDROGEN STORAGE TANKS

Hydrogen, the most common element in the universe, has been considered as a clean and abundant energy alternative to fossil fuels for many years. But its physical characteristics make it very difficult to store and transport .It takes 40 times as much space as gasoline when pressurized .In liquid state, it needs to be kept at extremely low temperatures.

The problem with hydrogen as a gas or liquid is its density is too low. Using currently available technology, it only drives a mile, if you have a 20-gallon tank and filled it with hydrogen at typical room temperature and pressure. Carbonized chicken feathers works well for hydrogen storage.

Carbonized chicken feather fibers holds the potential of improving drastically existing methods of hydrogen storage and would pave the way for the practical development of a truly hydrogen-based energy economy. Chicken feather fibers are mostly composed of keratin, which is a natural protein that forms strong, hollow tubes. When they are heated, this protein creates crosslinks, which strengthen its structure, and becomes more porous, finally increase its surface area. The Ultimate result is carbonized chicken feather fibers. They can absorb as much or even more hydrogen than carbon nanotubes or metal hydrides.

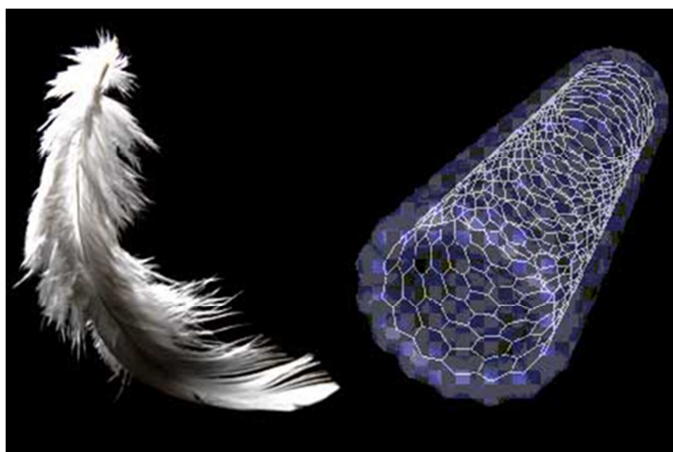


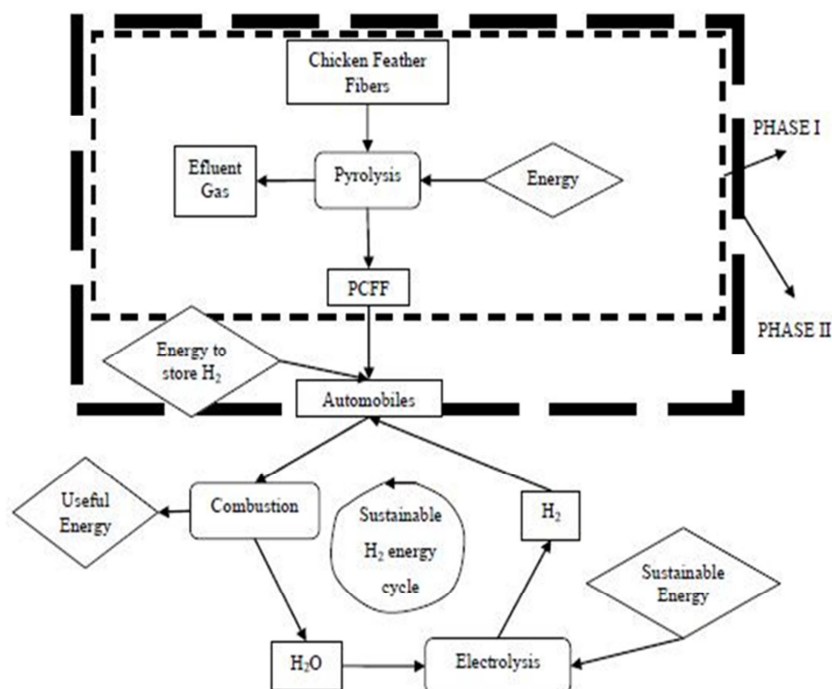
Fig. shows the transformation of feather to nano tube.

Pyrolysis process is applied to the chicken feather meal, during which a very high heat without combustion in the absence of oxygen is applied. Those yielded fibers “that are micro-porous, very thin and hollow inside like carbon nanotubes. They formed at 350 degrees Centigrade, and collapsed above 500 C. perfect temperature is yet to be found.

Added advantage of this process is that no lack of chicken-feed is observed, cause of fiber which is taken from the central quill part, which leaves the fluffy feathers available to force-feed livestock. The produced fiber is exceptionally cheap, and the gas tank equipment weighs around \$200 on your pocket.

Using carbonized chicken feathers would only add about \$200 to the price of a car. By comparison, to make a 20-gallon hydrogen fuel tank that uses carbon nanotubes which could cost \$5.5 million; one that uses metal hydrides could cost up to \$30,000. Roughly, it would take around 75-gallon tank to go 300 miles in a car which uses carbonized chicken feather fibers to store hydrogen. The range is still yet to be improved.

In addition to hydrogen storage, chicken feather fibers find numerous applications into a number of other products including hurricane-resistant roofing, lightweight car parts and bio-based computer circuit boards.



Flow sheet showing chicken feather to hydrogen storage.

CONCLUSION

As we can see there is a huge scope for this branch to further grow up bringing new trends and economical technologies, which would serve the nation, by helping to switch over to biodiesel driven vehicles. They also provide cheaper alternative for hydrogen fuel hold up, which cuts the cost of metal hydride fuel tank drastically. On a long run these can prove very useful applications. Apart from using this, it also finds it's applications in bio based switch boards, light weight car parts, Hurricane resistant roofing, etc. So, we need to rely more on natural waste to make most of the bio materials form the nature.

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Silkworm Production and Constraints in Eastern Tigray, Northern Ethiopia

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ABSTRACT: Sericulture is an agro based industry, playing an important role in community of the world. An assessment was conducted to assess the silkworm production and identify the major constraints for silkworm rearing in eastern Tigray from February to May, 2014. Primary data on type of silk worm, food (host) plants of silkworm used, annual income and major constraints were collected from silk worm rears using semi structure interview. Two types of silk worms were identified namely, mulberry and eri silk worms. Mulberry silk worm was more adapted to the study area. The main food or host plants were mulberry for mulberry silkworm and castor for eri silk worm, respectively. The average annual silk production ranges from 100 to 500 kg of silk. Mulberry silkworm produces higher kilograms of silk and income per year than eri silkworm. The major constraints were lack of food or host plants, drought, lack of knowledge such as training, lack modern house, lack of market availability, lack of governmental and nongovernmental support, lack wide area, lack of silk worm production materials and seasonal environmental condition fluctuation. Despite all the constraints, the area has great potential for silk production. Therefore, the people should be aware on silk worm farming and the government also fulfills the facilities for high potential of silk production at regional and federal level.

KEYWORDS: Constraints, host plant, silk, silkworm, Tigray, Ethiopia.

1 INTRODUCTION

Silk is a functional term used to describe protein fibers that are secreted by arthropods. It is a natural protein fiber and is very soft, lustrous, smooth, strong and durable than any natural or artificial fibre [1]. Silkworm can be taxonomically classified as Phylum: Arthropoda, Class: Insecta, Order: Lepidoptera, and Family: Bombycidae, Saturniidae, Lasiocampidae, Thaumatopodidae, etc [2]. According to Jolly *et al* [3] there are about 80 species of silkworms. Silks worms can be broadly classified as mulberry silkworms and wild or non mulberry silkworms. Mulberry sericulture deals with production of mulberry silk from domesticated silkworm *Bombyx mori* which significantly dominate the international silk trade. However, non-mulberry sericulture is universally known as forest or wild sericulture and deals about silk produced from wild silk producing moths from different lepidopteran families. Eri, tasar and muga are some of the non-mulberry silks produced from non mulberry or wild silkworms [2].

Many countries have been involved in sericulture industry development and more than half of these countries are situated in Asia and more than 85% of raw silk is produced by the five major silk producing countries such as China, India, Uzbekistan, Brazil and Thailand [4]. Silk has been used for textiles for thousands of years in Africa too [5, 6]. The potential of the African indigenous silk moth species for wild silk production has been well documented in Nigeria [7], Uganda [8] and Kenya [9] and other central and southern African countries.

Silk played an important role in the social and religious life of Ethiopia from the earliest days of the Kingdom of Axum [10]. The silk was imported in large quantities from India, Arabia and China and stored in vast caverns in the central highlands of Ethiopia [10]. Ethiopia is granted with diversified climate, vegetation and topography [11, 12] and this is also true for diversified options of sericulture industry which are adopted on different vegetation (for rearing of silk-worms) and different species of silkworms. However, there were no known records of silk being produced in the country until 1930's. In 1930s,

however, the Italians realized the suitability of climatic condition for rearing of silk worm and availability of necessary resource [12].

Later on, visits paid by expatriate professionals also confirmed the immense potential of the country for silk production and sericulture project was reinitiated jointly by Ethiopian Institute of Agricultural Research and Ministry of Science and Technology in early 2000's and an exciting opportunity for producing silk came in to re-emergence with the introduction of eri and mulberry silkworms from different countries [10]. However, most researchers revealed that eri silkworm is very suitable for Ethiopian conditions due to different reasons such as its hardness, disease resistant, having short production cycle (46 days) and etc. As a result a silk production from eri silkworm is commonly practiced in Ethiopia [10, 13]. However, currently the people of country develop awareness to rare both the domestic and wild types of silkworms extensively for high silk production. Particularly in Tigray region there are private and small and micro enterprises participated in raising silkworm as a main agricultural sector. But, the expected income from this sector is not obtained due to different constraints. Therefore, this study was conducted to assess the silkworm production and major constraints in Eastern Tigray, Northern Ethiopia.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The study was conducted from February to May, 2014 in Eastern zone of Tigray region which is located in Northern part of Ethiopia 850 Km far from Addis Ababa, the capital city of Ethiopia and 40 Km far from Mekelle, the capital city of Tigray regional state. The rain fall of this area is bimodal with short rain season occurring between February and April and long rain season from June to August. It's the maximum and minimum annual rain fall is 1200 mm to 500 mm, respectively. The annual temperature is 35 to 25 degree celsius. Agriculture is the main occupation of the people of the area and silkworm production is not widely used but recently the people are introduced silkworm production as a source of income. In eastern Tigray such as in Adigrat, Wukro, and Hawzen towns silk production is extensively practiced.

2.2 DATA COLLECTION AND ANALYSIS

Primary data were collected through the semi structure interview with the silkworm rears (silkworm keepers) of Adigrat, Wukro, and Hawzen silk production areas. Data on type of silkworm owned, type of food or host plants of silk worm used, annual income, and major constraints of the silk worm production were conducted. The collected data was analyzed using manually then the result was presented by using tables.

3 RESULT AND DISCUSSION

3.1 TYPE OF SILK WORM AND FOOD PLANTS

Silkworm rearing is the recent widely spread practice in the farming communities of the study area. The study was identified two types of silk worms namely, mulberry and eri silkworms (Table 1). Mulberry silkworm was more adapted to the environmental condition of the area. But according the previous information mostly eri silkworm was more practiced in different part of Ethiopia [10, 14]. However, recently mulberry silkworm is become more practiced and adapted to the situation of the country and it delivers a great silk than the eri silkworm. This might be due to characteristics of the mulberry silk worm, which is mostly domesticated where as eri silk worm is forest or wild silkworm [2, 15]. In addition to this people of the country also increased his awareness to rear the silkworms domestically, which is favorable to mulberry silk worm.

Mulberry and caster plants were identified as the major food plants of the silkworms in the area (Table 1). Mulberry was the host plant for mulberry silk worm while caster leaves for eri silk worm. The availability of food or host plant has a great role for increasing the production potential of silk worm [13].

Table 1. Type of silkworm and food plants in Eastern Tigray, Northern Ethiopia, 2014.

Type of Silkworm	Status	Food plant
Mulberry Silkworm	Well adapted	Mulberry
Eri Silkworm	Partially adapted	Caster

3.2 SILK PRODUCTION POTENTIAL

The average annual silk production potential ranges from 100 to 500 kg of silk (Table 2). The price of 1 kg silk was on average 165 and 100 Ethiopian birr (ETB) (8.5 and 5.1 USD) from mulberry and eri silkworms, respectively. Mulberry silk worm produces higher kilograms of silk and income per year than eri silk worm. This might be due to the well adaptability of mulberry to the environmental condition of the area. It is estimated that a silkworm rears could get about 61,000 ETB (3,128 USD) gross benefit annually from mulberry silk worm while 20,000 ETB (1,025 USD) from eri silkworm. Silk worm rearing contributes to the income of individuals and the economy of the country. Silk production through silk rearing could be a useful avenue for improving economy [2].

Silk production potential of the area is very low as compared with other parts of the world [4, 6]. This might be due to the ecological variation, rearing capacity or farming technique, awareness of people and availability of food plants to silk worms.

Regarding to the annual silk production potential among the study area, the higher was produced in Hawzen while the lower in Adigrat and Wukro silk production areas. This variation might be due to rearing or farming and other facilities variations among the silk production areas for instance in Hawzen, this sector is governed by Millennium Village Project and this project may deliver different facilities that support (helps) for high production of silk where as Adigrat and Wukro are private sectors. The higher silk production potential in Hawzen area might be due to availability of different silk production facilities like the presence of available food plant, silk worm production material, best farming techniques and other factors that contribute for high production of the silk.

Table 2: Annual silk production and income of silk worm in eastern Tigray, Northern Ethiopia, 2014

Area	Type of silk worm	Silk Production /one time (kg)	Production cycle / year	Silk production / year (Kg)	Price of silk / 1kg	Annual Birr (ETB)
Adigrat	Mulberry	100 – 150	2 x	200 – 300	150	30,000 - 45,000
	Eri silk	50 – 60	2 x	100 – 120	70	7,000 - 8,400
Hawzen	Mulberry	150 – 250	2 x	300 – 500	180	54,000 - 90,000
	Eri	100 -130	2x	200-260	130	26,000 - 33,800
Wukro	Mulberry	100 – 120	2 x	200 – 240	150	30,000 - 36,000
	Eri	50 – 70	2 x	100 – 140	70	6,000 – 8,400

ETB = Ethiopian Birr, USD = USA Dollar

3.3 CONSTRAINTS OF SILKWORM RARING

According to respondents the major silkworm rearing constraints were lack of food or host plants, drought, lack of knowledge such as training, lack modern house, lack of market availability, lack of governmental and nongovernmental support, lack wide area, lack of silk worm production materials and seasonal environmental condition fluctuation such as temperature decreases up to less than 10⁰c especially from October to January, which allows leaving of plant leaf (Table 3). These problems may lead to poor quality and low amount of silk production. Because of the absence of food plant and lack silkworm farming knowledge the silk production potential of the silk worms are being affected. Despite the high rainfall in the area, silkworms produce silk twice per year and this finding is similar with different finding in different part of the world [4, 6, 13].

Most of constraints were common in Adigrat and Wukro silk production areas. This might be due to lack of governmental and nongovernmental support and consequently the silk production potential is also very low.

Table 3: Major constraints of silkworm production in Eastern Tigray, Northern Ethiopia, 2014

Constraints	Rank
Food plant	1
Drought	2
Knowledge (skilled man)	3
Modern house	4
Market	5
Financial support	6
Wide area	7
Silk production material materials	8
Others	9

4 CONCLUSION AND RECOMMENDATION

In the present study two types of silk worms namely, mulberry and eri silk worms were identified and mulberry silk worm was more adapted to the area. The main food or hosts were mulberry for mulberry silkworm and castor for eri silk worm, respectively. Mulberry silk worm produces higher kilograms of silk and income per year than eri silkworm. The major constraints were lack of wide area, food plant, silk worm production material, drought, modern house, knowledge and training, market, governmental and nongovernmental institutions that deliver support. Despite all the constraints, there are many opportunities and potential to increase production and quality of silk products in the area. The government and other concerned bodies need to have deliver training on silk worm farming, financial support to the private silkworm rears, make conducive conditions for market and alleviate the other major constraints for high production potential of silk at regional and federal level.

ACKNOWLEDGEMENTS

Researcher acknowledges the support of Adigrat University for material assistance and very grateful to the silkworm rearing communities for their very kind support. Researcher also grateful to Tigist Gedefa for field assistant.

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Cysticercosis bovis in Eastern Tigray, Northern Ethiopia

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ABSTRACT: Taeniasis is an important worldwide food borne parasitic disease. A cross sectional study was conducted on 540 bovine species from October 2012 to March 2013 to determine prevalence and associated risk factors of cysticercosis at Adigrat Municipal Abattoir. The overall prevalence of cysticercosis was 5.73% (29). Infection prevalence of cysticercosis was significantly associated with age, body condition and breed of cattle ($P < 0.05$). Infection rate of cysticercosis with respect to age group showed that higher prevalence was in cattle 5 and above years (8.47%) than below 5 years (2.96%) ($\chi^2 = 7.949$, $p = 0.003$) and infection rate with respect to body condition revealed the highest prevalence (13.5%) was in poor followed by medium and good body condition scores 4.6 and 1.66%, respectively ($\chi^2 = 23.1$, $p = 0.000$). Related to breed of cattle highest prevalence (6.31%) was in Holstine – Fresian followed by local (5.2%) and barka breeds (4.91%) ($\chi^2 = 0.211$, $p = 0.036$). However, no significant variation was observed with related to sex of cattle ($p > 0.05$). Heart (35.56%) was the most infected organ by large number of cysts followed by tongue (23.3 %), masseter muscle (14.4 %), tricept muscle (10 %), liver (8.8 %) and tight muscle (7.7%), respectively. In conclusion, results obtained from this study confirm that cysticercosis is a health problem in cattle in the study area. Therefore, it is necessary to establish appropriate strategy for prevention and controls.

KEYWORDS: Adigrat abattoir, Prevalence, Cattle, *Cysticercosis bovis*, Risk factors.

1 INTRODUCTION

Bovine cysticercosis is disease name given to the condition caused by the zoonotic tapeworm *Tania saginata* (*T.saginata*) [1]. The larval stage of *T. saginata* occurs in musculature of cattle while the adult stage occurs in intestine of man causing taeniasis. The life cycle of the parasite, *T. saginata* involves humans and cattle the final and intermediate hosts, respectively [2]. An infected animal releases gravid segments that are shed by the adult fall to ground and release eggs on the ground. Eggs are immediately infective when passed. Animals acquire infection from ingestion of segments and eggs contaminating herbage or in faeces commonly herbivores while grazing. Most incidents in cattle arise as a result of direct exposure to proglottids shed from farm workers, but there have been some reports of large scale outbreaks resulting from sewage-contaminated feed or forage [3]. The clinical effect of cysticercosis on infected animals is generally not significant but it is economically important as it causes carcass condemnation arising from heavy infestation with the cysticercosis of *T. saginata* as well as the cost of inspecting meat, the necessity to freeze or boil infected meat and losses may also occur from restriction of live animal and animal products [4]. In Ethiopian cysticercosis was identified as a major health problem and production losses in domestic ruminants. Several studies have been conducted on the epidemiological distribution of bovine cysticercosis in different parts of Ethiopia [5, 6 7]. However, the prevalence of bovine cysticercosis with respect to host related risk factors is limited in Adigrat. Therefore, this study was undertaken to determine prevalence and associated risk factors of cysticercosis in cattle slaughtered at Adigrat municipal abattoir.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The study was conducted from October 2012 to March 2013 in Eastern zone of Tigray, called Adigrat abattoir. The wereda has different agro-ecological areas namely sub moist dry, sub moist cool and sub dega. The annual rain fall ranges from 400-

600mm and the minimum and maximum temperature ranges from 6-21.8 °C with an altitude of 2000-3000 meter above sea level. In the study area the maximum rain fall occurs from mid June up to September and between March and May but the minimum rain fall occurs from April to May. The farming system is mixed farming system; crop cultivation and animal husbandry similar to that of most Ethiopian husbandry system [8].

2.2 STUDY ANIMAL

The study was conducted on 540 cattle slaughtered in Adigrat Municipal Abattoir which originates from neighboring localities and various grazing areas of the region. All the cattle breeds presented for slaughter were selected for the study by random sampling method. Most of the cattle's were local breeds, while some are barka and holstine –fresian breeds.

2.3 SAMPLE SIZE

The required sample size was calculated according to [9].

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where, "n" is required sample size, "z" is standard value, "p" is expected prevalence and "d" is desired absolute precision. At 95% confidence interval $z = 1.96$ and $d = 5\%$. Since no previous study was carried in the study area and the expected prevalence value was considered to be 50%. Accordingly, it was 384. However, to increase the level of accuracy of determining the prevalence the sample size was increased to 540.

2.4 STUDY METHODOLOGY

2.4.1 ANTE-MORTEM EXAMINATION

Three days visit per week was made for ante mortem and postmortem examination of slaughtered cattle. Age, breed, sex and body condition of each study animals was recorded on prepared format paper. Body scoring of the cattle was made based on the guideline provide by [10]. Each scoring were given number from 1(L-, very lean) to 9 (F+, very fat) and finally included under three body condition scores poor, medium and good. Age determination was carried by means of their dentition as described by [11].

2.4.2 POST MORTEM EXAMINATION

After the cattle slaughtered, careful examination on the carcass of individual cattle was made through palpation of the organs followed by incision to examine for the presence *Cysticercus* cysts following the methods described by ministry of agriculture[12] as follows; the surface and substance of tongue was examined visually, following by longitudinal incision of the under surface. Each the masseter muscles (both left and right) was incised make cuts parallel to the jaw bone from the lower jaw. The pericardium and heart were examined visually and followed by incision lengthwise the left ventricle and intraventricular septum so exposing for examination of *C. bovis*. The muscles of diaphragm were examined visually and by making incision. Examination of kidney, liver, and the lung was also conducted accordingly. Cysts observed in theses organs were carefully dissected and numbers of cysts in each organ was recorded for each animal.

2.5 STATISTICAL ANALYSIS

Data were coded and stored in to Microsoft excel and analyzed by using SPSS version 20. The prevalence was calculated as the number of positive samples divided by the total number of examined samples. Chi-square (χ^2) test was used to assess the association between the prevalence of *C. bovis* and host related risk factors such as sex, age, breed and body score of the animals. P value < 0.05 was considered as significant.

3 RESULTS

3.1 PREVALENCE OF CYSTICERCOSIS

The survey considered in this study reported that a total of 540 cattle were slaughtered in Adigrat municipal abattoir during the study period from October 2012 to March 2013. From the total examined cattle, 5.73% (29) were found to be infected with cysticercosis. Infection prevalence of cysticercosis was significantly associated with age, body condition and

breed of cattle. Infection rate of cysticercosis with respect to age group showed that higher prevalence was in cattle above 5 years (8.47%) than below 5 years (2.96%) ($\chi^2 = 7.949$, $p = 0.003$) and infection rate with respect to body condition revealed that the highest prevalence (13.5%) was in poor followed by medium and good body condition scores 4.6 and 1.66%, respectively ($\chi^2 = 23.1$, $p = 0.000$). Related to breed of the cattle the highest prevalence (6.31%) was in Holstine –Fresian followed by local (5.2%) and barka breeds (4.91%) ($\chi^2 = 0.211$, $p = 0.036$). However, no significant variation was observed with related to sex of cattle ($p > 0.05$) (Table 1).

Table 1. Prevalence of *C. bovis* and related risk factors

Category	No of examined	Prevalence (%)	χ^2	p
Age				
< 5 years	304	9 (2.96)	7.949	0.003
> 5 years	236	20(8.47)		
Sex				
Male	525	28(5.338)	0.51	0.378
Female	15	1(6.6)		
Body Score				
Poor	126	17(13.5)	23.1	0.000
Medium	174	8(4.6)		
Good	240	4(1.66)		
Breed				
Barka	61	3(4.91)	0.211	0.036
Holstine- Fresian	95	6(6.31)		
Local zebu	384	20(5.2)		

Heart (3.51%) was the most frequently infected organ followed by tongue (2.6%), masseter muscle (1.85%), tricept muscles (1.66%), liver (1.3%) and tight muscles (0.92%), respectively (Table 2). Anatomical distribution cysts in different organs revealed that the highest number of cysts were found from heart (35.56%) followed by tongue (23.3%), masseter (14.4%), tricept muscles (10%), liver (8.8%) and tight muscles (7.7%) (Table 2). No cyst was recorded from the lung and diaphragm.

Table 2. Distribution of *C. bovis* cyst in inspected organs

Infected organ	No of positive (%)	Total cyst count (%)
Masseter	10 (1.85)	13(14.4)
Tight muscles	5 (0.92)	7(7.7)
Liver	7 (1.3)	8(8.8)
Tongue	14 (2.6)	21(23.3)
Triceps	9 (1.66)	9(10)
Heart	19 (3.51)	32(35.56)
Lung	-	-
Diaphragm	-	-
Total	64(11.85)	90(100)

4 DISCUSSION

The present study revealed that the overall prevalence of cysticercosis in cattle slaughtered at Adigrat municipal abattoir was 5.73%, which is comparable to the prevalence of 4.4% reported from Jimma[5], 7.5% from Addis Abeba[13], 8.2% from Tigray region[14], 6.7% from Kombolcha Abattoir[15]. However, it was higher than the reported prevalence of 3% in Zeway [16], 3.6% in Addis Abeba [17], 2.98% in Nekemte [6], and 2.93% in Jimma abattoir [18].

The prevalence of cysticercosis bovis in this study was relatively lower as compared with previous reports from different abattoirs of Ethiopia, such as 11.3% from Wolaita Soddo[19], 22.9% from Hawassa municipal abattoir [20], 26.25% from Southern Ethiopia [21] and from other countries 16% from Upper Egypt [22] and 72.2% from Nigeria [23]. The variation of prevalence in different study sites may be due to variations in personal and environmental hygiene, religion, culture and feeding habits of the population and their production systems [5]. The difference in prevalence rate could also attributed

due to the limitation of conventional method of meat inspection which is less sensitive to pick all animals that are infected with *T. saginata* metacestodes. Observations indicated that except for dead and degenerated cysts which form white and fibrotic lesions viable cysts pass to human consumption without being detected due to careless meat inspection as described [24].

In this study, animal greater than five years of age were highly infected. This finding is in agreement with the report of [25]. But, it was inconsistent with other works who found no significance variation in different age group of cattle [6, 17]. The increase in prevalence of cysticercosis with age may be explained due to the long cumulative exposure time of the animals to the different sources of infection with eggs of *T. saginata*. Animals with poor body condition were highly infected with *C. bovis* than those with medium and good body condition scores. As [6] explained it is easier to detect cysts from emaciated carcass and organs as compared to well conditioned animals.

The result of this study showed that the highest prevalence was found in Holstine – Fresian breed cattle. [3] reported roughage feed components such hay and crop by-products which purchased from unknown locations may serves as source of *T. saginata* eggs as they contaminate with human waste during harvesting and collection time. This lower prevalence of cysticercosis in local breeds could be explained that, locally adapted breeds are more resistant to parasitic diseases infections as described by [27]. This result was inconsistent with finding of [13] from Addis Ababa abattoir and [24] from Iran, who reported high prevalence of cysticercosis in local breeds. This may be associated with management system where local breeds have greater chance to contaminated pasture with human excreta.

Prevalence of *C. bovis* in this study was not affected by sex of the animals. This is in agreement with previous reports [13, 15, 16, 24]. This could be associated with similar management given to both male and females cattle. In communal system both sexes were grazing on the same pastures and thus exposed to similar challenge with *T. saginata* eggs. In the study, female cattle examined for cysticercosis were small in number which makes difficulty to correlate prevalence with the sex of animals. However, according to [17, 26] males were highly infected than females. This may be related to management system of longer exposure of male outdoor, while females are kept in door at the beginning of lactation and breeding.

In this study heart (3.51%) was the most frequently infected organ. This result is in agreement with other study conducted by [22, 26]. However, [5, 28] reported that tongue was the most infected organ. In the present study, highest number of cysts was found from heart (35.56%) followed by tongue (23.3%) and masseter muscles (14.4%). In the present study small number of cysts was in tight muscles (7.7%). This could be due to the practical limitation of meat inspection, as deep incision lower marketability of the owners don't allow multiple incision of the carcass. The variation in the predilection seats may be also attributed to management practices of the animals like using the cattle in the daily agricultural activities which influence the distribution of the cysticerci [26]. In Ethiopia bush defecation, habit of eating raw beef (kitfo, Kourte, Gored-Gored) and village slaughter might have contributed much for the increase in prevalence of cysticercosis in cattle.

5 CONCLUSION AND RECOMMENDATION

The study demonstrated that cysticercosis is a major health problem in cattle of the study area. Appropriate control strategies should be design to reduce the transmission and educational awareness of the society on avoiding consumption of raw meat and proper use of latrine with improved standard of human hygiene were recommended.

ACKNOWLEDGEMENTS

The authors extend their sincere gratitude to Veterinarian team of Adigrat municipal abattoir for their cooperation during the study.

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Honey Bee Diseases, Pest and Their Economic Importance in Ethiopia

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ABSTRACT: The Honey bee (*Aphis mellonifera* L.) is prone to infected with fungal, bacterial and protozoan pathogenic organisms. Honey bee diseases in Ethiopia include Chalkbrood diseases caused by pathogenic fungi, *Ascosphaera aphidivora*, Nosematosis caused by *Nosema apis* and amoeba caused by a single protozoa *malpighamoeba mellificae*. A numbers of invertebrate pests belong to insects themselves such as ants, beetle, moths, lice, termites, mites, and large vertebrate animals such as amphibians, reptile, lizards, birds, mammals like honey badgers and mice were recognized in the Ethiopian honey bees. Honey bee diseases, predators and pests are problems for bee keeping practice in Ethiopian. The success of apiculture influenced by these diseases causing pathogenic organisms and various pest animals. Infections of the disease ranging from chronic to highly virulent can result loss of honey bees' population and loss of honey bee products such as honey, wax and also caused honey bees to abscond and death. The economic loss associated with the presence of honey bee diseases and pest was estimated in some works and significant loss was reported. In the present review an attempt has been made to briefly the major honey bee diseases, pests and predators and their rate distribution in the country so as to help the researchers to develop efficient methods for prevention, control and management to improve productivity and the health welfare of bee population.

Key words: Honey bee, *Ascosphaera aphidivora*, Nosematosis, pests, Chalkbrood diseases

Introduction

Bees are of commercial value today as pollinators of forests, horticultural and agricultural crops and for their marketable products such as honey and wax. The most important species for bee keeping in East Africa and the wider sub Saharan Africa is the *Apis mellifera scutellata* [1.]. Over the past 5-10 years, honey bees have been faced with many threats including pests and diseases [2]. Bees are found to infect with different pathogenic organisms such as fungi, virus, bacteria and protozoan organisms. In Ethiopia, the land is not only favorable to bees, but also for different kinds of honeybee pest and predators [3]. Pests and predators result in a great damage on honey bee colonies with in short period of time. In Ethiopia several surveys have been made on the existence of honey bee diseases such as Chalkbrood diseases, American foul diseases, European foulbrood, and sac brood, stone brood diseases and several pests and predators of bees and found that many of honey bee diseases and pests were reported in the country [4]. For example in Tigray regional state in Atsbi-Womberta honey bee diseases, pests and pathogens identified as major problem for the adoption of improved honey bee keeping [5]. Honey bees diseases, pests and predators are causing a significance economic loss in honey bees and their products. Historical evidences from various countries suggest that there is a significant relationship between the success of apiculture industry and the control of honey bee disease and pests.

The present paper briefly reviews major reported honey bee disease, pests and predator species in the wide geographical bee keeping areas of Ethiopia. An attempt has made in this article to present the geographical distribution of these various honey bee diseases, pests, predators and assessment made on the economic loss associated with their presence on life of honey bees.

Major honey bee diseases in Ethiopia

Chalk brood diseases

Chalkbrood is an infectious disease of honeybee larvae caused by a fungus *Ascosphaera apis*, which causes death and mummification of sealed brood of honeybee with consequent weakness of the colony [6]. In Ethiopia the survey on chalkbrood diseases was started in the year of 2000, and the existence of the diseases was reported in 2001 around the Holeta research areas [3]. Survey on chalkbrood disease in Shoa and Arsi zones, reported an overall prevalence of 56.49%, with higher in west Shoa (24.5%) followed by Arsi (13.74) and lowest in East Shoa (7.63%) and North Shoa (9.92%). No comparative study in infestation rate of chalk brood diseases among colony in same apiary or among bee colonies at different apiaries is studied. However [7] reported highest infestation rate in two apiaries owned by private beekeepers around Holeta bee research center. The study reported variable infestation level of the diseases from different apiary sites with prevalence rate of range from 0- 100% with overall infestation level of 17.4%. Study in apiaries sites at Addis Abeba [8] also reported the diseases in 43% of the colony of bees. Observation and reports from bee keepers and experts confirmed the most affected broods were drones broods in month of October. [7] also reported the occurrence of the diseases during the brood season in October when the ambient temperature sometimes goes below zero degree in individual bee keeper farmers around Holeta and at Gedo demonstration site.

Table 1. Distribution rate (%) of honeybee chalkbrood disease in study Regional States of Ethiopia

Region	Zone	HCBd distribution percentage
Amhara	N. Gonder	80%
	W. Gojam	100%
	S. Wollo	75%
Oromiya	Jimma	95.24%
	Ilubabor	64.7%
	E. Wollega	25.5%
	W. Shoa	40%
	Arsi	45.45%
Beneshangul- Gumuz	Assosa	33.33%

In Ethiopia the geographical distribution of chalkbrood diseases in honey bee were recorded [9]. The study reported an infection rate of 37.12%, 19.89%, 17.93% and distribution rate of 87.50%, 56.56% and 33.33% in Amhara, Oromia and Benshangul- gumuz. In the study a number of bioclimatic variables such as mean annual temperature, annual rainfall, annual range in temperature and precipitation were used to establish the ecology of the diseases. The finding shows that moist dega, moist weina-dega and wet -weynadega were identified as suitable ecological zones. However, the dry alpine, dry bereha and moist bereha areas are not suitable for the diseases at all [9].

In Ethiopia the infestation and distribution rate of the chalkbrood diseases is unequal. [9] reported distribution rate of (100%) of in West Gojam and 95.42% in Jimma out of 33 Woredas sampled for the study of the diseases (Table1). Distribution of the diseases is associated with delivery of contaminated apiary equipment's such as wax foundation sheets contaminated with *Ascosphaera apis* [10]. The highest distribution rate of in West Gojam and Jimma zone is the results of the introduction of contaminated bee equipment's through the extension service in these areas [9].The disease causes loss of colony of bees and reduction in the productively in infected colonies. [9] reported the mean yield of honey in colony infected with chalkbrood diseases (45kg) is lower than the mean yield (80kg) in uninfected bee colony.

Nosematosis

Nosema is caused by *Nosema apis* and *Nosema ceranae*. It is a microsporidian fungal disease that infects the intestinal tract of adult bees. Nosema cause detrimental effects on honey bees, colony development, queen performance and honey production. In Ethiopia nosema was reported in low infestation rate in the survey conducted by the initiation of FAO [4]. Diagnosis made on 152 colony bees in field and laboratory at Addis Abeba reported prevalence rate of 53.3% [8]. In Ethiopia nosema was also reported from different regions with varying prevalence rate such as 58% in Oromia, 60% Benishangul-Gumuz and 47% in Amhara regions[11]. Similar survey conducted in 58 districts of Oromia, Amhara, Southern Nations and Nationality and Peoples (SNNP), Tigray, Gambella, Benishangul –gumuz, Somale regional state of Ethiopia, *Nosema apis* were identified the species causes nosematosis with 37.3% of infection rate [12]. In the central highlands of Ethiopia, highest infestation level of *Nosema apis* and spore number per individual honey bees was reported in the month of

August and September [13]. The study also found positive correlation between Nosema infestation rate, number of Nosema spore per individual honey bee and humidity.

Amoeba

Amoeba is diseases of honey bee caused by a single celled parasite called *malpighamoeba mellificae*. The parasite affects malpighian tubules of honey bees and shortens the life cycle of bees. The diseases were reported in Ethiopia with low infestation level in the survey made in the country initiated by FAO [4]. Survey conducted in the year of 2000, Amoeba was reported in South and South parts of the country [14]. [8] Diagnosis made on honey bees in field and laboratory at Addis Abeba reported a prevalence rate of 73% of amoeba infestation. The diseases was also reported with high prevalence rate in different regional state of Ethiopia such as; Oromia region with prevalence rate (88%), Amhara region (95%) and 60 % in Benishangul- Gumuz [11]. Study on annual cycle and seasonal dynamics of amoeba from the Holeta research center apiary [13] reported, amoeba cysts were reported throughout the year regardless of hive type. The study also reported that highest cyst number (disease intensity) in the months of April and August and lowest intensity in the month of January [13]. This study helps to understanding the seasonal dynamics of the diseases in the area and to undertake seasonal management of colony honey bees.

Honey Bees Pests and Predators

The honey bee colony is not immune from predation and it can take a variety of forms, from destruction of a comb by wax moth to physical dismembering of a colony by a hungry black bear. The most damaging group of pests are arthropods, relatives of the bees themselves and different vertebrate pest animals.

Small Hive Beetle, *Aethina tumida*

Small hive beetle (SHB) is indigenous to Africa, where it is considered a minor pest of honey bees. Both adults and larvae can be serious pests of weakened honey bee colonies or honey supers. The beetles multiply to huge numbers, their larvae tunnel through comb to eat brood, ruin stored honey, and ultimately destroy infested colonies or cause them to abscond. The beetle also defecates in the honey, causing it to ferment and run out of the combs. The SHB is a nest parasite of honey bees (*Aphis mellifera* L.) colonies native to Sub-Saharan Africa. The pest was reported from many African country such as South Africa [15], Kenya, Namibia and Eritrea [16].

In Ethiopia the small hive beetle was recognized as local honey bee parasite in two honey flow seasons in the south and south-west parts, in 37.5 % of colony bee with prevalence rate of 10 % [14]. The small hive beetle was reported in the maize and coffee growing regions of Oromia regional state; Jimma, Illu Abbadora, Horo Guduru, Wollega, East Wollega and Western Showa. [17] reported highest infestation and distribution of Small hive beetle in Jimma (60% and 83.9% and 5.3% and 1.1% in Horo Guduru. Similarly the small Hive beetle was reported in six districts; Mega, Moyale, Teltele, Konso, Key-Afer and Segen in the South and Southern parts of Ethiopia with prevalence rate infection ranges from 21% in Konso to 66% in Teltele [18].The study speculates the locality of the pest in region might be that the pest entered to the country from this direction.

Bee lice

Lice are known to infect honey bees in hive. Bee louse are wingless ectoparasite fly which causes significant damage in colony bees. Bee lice larvae feed on honey and pollen by tunneling under the cell capping [19]. The adult lice feed on nectar directly from the mouth of honey bees, this reduce food availability of queen and reduce egg-lying capacity [20]. Bee louse are widely distributed in Africa, Asia, and North America and southern of Africa. In Ethiopian infestation of lice in honey bees was reported from the western region of Shoa, Oromia regional state with overall prevalence rate of 42% with highest prevalence rate 70.8% in Gemechis, 50% in Holeta and 17.1% in Jaldu [21]. In the study the prevalence in infestation rate of bee lice was significantly associated with hive type and management type (Table 1).

Table 1. Prevalence of bee louse with its associated risk factors around Holeta research center of Oromia regional state.

Risk factors	No hives examined	% of lice infestation	p-value
Hive type			
Modern	165	76(46.1%)	0.001
Transitional	188	22(25%)	
Traditional	132	64(48.5%)	
Altitude			
Highlands	322	130(40.4)	0.125
Midlands	63	32(50.4%)	
Management type			
Backyard	256	97(37.9%)	0.019
Apiary	129	65(50.4%)	
Colony type			
Weak	83	34(40.9%)	0.956
Medium	160	67(41.9%)	
Strong	142	61(43%)	

Similar study conducted in Tigray regional state reported an overall prevalence louse infestation 4% and 5.5% in brood and adult bees in three peasant associations of Genfel, Adikisandid and Aynalem in Wukro districts [22]. The study reported the main lice species affecting honey bees in the area is *Braula coeval*. Similarly bee louse was also identified as major constraints of bee keeping in Addis Abeba [8], in Illu Ababora and Arsi Zone [9] and in Burie District of Amhara [23].

Ants (*Dorylus fulvus*)

Ants are most troublesome to honey bees and bee keeping sector. Ant eats or carries off any comb contents honey, pollen and brood [24]. Ant (*Dorylus fulvus*) was one of important honey bees' enemies and causing a serious problem [3]. In Ethiopia ants in colony of honey bees were reported from different regions such as Addis Abeba [8], Keffa, Shako and Bench-Maji zone [25], Kombelcha [26], Highlands of Southeast Ethiopia [27]. In Atsbi-Womberta, Ahferom and Wukro districts of Tigray regional state ants was reported as series problem in bee keeping [28] and the problem ants is major problems for the adoption of improved honey bee keeping [5]. In Tigray, Amhara and SNNP regional states and Gomma district Jimma zone bee keepers ranked ants as first problematic pest insect in honey bees [29].

Ants causes severe economic loss in honey production by killing bees, rob their products [30], initiate aggressiveness in bees, lead to absconding and destroying the entire colony of honey bees [31]. Bees are the first and most victim of the attack with ants followed by honey [32]. Ants were also reported to feed on honey, brood, and bees' wax and pollen after all honey and the broods are depleted.

Table 2. Percentage of respondents to Ant (*Dorylus fulvus*) attack on honey bee colonies

District infected	No colony owned	No colony attacked by ants	% of colony infected
Ameya	547	157	29%
Tikur-Inchini	134	22	16%
Ambo	179	95	53%
Dano	270	208	77%
Adeaberga	414	163	39%
Cheliya	298	185	62%
Welmera	155	56	36%
Total	1997	884	44%

Study in seven districts of West Shoa Zone (Table 2), shows that 44 % of the colony bees were attacked by Ants result in 24% of absconding and 4.2% death and 29% of honey production was loss to due to Ants attack [32]. The total economic loss caused due ants attack was estimated to be 3,839.810 Ethiopian birr [32]. Comparing the monetary loss in terms of products the loss through bee products (honey and wax) overweight the loss produced through the bee colonies themselves.

Wax Moth

A number of moth species are known to infest honey bees. Wax moths causes significance damage in colony of honey bees in several countries such as: Algeria, Egypt, Kenya, Tanzania, Uganda, Sudan, Ghana, Nigeria and Senegal [33]. Wax moths are serious pests causing damage on wax production of honey. The caterpillar of lesser wax moths feed on pollen, cast skins and cocoons, but don't destroy bee colonies. The wax moth pests infest stored equipment and weaken colony by spending of time in comb maintenance. However, strong colony of bees keeps wax moths under control. The wax moth (smaller and larger) in honey bees was reported in the South and South West of parts of Ethiopia in the year of 2000 [14]. Similarly wax moths (*Galleria mellonella*) and the night flying sort of wax moth (*Aphomia sociella*) was reported in honey bees in the study carried in Tigray regional state in three district of Atsewonberta, Aheferom and Wukro [28]. In the five regional states of Ethiopia wax moths ranked among the disastrous pests of honey bees by bee keepers [29].

Poisonous plants

A number plant species are poisonous pest to honey bees. A recently emerged red color flower locally called Ababbo Diima [34] was reported to kill worker bees during their flowering stages. Plant species belongs to families of *Ranunculaceae*, *Solanaceae*, *Acanthaceae*, *Euphorbiaceae* and *Phytolacaceae* were reported to poisons to bees [35]. Similarly the nectar or pollen of poisonous plants such as *Cassia siamea*, *Croton macrostachyus*, *Aloe brahana*, *Zizyphus mucronata*, *Phytolacca dodecandra* and *Susbania* species was reported to be toxic to the bees themselves and those in which the honey produced from their nectar are toxic to humans [36]. Similarly honey from *Datura arborea* is reported irritates human beings when eating and *Euphorbia cottinifolia* is known to kill honeybees [25]. These studies indicated the emergence new enemies of honey bee pest plants, this needs a scientific study on the real impact of these pest plants on health of honey bees their influence on the productivity to mobilize community in identification and eradication of the pest plants form the environment.

Vertebrate Pest and Predators of Honey Bees

Bee keeping in tropical climates frequently suffers from damage caused by different vertebrate pests. In Ethiopia honey bee predators were reported from all the classes of vertebrate animals. Reptiles, frogs, toads, birds, lizards, mammals like, monkey or apes, mice and honey badger were reported as predators of honey bees in several studies by bee keepers [14, 26]. According of the respondents these honeybee enemies are causing great losses (40.7%) of total honey production per annum. In Kombelsha area [26] reported honey badgers (*Mellivora capensis*) as a series predator causing considerable amount of honey lost and causing absconding. The predator also reported causing damage in colony of honey bees in month of November and April in Keffa, Sheka and Benchi Maji zone [25].

Bees are virtually defenseless against predation of by birds. The heavy traffic of bee flying in out of hive provides as source of food for different bird species. For example birds such as: bee-eaters (*Merops apiaster*, *Merops orientalis*), swifts (*Cypselus species*, *Apus species*), drongos (*Dicurus species*), Shrikes (*Lanius species*) and wood peckers (*Picus species*) are reported as predators of honey bees [37].

In Ethiopia bee eating birds are described as problem in colony of honey bees. In Illubabor zone locally birds known Hamaa were reported to eat bees by breaking the hives at night and other bird called Simbiroo predate bees by waiting around the hive [34]. These birds weaken the hive and reduce the quantity of honey harvested. [38] also reported bee keeping the most stable for most formers In Illubabor Zone is affecting by bee eating birds such Aardvark (*Orycteropus afer*).

Man

Perhaps the greatest predator/pest of honey bees is man. Bees can be vandalized, stolen and/or burned [39]. In the southern regions of the country hunting of wild honey bees is practiced. Peoples never keep bees, but harvest wild bees from caves, cracks using indicator birds and numbers of bees were burned through fires. Man is also reported as predators or pests and robbery of bee were reported in rural bee keeping areas of Ethiopia and developing countries. Some authorities speculate that bees came to Ethiopia from Egypt along the Nile Valley, and that the same bees were also taken to Somalia [40]. Somali bee-eater is one of the most serious pests of honeybee colonies in Somalia [40]. In addition, reduction of bee forage by large-scale agriculture and urbanization is deleterious to bee populations.

Traditional methods of controlling of honey bee diseases and pests

Beekeepers practice different prevention methods but are not totally efficient which requires developing suitable prevention methods. Some of the cultural practices are as follow: for ants destroying the ant nest and killing the queen of ant, putting ash around hive stand, tying "Teff" straw on the hive stands and using of another small ant *Cremato*

gasterchiarinii Emery (1881) as biological control[25]. For honey badger they use mechanical barriers putting like thorny woods around the tree; fixing smooth iron sheet on the trunks of a tree where hives are hanged; hanging hives on ficus trees which has very smooth bark which is not suitable for honey badgers to climb on it and tying of thorny branches[25]. Different types of pest and predators control methods are employed in different bee keeping areas of the countries (Table 2). These numbers of traditional control methods are either used individually or in combination with other methods in all types of bee keeping practice and in all hive types.

Table 3. Traditional methods used by bee keepers for control and management honey bee pests and predators in Ethiopia

Pests and predators	Methods of control
Ants	Applying ash under the hive stands, clean the underneath of the hives & keep their apiary neat, use of leaves of eucalyptus & aje (local naming) as deterrents when it appears, wrapping the hive stands with polytine bag, hunting and killing ant queens
Wax moth	Clean apiary, remove old comb, and strengthen the colony, fumigation with cotton cloth and sorghum bran, rubbing with recommended plant materials like, Vernonia amygdalina, spraying garlic juice.
Bee lice	Clean apiary, fumigate with Olea Africana and cigarette and sorghum bran and make the colony strong.
Beetles	Clean apiary, narrowing the hive entrance, hand picking and kill, cover r opening of hive.
Lizard	Clean apiary, use spin around and kill
Snake	Clean apiary, smoking with plant material and kill
Birds	Putting something (cloth, festal...) and spin around the hive and, Killing using stones e.t.c
Honey badger	barriers putting like thorny woods around the tree; fixing smooth iron sheet on trunks of a tree where hives are hanged, hanging hives on ficus trees which has very smooth bark which is not suitable for honey badgers to climb, fastening corrugated iron on the bark of the trees containing honey bee colonies

A number of preventive or control management practices to minimize the effect honey bee pests are practiced in the country. For example strengthening honey bee colonies via feeding, removing unoccupied suppers and combs, trapping adult wax moths were tested against wax moths and results in reduction of infestation level of wax moths by 82.3% and increasing honey bee [41]. Three different ant protection methods such as inner tube, smooth iron sheet and tin filled with used engine oils are tests for their effectiveness in preventing access of ants by exposing to massive raids of ants and the tin filled with used engine oil methods was found the best in totally protecting honey bee colonies[30].

The way forward: Recommendations for control of honey bee diseases and pests

The following methods either individually or in combination with other integrated methods of diseases and pest control were recommended to improve productivity honey bees and their health welfare.

Good Hive Management

The effect of different honey bee diseases and pests can be reduced by improved management techniques such as strengthening colony with bees or hatching brood and enlarging colony entrance to aid ventilation [41]. Good bee keeping practice such as avoiding use contaminated equipment, transfer of infected combs from infected hives were recommended to avoid horizontal and vertical transmission of different honey bee diseases from colony to other near colony. In general the following colony management tools with integrated other improved beekeeping practice are recommended

-  Maintain a strong bee in each hive.
-  Inspect every hive at least once a month.
-  Move the hive to disrupt the life cycle of honey bee pests
-  Maintain close mowing or bare ground around the hive to facilitate chemical controls and provide less shelter for beetle larvae leaving the hive to pupate population

Searching Veterinary Medicinal Plants

For centuries medicinal plants were used for treatment of different diseases in animal and humans in health welfare. Crude medicinal plant extracts such as *Allium sativum* Linn, *Eugenia caryophyllum* Bullock & Harrison, *Piper betel*, *Curcuma*

longa Linn, *Illicium verum* Hook, *Cinnamomum cassia*, *Rhinacanthus nasutus* Kurz, *Azadirachta siamensis*, *Acorus calamus* Linn., and *Stemona tuberosa* Lour) shows anti fungal activity for treatment of chalk brood disease[42]. In order to prevent and control honey bees diseases, it is recommended to search and investigate veterinary medicinal products which value for treating honey bee diseases.

Breeding Resistance Variety Bees

Some hives appear to be more resistant to different honey bee diseases than others due their hygienic behavior [43]. These colonies have an ability of their adult bees to uncap and remove affected brood which reduce the spread of infection to whole colony. This hygienic behavior was explained as being controlled by two recessive genes, one for uncapping and one for removal of larva [44]. So it is recommended to selective breeding of varieties of honey bees colony by evaluating the hygienic behavior in different honey bee species found in the country. Breeding resistant variety of colonies should be practiced through selective rearing of queen from the resistant colony of bees.

Providing Education to Bee Keepers

Controlling of honey bee disease and pests require intensive knowledge of recognizing and detection of these different diseases causing organisms and pests in colony of honey bees. It is recommended to provide educational delivery through extension service to bee keepers on management of honey bees, detection of diseases in brood and how to manage the problems.

Quarantine measures

The spread and entrance of some honey bee diseases is associated with delivery of contaminated apiary equipment's such as wax foundation sheets [10]. Establishing quarantine measures through legal regulation and enforcement on introduction of honey bees and equipments can be reduce introduction of diseases from infested areas. During introduction of colony bee to a given locality of providing health of stock of bee and educating bee keepers the risk of buying infected colony of is recommended. In general the following measures are recommended when buying, selling of stock honey bees

- ✓ Before introducing new species or race of honey bee, it is important to study its potential (diseases and pest resistance) quality, foraging behavior and availability of forage
- ✓ In terms of introducing and buying of stock of bee from market/ regions to locality areas well quarantine and inspection is essential
- ✓ During introduction of honey bee equipment from abroad to country proper inspection of instruments is recommended

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Mobile Data Warehousing: A Survey

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ABSTRACT: Capturing mobile data is becoming feasible thanks to the frequent and widespread use of mobile devices embedded with positioning technologies. This phenomenon raises the need to handle efficiently, for decision making purposes, data becoming more and more mobile.

The data warehouse technology constitutes the core of modern decision making systems, however, it must be adapted to handle mobile data specificities which bear the mobile data warehousing subfield.

The goal of this paper is to explore, through a survey, mobile data warehousing domain in order to provide to research community an overview about main issues handled in this new area by concentrating on conceptual modeling one.

KEYWORDS: data warehousing, mobile data, data warehouse, mobile data warehousing, conceptual modeling.

1 INTRODUCTION

Nowadays, information is available with huge quantities in many containers such as transactional and operational data bases, web, organization's information systems...these containers are rich in term of data but poor in term of information. In fact, information sources are numerous, heterogeneous and dispersed containing a lot of detailed data difficult to read, to manage and to analyze with human's abilities and traditional analytical tools which results on the loss of the informational data needed for decision making purposes. The solution to this omnipresent phenomenon is to perform a unique repository containing only consistent data extracted from these diverse sources.

The data warehouse is the adequate solution, it is a new concept introduced by Bill Inmon and defined as 'a subject oriented, integrated, time variant, non volatile collection of data in support of management's decision making process' [22]. It is the core of decision making system and used to support difficult applications such as planning and forecasting since it provides the useful information always ready, easily and directly accessible for querying as well as analysis. It stores summarized data, and provides the meaningful information, still missing in operational data bases containing millions records of detailed and individual transactions. It is based on a multidimensional structure that supports OLAP and data mining and other exploitation techniques dedicated to transform summarized data into useful knowledge for decision making, planning tasks, prediction... Therefore, since its appearance and development, it becomes the solution in many fields aiming to ameliorate their activities based on the best decision at the right time taken by the right person.

However, today, we are face to a new challenge which is how to store and analyze dynamic data. In fact, the continuous mobility of professionals make the use of mobile technologies as a necessity in order to accomplish their missions and facilitate business. Also, scientists and ecologists are interested always to the comprehension of natural phenomena closely related to the movement of animals, stars, and even planets, mountains, oceans... tracked by satellites. Vehicles are also equipped with GPS receivers capturing their positions while moving. In summary, sensors embedding used technologies make production of huge amounts of spatio-temporal data. These later, commonly called trajectory data are cumulating every moment with huge quantities in information systems of ubiquitous applications which raise the need to efficiently

store and analyze them in order to extract the useful knowledge. This later is still missing but always required for decision making purposes in order to understand complex phenomena such as seasoned migrations, traffic jams, climate changes, people movements, customer behaviors, causes of some unusual habits, causes of diseases.... The data warehouse is the solution since it is widely recognized as the engine of decision support systems. However, it is not conceived to support the complex continuous spatio-temporal nature of mobile data which imposes its adaptation to the mobile context point of view conceptual and logical modeling, indexing, aggregation functions, ETL process, querying and analysis techniques and tools, implementation utilities....

In this paper we aim to investigate main works handling mobile data warehousing issues, and we focus our survey on conceptual modeling proposals following the subsequent organization. Section 2 provides an overview on data warehousing technology and most famous conceptual models proposed in the literature. In section 3, we explore spatial and spatio-temporal data warehousing and its main conception requirements. In section 4, we handle trajectory data warehousing field, which is a particular kind of spatio-temporal data warehouse demanding specific interest. Finally, in section 5, we conclude our work.

2 DATA WAREHOUSING

To move toward an integrated environment and abandon the operational and non organized one, a data warehousing process should be conducted. The data warehousing is defined as the process which encompasses architectures, algorithms and tools for bringing together selected data from multiple data bases or other information sources into a single repository called a data warehouse, suitable for direct querying or analysis [66]. Authors in [11] affirmed that the 'Data warehousing is a collection of decision support technologies, aimed at enabling the knowledge worker (executive, manager, analyst) to make better and faster decision'. They described a data warehousing architecture with the process of Extract, Transform and Load data (ETL) from operational data bases and external sources into a unique integrated repository called the data warehouse. Since its appearance, the data warehouse becomes the major interest of the database industry from design to implementation.

2.1 THE FOUNDATION OF THE DATA WAREHOUSE TECHNOLOGY

The multidimensional structure is the modeling foundation of the data warehouse technology. It consists on data storage in a cube permitting visualization and analysis of data from different perspectives. The glossary of the multidimensional paradigm is composed of fact, dimensions, measures and hierarchies. In the following a concise definition of each term of the multidimensional glossary:

- **Fact:** The fact table represents the fact of interest or the subject of analysis including numerical attributes called measures and other descriptive ones generally the keys of related dimensions.
- **Dimensions:** The dimension tables represent attributes closely related to the focus of analysis (fact) and different axes of measures analysis (Product, store and time dimensions are crucial elements in sales-DW where the fact table represent sales themselves). A dimension is organized in members; each member is a specific attribute or a group of attributes which values are defined in a specific domain. For example the time dimension could be organized on day, week, month and year members. Members are organized in hierarchies allowing the exploitation of measures under different granularities by applying roll-up and drill-down OLAP operations on them. Example of hierarchies: City<State<Country for space and Day<Week<Month<Quarter<Year for time. Hierarchies over dimensions are useful in constraining the values of members. A dimension member could include also descriptive attributes such as year-type in year member. The Measures; Called also fact attributes having numeric values such as number of clients, number of transactions, quantity sold... which are analyzed along the different referenced dimensions and their levels by applying aggregate functions on their values kind of Sum, Average, Min, Max,... in the case of no measure affected to the fact table, this later records a default measure which is the number of occurrence of the object fact type satisfying a given condition (count).
- **Hierarchies.** The organization of dimension' members in hierarchies is necessary for the analysis of data at different granularities which enable the precise detection of the source of a given problem, for example the province in which the quantity of sales is the lower. This hierarchical organization is necessary for applying OLAP roll-up and drill-down operations exploring different details of data.

A multidimensional model is implemented in the well known logical designs namely the star, snowflake or constellation scheme defined in the following:

- **The Star Schema:** A star schema is characterized with a unique central fact table and surrounding single dimension tables. Each dimension is rooted in a unique entry (key), and each reference in the fact table points to the root of the corresponding dimension. In this schema, the hierarchy along dimension tables is not explicitly represented.
- **The Snowflake Schema:** This schema is the refinement of the star one in which dimensions are normalized and members are explicitly modeled. Indeed, each dimension from the star schema is broken into set of members organized in an application-defined hierarchy. Beside the increasing number of tables, this structure provides facilities of maintenance.
- **The Fact-Constellation Schema:** In this structure, we have more than one fact table sharing some dimensions. This structure is adopted for huge data warehouses.

2.2 DATA WAREHOUSE CONCEPTUAL MODELS

To respond to the DW multidimensional modeling requirements, designers use often the abovementioned relational models. Concerning the conceptual modeling, there is not till now an agreement about a conceptual model offering both graphical representation and formal definition [31]. In fact, conceptual modeling phase in the world of data warehousing is of crucial importance especially in reducing costs of maintenance of the system in the case of any technological changes. However, the well known conceptual models, namely the Entity-Relationship (ER) and the Object Oriented (OO) model, don't represent the semantic of multidimensional paradigm. Nevertheless, many attempts were proposed to adopt them, for instance, the ME/R-Multidimensional Entity Relationship Model introduced in [58]. It is a specialization of the ER model to represent multidimensional properties. The authors propose a minimal set of extensions which are powerful enough to represent the semantic of multidimensional paradigm (facts, measures, dimensions). The approach consists on two extensions; a special entity set and two relationship sets. The entity set defines the dimension level grouping qualifying data. The two relationship sets are, first the fact relationship set defining the n-ary relationship between dimensions and models at the same time the quantifying data. The second is a special binary relationship set connecting dimension levels between each others called also the rolls-up to relationship set and define a DAG-directed acyclic graph between them. Seeking for a clear and distinguished graphical representation to these new concepts, authors propose special graphical components.

The above contribution favorites the explicit representation of dimension levels by introducing the notion of dimension level set defining hierarchical classification thanks to rollup relationships between levels. Moreover, thanks to the fact relationship set, it is possible and easy to model complex structure called 'multi-cube model' by including additional facts.

Tryfona and colleagues introduced the starER conceptual model to meet main data warehouses conceptual modeling requirements revealed by authors in the following points [62]:

- Represent facts and their characteristics;
- Connect the temporal dimension to facts which are always closely related to the aspect time;
- Represent application objects, their properties and relationships among them (specialization/generalization, aggregation, membership);
- Establish semantic links between facts and application objects modeled;
- Detect dimensions and their possible and indispensable hierarchies;

Based on the following requirements and with respect to the semantic of the ER model, authors proposed some concepts to adapt it to design efficiently the data warehouse. StarER is the result of combining the ER model, to which most designers and users are familiar, and the efficient structure of the star schema dominant in the world of data warehouses. Main constructs of StarER are the fact set, the entity set, relationship set and attributes. The major weakness of this approach is that each component of the model is represented separately with its own graphical shape, and the variety of relationships between entity sets which complicate the readability and understandability of the final conceptual or semantic design especially in the case of large data warehouse.

These weaknesses are coped in an important contribution in the literature of DW conceptual modeling which is of Malinowski [34] called MultiDimER. In this later, a minimum set of relationships is used which is of the ER formalism (many-to-many, many-to-one...). It is a conceptual model based on the ER graphical notation and defined by authors as a finite set of dimensions and fact relationships. It consists on a multidimensional adaptation of ER model to suit the DW philosophy. Indeed, they integrate specific symbols to the ER notation (entity types, attributes, relationship types) to represent the fact relationship, the dimensions and their possible levels as well as the relationships among them, the cardinalities and the analysis criteria. The strength of this contribution is that the MultiDimER is based on a simple graphical notation and clear formal definition to which most approaches lack.

However, this is not the case of CGMD-Conceptual Generalized MultiDimensional model proposed in [23] which is based on a strong formal definition. In fact, the author have extended the ER model (EER) with simple and multidimensional aggregated entities, and combined it with the GMD-Generalized MultiDimensional model which is a logic-based multidimensional model to obtain a new DW design called CGMD. It is based on the ER semantic since it includes the notion of entities, relationships, attributes, associations and cardinalities. According to the GMD abstracts, each entity is a fact, each relationship is a dimension, hierarchical levels relationships are defined by is-a link and measures are attributes directly associated to the fact entity. Nevertheless, the major limitation of this model resides in its complex graphical representation.

In [14] and [15] writers build a conceptual model by using the ER schemas, implemented in existing information systems of the enterprises, to derive a DFM-Dimensional Fact Model. The proposed model is a tree-structured fact schemes designed as a directed acyclic and weakly connected graph. Authors defined a methodology to be followed in a data warehouse development which consists on an iterative process to transform the E/R model into a fact scheme. The process begins with identifying facts then constructing the main components of their fact tree namely attribute tree, dimensions, fact attributes and hierarchies. The DFM is designed with simple graphical notations and based on clear formal definition.

In [20] authors developed the same idea by defining a complete process for data warehouse design starting from user requirements analysis passing with the conceptual and logical design until reaching the implementation phase, which resembles the traditional data base modeling process. Concerning the phase of conceptual design, main issues to be handled are the definition of measures, the design of dimensional hierarchies (path aggregation) and the determination of summarizability constraints, with always determining functional dependencies from dimension levels to measures, and between dimension levels each others. They distinguish also between simple and multiple hierarchy, optional and alternative groups of aggregation paths. Their procedure shows how to derive a graphical multidimensional diagram in a multidimensional normal form (MNF) from an operational data base designed in E/R schema.

Within UML-based conceptual models, the most famous approaches are of Trujillo and colleagues. In [29] authors proposed UML extensions for object-oriented multidimensional modeling. This extension is performed thanks to stereotype mechanism, tagged values and constraints expressed in OCL-Object Constraint Language. In addition to a set of Well-Formedness rules managing new elements added and determining the semantic of the model. Stereotypes and icons allow an expressive representation of different constituent elements of a multidimensional model namely fact classes, dimension classes, hierarchy levels and attributes. Dimension level classes (stereotyped Base classes) should define a directed acyclic graph rooted in dimension class. Concerning relationships, the aggregation relates facts to dimensions, and association/generalization relates dimension levels to each other.

In another work of the same team [30], an UML package is proposed to facilitate the modeling of large data warehouse systems. In fact, they suggest a set of UML diagrams (package) extended with the aforementioned stereotypes, icons and constraints (OCL) to cope with multidimensional modeling and consequently designers will not be limited only to the class diagram.

In the following table we compare between the abovementioned conceptual approaches by considering the major criteria diversely handled in all of them mainly: the graphical representation, the multidimensional structure foundation of a data warehouse (facts, dimensions, measures, and hierarchies), fact/dimension relationships, and dimension levels relationships. The study is accompanied with an example to visualize the conceptual design since the conceptual modeling is an art rather than a science:

Table1. A comparative study between DW conceptual models

DW Conceptual Model	Graphical representation	Multidimensional Structure Description	Fact/ Dimension relationship	Dimension Levels relationship	Example of the Conceptual Model
Sapia et al., 1998 (ME/R)	Based on ER model	<u>Facts</u>: an <i>n</i>-ary relationship set (diamonds) <u>Dimensions</u>: a dimension is defined with a set of dimension levels (rectangles) <u>Hierarchies</u>: explicitly represented with 'roll-up to' relationship set <u>Measures</u>: related to the fact relationship (ovals)	n-ary relationship	-to-one	

Golfarelli et al., 1998 (DFM)	Tree-structured fact schemes	<u>Facts</u>: important event in the enterprise world (box) <u>Dimensions</u>: conceptualization of discrete attributes (vertex attached directly to fact) <u>Hierarchies</u>: explicitly represented with sub-trees rooted in dimensions	Many- to-one	-to-one	
Tryfona et al., 1999 (StarER)	Based on ER model	<u>Fact set</u>: real world data generated over time as facts thus connected always to time (circles) <u>Entity set</u>: real world objects (rectangles) <u>Hierarchies</u>: explicitly represented with membership relationships <u>Attributes</u>: static properties of fact set, entity set and relationship set.	many-to-many many-to-one	strict, non-strict, complete or non-complete memberships	
Husemann et al., 2000 (MNF diagram)	Multidimensional Normal Form (MNF)	<u>Fact schemata</u>: atomic information elements <u>Dimension levels</u>: derived by determining all functional dependencies <u>Hierarchies</u>: explicit aggregation paths on dimension levels	Edges	Simple arrows	
Lujan-Mora and Trujillo, 2001	Based on UML notation	<u>Fact classes</u>: contain identifier (OID) and Fact attributes representing measures <u>Dimension classes</u>: contain identifier, Dimension attributes and descriptors <u>Hierarchies</u>: Base classes forming a DAG	Aggregation: Many-to-many Many-to-one	Association/ Generalization	
Malinowski et al., 2006 (MultiDim ER)	Based on ER model	<u>Fact relationships</u>: the focus of analysis (diamond) <u>Dimensions</u>: abstraction for grouping data having same semantic characteristics <u>Hierarchies</u>: explicitly represented with a parent/child relationship	Zero-to-many generally omitted from the schema	-to-many	
S.Kamble, 2008 (CGMD)	Based on ER model	<u>Facts</u>: aggregated weak entities (double lined rectangle) <u>Dimensions</u>: weak relationships (double lined diamond) <u>Hierarchies</u>: Aggregated entities links between levels explicitly represented	-to-one -to-many	Aggregation	

3 SPATIO-TEMPORAL DATA WAREHOUSING

Spatio-temporal data are captured by positioning technologies (GPS) used by an object in motion (people...) or connected to an entity in continuous movement (stars, animals, vehicles...). Moving objects are defined through the literature as follows:

- **Definition 1:** 'A mobile object can be defined as an object that changes its geographical position as time passes. Such object integrates spatial and temporal characteristics' [53].
- **Definition 2:** 'when we try an integration of space and time, we are dealing with geometries changing over time' [12].
- **Definition 3:** 'Objects that change position or extent continuously termed moving objects' [18].

Objects moving continuously over time are of particular interest and hard handling compared with discretely moving objects. In fact, discrete changes are widely treated and easily modeled in classical data bases, however, continuous changes (continuous updates of each change on moving object state in the data base) are difficult to support.

In fact, nowadays tracking the movement of a spatial object is becoming easy, possible and cheap thanks to the popularity of location-aware devices used by ordinary people to communicate between each others, or by scientists to collect data necessary in some experiences, or in other applications belonging to different fields. The frequent use of such devices allows capturing huge amounts of movement data, stored in the information systems of organizations providing services through wireless networks. These data are precious resource that must be rightly exploited in order to extract interesting patterns bringing the knowledge helping managers to make decision in many mobility based applications such as transportation planning, traffic management, location based services, mobile marketing... as well as to understand various social and natural phenomena for instance unknown causes of certain diseases or natural disasters, animal and birds movements behavior, customer comportment...

The data warehouse provides the adequate support for such analysis, however, it is not conceived and developed to store and manage mobile data regarding its dynamic nature. Therefore, traditional data warehouse technology must be adapted to mobility context, point of view modeling and design, ETL process, aggregation of spatial and temporal measures, analysis and querying tools and techniques, implementation utilities... which are opened issues in the mobility data warehousing field. The first and basic question is how to incorporate space and time dimensions in the data warehouse model with always keeping its coherence, semantic, and dimensional structure? Most of applications solve the problem by adopting directly the well-known relational models in the world of data warehouse namely the star, snowflake and fact constellation schemes providing a concrete vision of the target application. However, conceptual modeling of such data is very important and not straightforward regarding their particularity.

3.1 SPATIAL DATA WAREHOUSE CONCEPTUAL MODELS

Let's start from the beginning of the recent history, with the development of GIS-Geographic Information Systems and the advance of geospatial data, a real need to analyze spatial data and transform it into knowledge is born, phenomena closely related to the importance of spatial data in the decision making process. However, GIS allow to store, analyze and visualize geospatial data as points, lines and polygons defined with x and y numeric coordinates, and cannot support a decision process based on geo-localization of some problems. Therefore, works on integrating spatial dimension in the data warehouse was largely developed. In fact, spatial data are geometric components defined with X and Y coordinates and other semantic characteristics that should be modeled (names of places). This spatial data is often stored in data bases in a string format like 'street address' having generally implicit hierarchy. In the new situation, spatial objects' hierarchy should be explicitly represented. The spatial data types have facilitated the task of modeling spatial data warehouses by extending existing models by the stated above new data types as well as their properties. The SDW are the result of coupling the spatial technology (GIS) with the non spatial-technology namely the data warehouse. In [4] fundamentals of spatial data warehousing are defined. Indeed, a SDW is based on spatial dimensions and spatial measures. Authors consider three types of spatial dimensions:

- Non geometric spatial dimension: dimensions contain only nominal data to locate a spatial phenomenon such as name of municipalities whose generalization are also nominal such as district and province. Such dimensions could be implemented in non spatial technologies where the cartographic representation is not of interest.
- Geometric-to-non geometric spatial dimension: this kind of dimension is geometric at the finest level but its generalization is non geometric. Thus, the finest level is represented with its geometric shape e.g. polygon. For example, a province represented with a polygon in a map.

- Fully geometric spatial dimension: A dimension whose primitive as well as each of the generalizations levels are geometric.

Concerning measures, a spatial data cube contain numerical and spatial measures:

- Numerical measures: represents numerical data for example the quantity sold, the revenue...
- Spatial measures: a spatial measure is a pointer to spatial objects having similar characteristics.

Han is the pioneer of the SDW concept [19] by extending the traditional data warehouse and OLAP operators with spatial character. For the SDW design, he used the star schema and tried to extend it with spatial dimensions and measures. Spatial dimensions are modeled in two cases in a spatial data cube; spatial-to-non spatial dimension or spatial-to-spatial dimension. Spatial measures are measures containing one or more pointers to spatial objects. He aimed along this work to prove the weakness of existing systems such as GIS to support spatio-temporal decision process, and to find the suitable design and implementation of a spatial data warehouse as well as efficient analysis of spatial data stored in a multidimensional structure (Spatial OLAP). In fact, regarding the importance of spatial data in decision support systems and the disability of GIS to support such process, new dedicated and adopted tools must be developed. Face to this need, OLAP systems was integrated with GIS to bear SOLAP systems. While OLAP technology is defined in [10] as “a category of software technology that enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user”, SOLAP tools are identified in [56] as ‘a visual platform built especially to support rapid and easy spatio-temporal analysis and exploration of data following a multidimensional approach comprised of aggregation levels available in cartographic displays as well as in tabular and diagram displays’.

Motivated with the contribution of Han, subsequent works in the SDW subfield appeared, for instance [40]. In the later paper authors proposed two alternative solutions to model heterogeneous data in multidimensional structures where the goal is to support a geographic knowledge discovery process in the field of forestry. Before the DW design process, they defined the hierarchy of spatial dimension which depends on the forest management rules, and of descriptive dimensions (age, species, disease, density, height). In forestry, the facts are measured area thus the measure is volume. Concerning multidimensional modeling of forestry spatio-temporal data, two solutions are proposed. The first is a temporally integrated multi-epoch cube involving only three descriptive dimensions (age, height and species) and the spatial one. The temporal variation is integrated within these later. Second solution consists on three spatially-specific mono-epoch cubes, one for each inventory based on forest stands, and one spatially-unified multi-epoch cube based on regular cells. The design is represented with a fact constellation schema composed of four fact tables sharing some dimensions. Indeed, it optimizes the data storage besides its complex structure composed of four multidimensional cubes. A prototype of the SOLAP application is developed and a performance comparative study between the two structures is performed. In [33] authors extended the MultiDimER model with MADS graphical notations to represent spatial dimensions, spatial hierarchies and spatial measures. Spatial dimensions are defined as entities having at least one spatial hierarchy. Spatial hierarchy is hierarchy having at least one spatial level, and a spatial level is the one to which the spatial characteristics should be kept. Spatiality is represented using geometry attribute represented with pictograms, having as values spatial data types namely point, area, line... and topological relations linking spatial level such as contains, equals, intersect, adopted from MADS. Non spatial dimensions are called thematic. Spatial fact relationships are fact relationships with the symbol of topological relation (pictogram) to join one or more spatial dimensions. Spatial measures are associated to fact relationships independently if whether it is spatial or not. They are either represented with geometry and define a spatial function used for further aggregation among hierarchies, or numerical values result of spatial or topological computations. An amelioration of this work is in [35] in which authors introduced several kinds of spatial hierarchies. They distinguish simple hierarchies; symmetric, asymmetric and generalized, non-strict hierarchies, multiple alternative hierarchies and parallel spatial hierarchies.

Still in the context of adaptation of multidimensional concepts to spatial data, Spaccapietra and Damiani in [60] propose, in addition to spatial dimensions and facts, the exploitation of granularity on spatial measures also, not only on spatial dimensions. They introduced the multi-level spatial measure concept in a new model called MuSD (Multi-granular Spatial Data warehouse). A multi-level spatial measure is a measure that is represented by multiple geometries at different levels of details. They include also in their proposed model a set of spatial OLAP operators in order to analyze the different levels of granularity of spatial data over dimensions as well as measures.

Authors in [57] proposed a formal description of a spatial multidimensional model. The model describes the main features of a spatial application in a multidimensional space represented with a base cube. Facts and dimensions are defined as entity schemas related between each others with n to n relationships. Writers introduced also the concept of entity instances representing tuples of values associated to attributes of the entity schemas. Entity schema and instances are organized in hierarchies (hierarchy schemas and hierarchy instances). Measures are supported by the model as complex

entities and spatial measures as geographical objects thanks to aggregate ad-hoc user defined functions between two entities; one representing the detailed measure and the second representing the measure after the aggregation process. This model is just a formal description of a spatial multidimensional model and don't adopt any specific graphical representation (design). Also, the spatial data are not fully exploited in this formal definition such as topological relationships and type of spatial objects treated. In [34], Malinowski addressed another problem in the field of spatial data warehousing. In fact, to avoid future problems in SDW related to its design and feeding with spatial data, a methodology should be established and followed starting from an efficient user requirements specification. They proposed three approaches for requirements specification; one based on user' requirements, other based on data available in source systems and the third is based on both. In the present work, Malinowski refers to the methodology followed when developing ordinary data bases (requirements specification, conceptual modeling, logical modeling, and implementation). Recent work on this field is [13] in which authors consider that spatiality is a personalization feature since each decision maker has its spatial information need. Their vision is that a unique static spatial multidimensional schema may not cover some needs or may be very large since it supports all needs of decision makers which complicate the schema and harden the task of accessing the spatial information needed. To better satisfy each specific need of decision makers, a personalization process is defined to give a personalized version of spatial data warehouse for each need. In [55] authors present an index structure for spatial data to facilitate the work of data warehouse designer. They extended the traditional set-grouping hierarchy structure to provide grouping schema of spatial data in multidimensional space. In this context, a spatial index tree is introduced organizing spatial data in hierarchies. Such structure permits an automatic generation of spatial hierarchy on spatial dimensions necessary for further aggregations. In this contribution, Rao and his team introduced a structure facilitating the logical modeling step and schema generation of the data warehouse (star schema), and don't provide any graphical notation or formal definition of a multidimensional conceptual model.

3.2 SPATIO-TEMPORAL DATA WAREHOUSE CONCEPTUAL MODELS

In most applications acting in the mobile context and manipulating spatio-temporal data, the space and time are closely related characteristics, so they have to be considered together in the multidimensional modeling task. In other words, dealing with spatio-temporal data means dealing with spatial objects evolving over time, and find a concise formal definition and graphical representation for them. MADS-Modeling of Application Data with Spatio-temporal features [52], [50], [51], [60] is a famous conceptual model supporting spatio-temporal features in an ER-like model. It maintains the semantic and graphical notations of the ER model (Object type is an entity, relationship type is an association, descriptive and key attributes, aggregation links, constrained relationships, cardinalities). It supports spatial and temporal features representation for objects, attributes and relationships. In fact, authors represent spatial feature by the predefined attribute Geometry whose value is a spatial abstract data type (SADT) namely line, point, area, point set, line set, complex area, and represented graphically with icons to enable visual notation. The temporal feature of objects, attributes or relationships is represented with Lifecycle attribute having as values a temporal abstract data types (TADT) such as instants, time intervals...and represented with icons also. MADS supports also constraining relationships which are mainly; topological relationship (disjoint, adjacent, intersect, cross, inside, equal...) between at least two objects which can be either spatial or non-spatial object types. Synchronization relationship (before, during, overlap, meets, starts, finishes...) constraining the binary link between temporal or non-temporal object types. Concerning the granularity of information, MADS define the unit (hour, day, minute...) for time and the resolution for space. In this model mobility of objects is represented with varying data types (space varying attributes such as weather, time varying attribute such as population) represented with functions from time to space or the opposite and represented graphically with special notations. Hence, MADS supports the conceptual representation of spatial and temporal features of objects, attributes and relationships based on visual notation, and consider the movement as a time varying geometry. Besides MADS design is not dedicated to the data warehousing since it don't support constructors of a multidimensional paradigm (dimensions, fact, hierarchy, measures), but, its notations are used in many multidimensional models thanks to their power in expressing space and time features and time-varying attributes and objects. For instance, [63] in which authors extend the spatial MultiDimER model by adopting the MADS abstract data types. Moving objects are considered as moving types defined to describe the evolution over time of spatial objects and attributes by applying the constructor moving () on them. Authors aimed along their work to find a concise multidimensional conceptual model for spatio-temporal data warehouse supporting spatio-temporal data types and moving objects representation. To enable temporal querying, authors performed the extension of their model with temporal features represented with LS and VT pictograms representing temporal levels and temporal attributes, also LS pictogram is used to represent synchronization (temporal relationship) between parent-child levels. Those pictograms (LS and VT) are introduced in [34] in the context of developing Temporal DW. Still with MultiDimER model, in [42] an attempt to adopt the spatial MultiDimER to spatio-temporal context by supporting partial containment and tracking temporal relationships between dimensions. They introduced the concept of Total/Partial containment relationship of a child spatial level in the

parent one represented with specific symbols. They proposed also ' μ ' symbol allowing an expressive representation of time in their model; main features are time-varying geometries and temporal relationships between spatial levels expressing mobility of objects over time. From Entity-Relationship based spatio-temporal models to UML ones. In [59] authors developed a multidimensional conceptual model to represent people trajectories using UML notation. They performed an approximation to represent trajectory defined by the pair (id zone, id time-interval) based on discrete space and time. The levels of detail are performed by zone subdivision for space and time intervals for time. For the design issue of their spatio-temporal data warehouse, writers used the snowflake schema for modeling population displacement in space and time. The fact is ST-Journey class and two dimensions; space and time and other thematic dimensions. Their solution was implemented to support the HEARTS project aiming at studying human motion by exploring his daily trips and journeys in order to produce statistics on flexible groups by performing querying on the resulting Spatio-Temporal DW. The UML model used at the conceptual level is not expressive enough to represent the multidimensional paradigm of the DW (fact, dimensions, and hierarchies), space-time features and relationships between spatial and temporal entities. Unlike [8], who extended UML diagrams using PVL graphical notations defined by Perceptory visual tool (conceptual modeling tool). PVL is a visual language depicting geometric and temporal properties of objects and attributes. It uses five basic constructs represented by pictograms (point, line, area, punctual time, durable time) introduced to conceptual model schemas using UML stereotype mechanism. This work aimed to find a geospatial repository reflecting as much as possible spatiality and temporality of data, and don't interested on finding a dimensional model suitable for the DW design. In [27], authors proposed a general object-oriented framework for spatio-temporal data modeling in which each object is characterized with when, where and what attributes enriching the model with semantic interpretation of real world dynamic. The approach is based on a class of spatio-temporal objects defined with an identifier, space/time/theme attributes and behaviors. Concerning theme, space and time attributes, they are represented with three tables related with one-to-one, one-to-many and many-to-many relationships between them in order to model the continuous changes of geometry of the theme over time. However, behaviors are divided into spatial changes (stay-in, transform-between, splitting, moving..., spatial relationships (topological: include, intersect...and metric: distance, and temporal relationships (topological: overlap, during...). The proposed model supports also relationships between objects namely association, generalization, specialization and aggregation. This contribution proposes a solution for continuous movement changes modeling but not in the multidimensional environment. Indexing issue was also the interest in the data warehousing field, for instance Papadias and colleagues in [49]. In the mentioned paper, authors proposed an index structure aiming to replace the data cube. They indexed static spatial dimensions, considered as a static set of road segments, using an aggregated RB-Tree. Each region, considered as the finest granularity of spatial hierarchy, is stored only once and indexed in the R-tree, and each entry has a pointer to a B-tree containing its historical aggregated data. They dealt also with dynamic spatial dimensions in which the region can change its extent over time or new regions can appear or disappear (volatile regions). The dynamism of regions alters the spatial tree structure, to cope with this problem, Papadias and his group proposed alternative multi-tree indexes namely the Historical RB-Tree and the 3DRB-Tree. The goal of their work is to save memory space occupied by proposing alternative structures smaller than the data cube.

We propose the following table summarizing and comparing some of the most famous contributions in the spatio-temporal DW conceptual modeling according to these criteria: graphical representation, space feature modeling, time feature modeling, spatial relationship modeling, temporal relationship modeling, and object movement modeling:

Table 2. A comparative study between spatio-temporal DW conceptual models

STDW conceptual Model	Graphical Representation	Space Feature Modeling	Time Feature Modeling	Spatial Relationship Modeling	Temporal Relationship Modeling	Object' Movement Modeling
Brodeur et al., 2000	Based on UML notation	Geometry (point, line, area)	Temporality (punctual time, durable time)	Not treated	Not treated	Not treated
Savary et al., 2005	Based on UML notation	Spatial zones	Time intervals (Units)	Not treated	Not treated	<i>Journey</i> , defined with (id-zone, id-TimeInterval)
Pestana and Mira da Silva, 2005	Based on UML notation	Geometry (point, line, area)	Temporality (punctual time, durable time)	Topological relationship	Not treated	Not treated
Vaisman and Zimanyi, 2008 (MultiDimER)	Based on ER model	Spatial Abstract Data Type (point, points, line, region)	Time type (instant, periods)	MADS topological relationship	MADS Synchronization relationship	<i>Moving types: Moving (spatial data type)</i>
Moreno et al., 2010 (STMultidimER)	Based on ER model	Geometry	The unit (time instant, ex: <i>day</i>)	MADS topological relationship	Track' keeping of assignments between spatial levels	Time-varying geometries

4 TRAJECTORY DATA WAREHOUSING

Spatio-temporal models support a powerful representation of space and time features thanks to abstract data types, nevertheless, the movement of spatial objects defined with data continuously changing is still not supported, they can handle only discrete space and time. In fact, data continuously changing are defined recently with the concept of trajectory data. Through the literature it was diversely defined, some of them consider it a pure spatio-temporal concept and others link it to a certain semantic allowing its high-level interpretation:

- **Definition 1:** "A trajectory is the record of the movement of some object i.e. the record of the positions of the object at specific moments in time." [17].
- **Definition 2:** "A trajectory is a continuous variation in space and time." [65]
- **Definition 3:** "movement can be described as continuous change of position in the geographical space and through comparison between two different temporal instants." [36]
- **Definition 4:** 'A trajectory is the path made by the moving entity through the space where it moves. The path is never made instantly but requires a certain amount of time.' [17]

The above definitions describe the movement of an object (perceived as a point) as a spatio-temporal concept. Moving object's trajectory data is captured by a positioning technology as a sequence of raw spatio-temporal positions, each position is the triple $\langle x, y, t \rangle$, Trajectory = $\{ \langle x_1, y_1, t_1 \rangle, \langle x_2, y_2, t_2 \rangle, \dots, \langle x_n, y_n, t_n \rangle \}$.

- **Definition 5:** "A trajectory is the user defined record of the evolution of the position (perceived as a point) of an object that is moving in space during a given time interval in order to achieve a given goal" [60].

Spaccapietra defined the trajectory of a traveling object in a limited and finite time interval, going from a starting instant to a finishing one. Thus, a trajectory can be assimilated to a function from a user-specified time interval to a geometric space: Trajectory: $[t_{begin}, t_{end}] \rightarrow \text{space}$. Through his definition, authors give also a supplementary semantic to the trajectory concept by linking it to the goal for which the moving object travels.

4.1 TRAJECTORY DATA MODELS

First attempts on handling trajectory data modeling, storage and management focus on MOD-moving object data bases technology, since traditional data base technology cannot represent adequately data continuously changing. MOD becomes an important line of research based on moving abstract data types mainly moving points and moving regions facilitating the task of modeling moving objects data.

In this context we find in [5] several issues related to trajectory data are handled involving data preprocessing, conceptual modeling, data storage thus logical modeling and data mining. At the conceptual level, MOD is built based on modeling spatial data (roads, buildings...), non-spatial data (thematic information), and trajectories of moving objects. They explore the semantic involved in trajectory data and model them in an object-oriented way. The semantic is captured in term of properties of a unique trajectory (speed, heading, covered area, traveled distance, traveled time), relationships with its spatial environment (stay within, by pass, leave, enter, cross) and relationships among trajectories (intersect, meet, equal, near, far). Then, this semantic is represented in an UML class diagram as functions or operations (example: `GetHeading()`, `Cross()`...). This later representation is proved by the authors of the paper as the right representation of continuous changes of moving object data (properties and relations related to trajectories). Besides efforts on modeling moving objects, the semantic related to trajectory data is not fully supported. Spaccapietra and colleagues in [60] addressed this problem for a moving point and considered a trajectory as a first-class object. They performed a semantic segmentation of the spatio-temporal path into trajectories and a trajectory into stops, moves. They expressed the semantic facet of a trajectory with BES concept, move phases delimited with two stops, the network constraints, and the links to the rest of application objects. Concerning conceptual modeling, authors used MADS notations in an ER like model, thus in a transactional environment. They proposed two alternative modeling approaches for trajectory data; one based on a design pattern and the other is based on dedicated data types. The Trajectory Design Pattern offers predefined sub-schema providing basic data structures for trajectory data modeling. It can be adjusted toward the application requirements and connected to the rest of its data base schema. Trajectory Data Type is the alternative solution consisting in encapsulating common components of trajectories a `TrajectoryType` data type and define methods enabling access to them. Both approaches may be combined to offer an efficient modeling system according to application needs. The purpose of this work is to realize a generic conceptual model permitting an expressive representation of trajectory characteristics, components and constraints succeeding the expression of semantic facet of trajectories. Authors in [44] used the UML formalism to model trajectories as classes defined with displacements over time, so displacements and time also are classes. The trajectory class contains attributes speed, direction, duration..., the displacement class contains starting time, ending time, first position, last position... and the time class contains the attribute temporal hierarchy, expressing the finest granularity of the time. The model is designed in order to support the comprehension of human mobility. In [47] a new UML profile is defined to cope with modeling the semantic of trajectory data. They extended UML class diagram with stereotypes and icons to allow their model certain flexibility needed to succeed the representation of semantic aspects of trajectories and its related concepts inspired from the work of Spaccapietra mainly stops, moves, begin, and end. Their final objective is to model the movement of a mobile hospital vehicle while accomplishing its mission.

Concerning indexing moving objects' trajectories issue, we have [54] in which authors define a trajectory as a set of line segments defined in 3D space (X, Y, T). They proposed two access methods to trajectory data; STR-Tree which is an extension of the R-Tree coping with organizing line segments according to spatial properties (proximity between line segments) and belonging to the same trajectory. Thus, they introduce the problem of trajectory preservation. They proposed an insertion and split algorithm since those of the R-tree are not appropriate to trajectory data. The second method is TB-tree which is a method that strictly preserve trajectories so called trajectory bundle; thus this structure don't consider spatial properties but only line segments belonging to the same trajectory. These structures are proposed to address successfully pure spatio-temporal queries.

In summary, the abovementioned works aim to find an approximation abstraction for trajectories and a conceptual representation in non-dimensional models. However, trajectory data should efficiently exploited and analyzed in order to extract the hidden information useful in making the competitive decision in applications becoming invaded with trajectory data. Since the data warehouse technology is the foundation of decision support systems, new line of research handling trajectory data warehousing is handled. In the subsequent section, we investigate main proposals on trajectory data warehouse conceptual modeling.

4.2 TRAJECTORY DATA WAREHOUSE CONCEPTUAL MODELING

TrDW is a very recent concept introduced by Braz and colleagues [7]. It is a challenging new area facing three main issues; one related to conceptual and logical modeling, the second related to the loading phase (ETL process) and the last to the computation of measures (aggregations of trajectory-oriented measures) for future OLAP purposes. Concerning the conceptual modeling, there is not until now considerable interest beside the importance of such phase, and designers are satisfied by only representing the TrDW by adopting the well-known relational schemes at the logical level namely star, snowflake and fact constellations and extending them with space and time dimensions. In this [6][7][45] authors handle the ETL process. In fact, they proposed the sampling for trajectory reconstruction; they dealt with stream of samplings assuming that a trajectory is a finite set of observations. They adopted the classic star schema for TrDW design defined with one fact

table containing the main trajectory-oriented measures and three dimension tables (X and Y for space and T for time fed with intervals of sample points). Their major focus is in measure aggregation problem namely the distinct count solved by proposing two alternative aggregate non-holistic functions; Presence Distributive and Presence Algebraic consisting on combining a bounded amount of measures stored in the base cells of the data cube. Writers handled also the loading phase consisting on feeding the data warehouse with sub-aggregate measures by proposing loading based on updating the data warehouse on the basis of single trajectories.

Similar work is of Marketos and his group, in [36][37][38][39] who used the classic star schema multidimensional model to design the TrDW defined with one central fact table and three dimensions (Object-Dim for the user profile, Space-Dim for the space and Time-Dim for the time), in which the authors integrate some semantic information and not only the geometric data captured by a positioning technology in contrary to the work of Braz and colleagues. The process of TrDW development begins with reconstruction trajectories consisting on filtering the raw time-stamped locations that arrive in bulk sets to decide if the data is to be appended to an existing trajectory or not, then the transformed trajectories are stored in MOD.

Concerning the loading phase, Marketos proposed two alternative approaches; the cell-oriented and the trajectory-oriented ETL processes. Authors coped also with the problem of holistic aggregate function by adopting the solution of Braz.

These two later works focused on storing trajectory data in a data warehouse to enable multidimensional analysis (OLAP operations) on them. In fact, they concentrated on trajectory reconstruction, ETL and aggregation issues in a trajectory data warehouse, and along their work they considered trajectory data as set of sample points thus, a pure spatio-temporal concept. However, there are other very recent works handling the conceptual modeling problem and taking into account the complex structure of trajectory data and its semantic character, for instance, [2][3]. In this later paper authors are interested to modeling herd movement data in a trajectory data warehouse. They adopt the idea of stop and move proper to Spaccapietra to model the movement of a herd of animals perceived as a point in order to simplify the modeling task. The same idea employed to enhance the commerce investment activity in [47] by modeling trajectory data generated by a mobile information collector. Indeed, mobile professionals, communicating via mobile devices and moving in a road network thanks to means of transport furnished with sensors, are in charge of collecting huge amount of mobile from planned and not planned observations. These data are modeled in a trajectory data warehouse, implemented and analyzed in order to help investors deciding about the best investment to be made. In fact, the trajectory data warehouse was proven as a solution in many fields, therefore, it invaded all domains. In [43] the trajectory data warehouse is conceived to enhance the supply chain. The proposed model also employs the famous and successful approach of Spaccapietra to succeed the modeling of continuously changing data thanks to move and stop concepts. The medical filed is very important in which the data warehouse could prove its results, and is an indispensable repository for historical data about patient' states. It is necessary to enhance treatments and facilitate the detection of causes of disease as well as other scientific discoveries. In this context Akaichi et al. in [1] proposed a conceptual model for storing streams of facial nerve trajectory data in the purpose of studying the evolution of the states of patients affected by facial paralysis. This work is enhanced with a visualization algorithm of the facial nerve; FAN. Regarding the efficiency of data warehouse technology, and the tendency of moving from operational and transactional environments to multidimensional one, in [48] a system is proposed to assist users in designing a data warehouse called DWADS-Data Warehouse Assistant Design System. The system is based on the clover model and works on two steps. The first consists on choosing the schema model (star, snowflake, or constellation). The second finalize the task. An evolved step in the world of trajectory data warehouse is tackled in [46] consists on updating the trajectory data warehouse according to structure changes in information sources. The proposed solution is a schema versioning approach keeping the track of TrDW evolution. To succeed their approach, authors proposed a set of algorithms handling dimension updates (add dimension, delete dimension, add attribute to a given dimension, delete an attribute from a given dimension) by always respecting integrity constraints. Also, updating dimension levels (add dimension level, delete dimension level) by always considering integrity constraints. Concerning fact updates, measures could change, and therefore algorithms to add or delete a measure are proposed.

In [25], authors handled the logistic management field in particular truck delivery of goods as a very interesting branch in the economy domain. They proposed a solution for modeling and analyzing trajectory data generated by a traveling truck accomplishing its dedicated mission. Their final goal is to improve logistic management field. They consider a trajectory, at the conceptual level, as manageable and a decomposable object into meaningful events (each event is defined by begin, end and a semantic information) based on the idea of moves and stops introduced by Spaccapietra. Indeed, writers suppose that the trajectory' semantic depends on the application. They considered a spatio-temporal path of a moving object a sequence of trajectories, and this later is a sequence of triples (latitude, longitude, and timestamp) generated by a positioning technology. Concerning conceptual modeling, authors proposed a trajectory design pattern representing trajectory data using UML graphical notation and stereotype mechanism to distinguish facts from dimensions and from thematic information. They treat trajectories and events as first-class objects allowing an explicit modeling of trajectory' geometry

(TrajectoryType fact table) and its semantic facet (EventType fact table) represented with its components (moves, stops). For implementation purpose, the model is implemented in an object-relational Data Base Management System DBMS. Campora et al. in [9] adopt the same previous approach but using an ER formalism for conceptual design. In fact, they considered a trajectory as a first class semantic object having an identity, sub-components (stops, moves, and episodes) and other related thematic information. They used the Episode concept offering a high level and a more general unified representation of a trajectory element (move, stop). They developed a semantic trajectory model based on the MultiDimER notation to design their TrDW. Dimension tables are organized around a central fact table Episode. Spatial and temporal objects (dimensions), level hierarchies, measures and relationship types are expressively represented thanks to the visual icons used. In this work a complete framework, called St-Toolkit, was developed to design, store and query trajectory data by supporting OLAP, SOLAP and STOLAP tools. In [41] authors employed the MultiDimER model to conceive a public transportation application consisting on taxi travel. They defined a trajectory as a set of observations; each observation is the triples (location, time, semantic). Authors proposed two alternative modeling approaches. The first one is based on composed multi-valued time-stamped measures in which a trajectory is considered as a measure composed of observations (stops and moves) which are themselves composed multi-valued measures, in the context of application adopted in this paper they are fill-up, pick-up and move. However, it presents some drawbacks related to aggregation functions, the relationship between time dimension and observations' timestamps, and time consistency checks. Therefore, authors proposed a second approach which is based on composition of facts. It consists on considering each observation a separate fact relationship linked to the central fact relationship, representing the trajectory, with zero-to-many relationship. Thus, the trajectory becomes a derived measure from the isolate fact relationships. Those later are linked directly to the time dimension to cope with the above stated drawback and so assuring time hierarchy navigation. This later approach is the amelioration of the previous one, but it presents also some difficulties; first one is the need for an operation linking fact relationships, example, combining a taxi-journey with its observations. Second, the resulting number of fact-relationships is becoming large which could complicate the querying task.

To summarize all the described works concerning trajectory data warehouse conceptual modeling, we elaborate the following table representing most famous conceptual representation of trajectory data in the literature. As evaluating characteristics, we consider in our comparative study: the graphical representation on which the model is based, trajectory's geometric facet modeling, trajectory's semantic facet modeling, links constraining the trajectory's relationships with the rest of application objects. Finally, we depict if the basis of multidimensional structure are considered:

Table 3. A comparative study between trajectory data warehouse conceptual models

TrDW Conceptual Model	Graphical Representation	Trajectory' Geometric Modeling	Trajectory' Semantic Modeling	Links to Application Objects	Multidimensional Paradigm
C.Leal et al., 2011	Based on UML notation	Trajectory = $(longitude, latitude, instant)$	Stops and moves each one is defined with <i>begin, end and semantic information</i> : $(e = b, d, a)$,	No constraints	<u>Facts</u> : <i>TrajectoryType</i> and <i>EventType</i> classes <u>Dimensions</u> : Time, Region, MovingObject, TrajectoryCategory and EventCategory <u>Hierarchies</u> not explicitly represented
Campora et al., 2011	Based on ER model (MultiDimER notation)	Trajectory = segment of the spatio-temporal path covered by a moving object	moves and stops represented with a unified concept called <i>Episode</i>	Topological and synchronization relationships	<u>Fact</u> : <i>Episode</i> fact relationship <u>Dimensions</u> : time, Space, Events and Trajectory Group tables <u>Hierarchies</u> : explicitly represented and annotated with MADS icons
Moreno and Arango, 2011	Based on ER model (MultiDimER notation)	trajectory = sequence of observations $(o_i = (l_i, t_i, s_i))$	Stops and moves modeled as composed multi-valued or derived measures	No constraints	<u>Fact</u> : Journey fact relationship <u>Dimensions</u> : Space and Time dimensions <u>Hierarchies</u> : explicitly represented

5 CONCLUSION

The data warehouse technology is the revolution in the world of data base industry, recognized as the best repository providing the ready, interesting and directly accessible data for support of knowledge extraction and consequently decision-making process. Today, with the increasing volume of mobile data having a complex space-time character, many attempts to adopt data warehouse technology to store and manage them was appeared through the literature.

In this paper, we investigated main issues in the field of mobile data warehousing aiming to extend traditional data warehouse technology in order to handle mobility data requirements. We focused our survey on conceptual modeling issue regarding its importance in the process of building information systems. Some of these models are based on UML notation and others on ER formalism. Hence, we divided our investigation into two parts, first one focuses on spatial and spatio-temporal data warehouse conceptual models considering trajectory or movement of mobile objects as time-varying spatial attribute. Whereas, the second part is dedicated to trajectory data warehousing TrDW subfield representing the trajectory as a first-class object having a complex structure and semantic facet that cannot be supported by the spatio-temporal models.

ACKNOWLEDGMENT

I think my professor Jalel AKAICHI and every one, just every one.

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SWOT Analysis of Innovative Rural Indian Women Dairy-preneurs

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ABSTRACT: Liberalization and Globalization has not only affected the big industries but also has made an impact to the way of living in the rural India. Impressed by the successes of entrepreneurs, the zeal of entrepreneurship is now blooming in the rural veins of the country. The rural youth especially women in India are taking steps towards being dairy entrepreneurs particularly in states like Gujarat, Haryana and Punjab. Women Entrepreneurship as a phenomenon has gained importance recently mainly during latter half of the eighties. This study was conducted in some villages near Hisar, Jind and Fatehabad by purpose. A total of 80 dairy start-ups were interviewed. It was observed that most of the women entrepreneurs belong to the age group of 30 to 40 years and after the successful implementation of their business plans, their incomes increased substantially and there is a need to introduce proactive role of government and other cooperatives to strengthen the status of women in business more.

KEYWORDS: Entrepreneurship; Women & Business; Dairy Entrepreneurs; Women-preneurs; Dairy Sector.

1 INTRODUCTION

In ancient times, women in India never used to do business and were dependent on their families for source of income, but times are changing and now more than 60% of the total population in India is running their own enterprises and the rest are in service and other sectors. The small sized enterprises make quite an observable share of this part of population, who have low incomes but still making a difference in the society.

Entrepreneurs are considered as the pillars of development of society as a whole on both social and economical aspects. Women Entrepreneurship is a recently born issue as it is not that old in India. Women have now not become aware about their rights and situations but also initiated various ventures in diverse business fields and established their own successful business enterprises.

Expertise building and a helpful policy environment are essential for women in rural areas to become successful entrepreneurs and put in to a vibrant rural economy. Various women empowerment programs and plans have also been introduced by the Government of India so that the status of women entrepreneurs can be strengthened.

Being one of the largest producers on Milk in the World, dairy sector bears quite a great importance in the total economic structure of the nation. It has the highest potential of generating returns and employment through enhanced productivity of milch animals. Seeing the nation with the largest cattle and buffalo population in the world, various dairy development programmes/schemes have also been initiated by the Government of India which has ultimately changed dairy farming scenario tremendously and helped the dairy entrepreneurs to obtain higher incomes.

2 RESEARCH METHODOLOGY

2.1 AREA OF STUDY & SAMPLE SIZE

The study is conducted in Hisar, Jind and Fatehabad by selecting sample data of women entrepreneurs in Dairy sector and 80 women entrepreneurs were interviewed to assess the status of women entrepreneurs.

2.2 OBJECTIVE

The objective of this study is:

- to investigate about the status of women entrepreneurs in dairy industry in Hisar and nearby regions
- to analyze the support provided by the family to women entrepreneurs in dairy industry in Hisar and nearby regions
- to evaluate women entrepreneurs performance
- to identify the key drives of economic independence of women entrepreneurs.
- to study the impact of women entrepreneurs on family with respect to standard of living.

2.2.1 PRIMARY DATA

The study is mainly based on primary data collected from women dairy entrepreneurs in Hisar city and nearby regions. The data is related only to the women engaged in the field of Dairy Sector.

2.2.2 SECONDARY DATA

We have collected information and data by the way of secondary method:

- 1- Journals, Articles and news papers.
- 2- Research papers published in conference and seminars.
- 3- Internet.

3 FINDINGS

The findings attempts to draw socio-demographic profile of women respondents covered in the study. It includes Profile of the respondents and the entrepreneurial activities:

3.1 AGE IN YEARS

Categories	20-30	31-40	41-50	50 & above	Total
Frequency	24	47	9	Nil	80
% age	30%	58.75%	11.25%	Nil	100%

The frequency and percentage distribution for age show that the highest percentage (58.75%) is in the age group of 31 – 40 years followed by 20 – 30 years which is (30%). There was quite low visibility (11.25%) existing in age group 41-50 years who venture into entrepreneurship. This indicated that women ventured in their mid age of life. The discussion also revealed three main reasons for this, increased needs in family, growing household expenses, education of children, marriage of daughters which forced women to look for sources of income to support the family.

MONTHLY INCOME – BEFORE*Table 3.2 (a) : Monthly Income – Before*

Categories	Below Rs. 2,000/-	2000-3000	3000-5000	5000-above	Total
Frequency	70	5	3	2	80
% age	30%	58.75%	11.25%	Nil	100%

MONTHLY INCOME – AFTER BUSINESS*Table – 3.3 (b): Monthly Income – After business*

Categories	Below Rs. 2,000/-	2000-3000	3000-5000	5000-above	Total
Frequency	11	15	24	30	80
% age	13.75%	18.75%	30%	37.5%	100%

Monthly Income: The monthly income of the family is an indicator of the financial support that the respondent provided to her family after she started business. As per the table 3.3 (a) before the start of business majority of the respondents (88.75%) fell in the bracket of income below rupees three thousand followed by an income bracket between three and five thousand of (11.25%) and Nil in the income bracket of five thousand. The monthly income after the business was majority in the income bracket between five thousand and above thousand of (37.5%) followed by three to five thousand (30%).

3.2 MOTIVES FOR VENTURING INTO ENTREPRENEURSHIP

The study revealed that majority of the respondents ventured into business to support the family earnings. The discussion also lead to information the reason for this was because the adult male in the households (father/ husband/ son/ father in law) were unemployed or were employed but spend their earnings on alcohol and gambling or were daily wage workers who did not earn enough to support the family. Several of the respondents were driven to entrepreneurship by the sense of responsibility and obligation towards the family. This is also evident through the percentage of no job being. Income supplementation factor tempted women to become entrepreneurs and to establish themselves in society.

The women's face different types of the problems in his small unit business such as Delay in sanctioning of Loan is on first rank position, Shortage of Capital is on second position and other all types of problems are the on third rank position such as Inadequate size of Loan, Lack of Accounting Skills, Male Domination, Problem in Public Relation Lack of Economic Freedom, and Lack of Self Confidence such. Women in India are faced with other problems also to get ahead their life in business. A few problems can be detailed as;

1. The greatest deterrent to women entrepreneurs is that they are women. A kind of patriarchal – male dominant social order is the building block to them in their way towards business success. Male members think it a big risk financing the ventures run by women.
2. The financial institutions are skeptical about the entrepreneurial abilities of women. The bankers consider women loonies as higher risk than men loonies.
3. The women entrepreneurs are suffering from inadequate financial resources and working capital. The women entrepreneurs lack access to external funds due to their inability to provide tangible security. Very few women have the tangible property in hand.
4. Women's family obligations also bar them from becoming successful entrepreneurs in both developed and developing nations.
5. The business success is depends on the support the family members. The interest of the family members is a determinant factor in the realization of women folk business aspirations.

4 SUGGESTIONS

The following suggestions are given in order to overcome the constraints of rural women entrepreneurs and to elevate the socio-economic status of women, which in turn will lead to the economic growth and overall development of the nation:
i. Identification of the potentialities prevailing in our rural women entrepreneurs is not properly done. Hence, the Government and other co-operative organizations should conduct programmes to identify the potentialities of women who

could become successful entrepreneurs and they need to identify those qualities of the rural women which will turn them into good entrepreneurs.

ii. Though the rural women are aware of the banking procedure to acquire loan, they feel that the procedures are complicated and time consuming. Hence, the procedure and formalities of the bank should be simplified and the required documents should be minimized and proper man support must be available with the banks to help the rural women. Moreover, all the documents should be in regional language or both in English and the regional language.

iii. Rural Women generally do not have their own money. In such cases, women with similar interests and economic background can form groups so as to share knowledge and investment instead of establishing independent enterprises. They may deal with group activity namely group entrepreneurship, Self Help Group, etc.

iv. When women work outside their home, they face the problem of dual role and they are in a conflicting frame of mind whether to give priority to home or career. Hence, husbands and other family members should share the household activities.

v. Usually, there are no associations of women entrepreneurs. Hence, they can form an association and meet at a central place on a regular basis so as to discuss their needs, problems, experiences and achievements which would create an exposure

vi. The women must realize the fixing up of prices for their products. They must be trained in including all the expenses which they have incurred in the production of the final products. They must be given the knowledge of Cost Accounting also. ix.

vii. Encourage women's participation in decision-making.

viii. Vocational training to be extended to women community that enables them to understand the production process and production management.

5 CONCLUSION

Some unmarried women entrepreneurs feel that they can face problems of availing finance from the banks because of chances of possible change of their destination which arises after the marriage. Entrepreneurs approaching State Finance Corporation only for machinery, mainly in case of electronics, are not financed or discouraged. In order to achieve the objective of social justice, it is necessary to harness the latest skills and potentials of women, especially the rural women.

Now the scenario is fast changing with modernization, urbanization and development of education and business. Thus, the opportunities of self-employment for rural women have increased drastically. It is found that the percentage of unemployment among educated and qualified women is increasing. Thus, it is necessary to increase the opportunity of self-employment for educated un-employed women through the development of rural entrepreneurship. It should be stated here that the self-employed entrepreneur creates not only her employment but also creates employment opportunities to other rural people. It is most important to create a favorable atmosphere for a healthy development of entrepreneurship

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Multi-Level Minimum Cross Entropy Thresholding Using Gamma Distribution

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ABSTRACT: Thresholding is one of the popular and fundamental techniques for conducting image segmentation. Many thresholding techniques have been proposed in the literature. Among them, the minimum cross entropy thresholding has been widely adopted. Most minimum cross entropy thresholding methods use Gaussian distribution as an ideal reference histogram for the images to be thresholded. Clearly, it is doubtful that any natural images would generate a histogram with such a distribution. In this paper, a new minimum cross entropy thresholding method using Gamma distribution is proposed, since it is more general than other distributions. The new entropy thresholding method using Gamma distribution is extended to multi-level thresholding. The experimental results manifest that the proposed method can derive multiple thresholds which are very close to the optimal ones. The convergence of the proposed method is analyzed mathematically and the results validate that the proposed method is efficient and is suited for different real time applications.

KEYWORDS: thresholding, minimum cross entropy thresholding, multi-level thresholding, Gamma distribution, optical images thresholding.

1 INTRODUCTION

Image segmentation is considered as the fundamental step of digital image processing due to its ability of extracting objects of interest. Segmentation algorithms are based on one of two basic properties of intensity values: discontinuity and similarity. In the first category, the approach is to partition an image based on abrupt changes in intensity, such as edges in an image. The principle approaches in the second category are based on partitioning an image into regions that are similar according to a set of predefined criteria. Thresholding, region growing, region splitting and merging are examples of methods in this category [15].

Thresholding is the simplest and most used technique in image segmentation. It is used to convert an image to a high contrast image. There are many reasons for using thresholding. Accurately thresholding an image allows for the isolated regions to be analyzed in greater details. Computationally, thresholding is less intensive than some of the other methods currently available as well as being easy to implement successfully. Its use is widespread in such areas as target detection, medical imaging and document analysis to name a few [13].

Many different thresholding techniques have been proposed [4]. Some algorithms use very different concepts to threshold an image. This Paper focuses on a main category of thresholding technique, the entropy based method.

Entropy serves as a measure of separation that separates the information into two regions, above and below an intensity threshold. Entropy based methods can be subdivided into: entropic thresholding, cross-entropic thresholding, and fuzzy entropic thresholding. Entropic thresholding considers the image foreground and background as two different signal sources, so that when the sum of the two class entropies reaches its maximum, the image is said to be optimally thresholded. Fuzzy entropic thresholding considers the fuzzy membership as an indication of how strongly a grey value belongs to the background or to the foreground. Cross-entropic thresholding formulates the thresholding as the minimization of an information theoretic distance [1]. The cross entropy based techniques have proven to be successful and reasonably robust.

In this paper we will use the cross entropy thresholding to segment optical images. The threshold can be selected to minimize the cross entropy.

Most cross entropy thresholding methods use Gaussian distribution as an ideal reference histogram for the images to be thresholded. Clearly, it is doubtful that any natural images would generate a histogram with such a distribution. In this paper, a new entropy thresholding method using Gamma distribution is proposed, since it is more general than other distributions.

Traditional entropy thresholding methods are very popular and efficient in the case of bi-level thresholding. But they are rarely extended to multi-level thresholding since it is computationally expensive [2]. In this paper, the new entropy thresholding method using Gamma distribution is extended to multi-level thresholding.

This paper is organized as follows. Section 1 explains Gamma distribution. Section 2 proposes the new bi-level and multi-level entropy thresholding methods using Gamma distribution. Section 3 presents the experimental results of applying the new method on different images.

2 GAMMA DISTRIBUTION

Some images have a histogram shape that does not show obvious thresholds. Thus, those images should be analyzed using statistical modeling. Gaussian distributions are the most used ones. Other families are Gamma distributions, K-distributions, and Beta distributions. The interest of Gamma distribution comes essentially from the large variety of possible shapes that can be obtained by modifying a limited number of parameters. In particular, it can take into account the dissymmetry of class densities, which is not the case of Gaussian densities [17].

Gamma distribution is a continuous probability distribution. The probability density function of the Gamma distribution in homogeneous area is known to be [9]

$$f(x, \mu, N) = \frac{2q}{\mu} \frac{N^N}{\Gamma(N)} \left(\frac{qx}{\mu} \right)^{2N-1} e^{-N(qx/\mu)^2} \quad (1)$$

where $q = \frac{\Gamma(N+0.5)}{\Gamma(N)\sqrt{N}}$, and x is the intensity of the pixel, μ is the mean value of the distribution and N represents the parameter shape of the distribution.

The shape of the Gamma distribution could be symmetric or skewed to the right. If we want a symmetric histogram, we set N a high value. Otherwise, setting N to a small value produces a histogram that is skewed to the right.

The next section introduces the new bi-level minimum cross entropy thresholding method using Gamma distribution.

3 MINIMUM CROSS ENTROPY THRESHOLDING USING GAMMA DISTRIBUTION

Huang et al. (2004) in [6] divided thresholding techniques into bi-level and multi-level categories. In bi-level thresholding, a threshold is determined to segment the image into two brightness regions which correspond to background and object. In multi-level thresholding, more than one threshold will be determined to segment the image into certain brightness regions which correspond to one background and several objects. This section proposes a new bi-level minimum cross entropy thresholding method using Gamma distribution. Then, this method is extended to a multi-level thresholding one.

3.1 BI-LEVEL THRESHOLDING

Assume that $F = \{f_1, f_2, \dots, f_N\}$ and $S = \{s_1, s_2, \dots, s_N\}$ are two probability distributions on the same set. The cross entropy between F and S measures the overall difference between them and it is defined as

$$H(F, S) = \sum_{i=1}^N f_i \log \frac{f_i}{s_i} \quad (2)$$

The minimum cross entropy thresholding algorithm selects the threshold that minimizes the cross entropy between the original image and its thresholded version. Let I be the original image and $h(i)$, $i = 0, 1, 2, \dots, L$, be the corresponding

histogram with $L+1$ being the number of gray levels [2]. The thresholded image, denoted by I_t , using t as the threshold value is defined as

$$I_t(x, y) = \begin{cases} m_B(t), & I(x, y) < t, \\ m_O(t), & I(x, y) \geq t \end{cases} \quad (3)$$

where $m_B(t)$ is the mean of the background and $m_O(t)$ is the mean of the object in the original image. Fig. 1 clarifies this point.

Assuming that data of the image is modeled using Gamma distribution, the mean of the background and object are constructed by [9]:

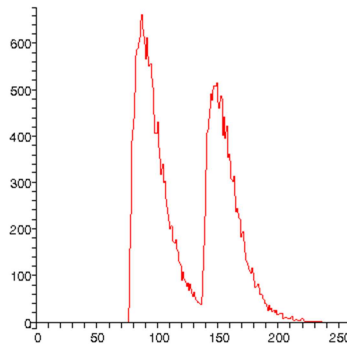


Fig. 1. Bi-modal histogram that can be partitioned by a single threshold

$$m_B^2(t) = \frac{\sum_{i=0}^{t-1} h(i).i^2 q^2}{\sum_{i=0}^{t-1} h(i)} \quad \text{and} \quad m_O^2(t) = \frac{\sum_{i=t}^L h(i).i^2 q^2}{\sum_{i=t}^L h(i)} \quad (4)$$

Using the definition of equation (2), the cross entropy between the original image $I(x,y)$ and its thresholded image I_t is calculated by [2]:

$$H(t) = \sum_{i=0}^{t-1} ih(i) \log\left(\frac{i}{m_B(t)}\right) + \sum_{i=t}^L ih(i) \log\left(\frac{i}{m_O(t)}\right) \quad (5)$$

The above minimum cross entropy thresholding objective function (5) can be rewritten as

$$H(t) = \sum_{i=0}^L ih(i) \log(i) - \sum_{i=0}^{t-1} ih(i) \log(m_B(t)) - \sum_{i=t}^L ih(i) \log(m_O(t)) \quad (6)$$

Since the first term is constant for a given image, the objective function can be redefined as

$$\eta(t) = -\sum_{i=0}^{t-1} ih(i) \log(m_B(t)) - \sum_{i=t}^L ih(i) \log(m_O(t)) \quad (7)$$

The optimal threshold t_{opt} is determined by minimizing the cross entropy.

$$t_{opt} = \arg \min_t \{\eta(t)\} \quad (8)$$

The computational complexity for determining t_{opt} is $O(L^2)$.

3.2 MULTI-LEVEL THRESHOLDING

Bi-level thresholding segments an image based on the assumption that the image contains only two types of regions. Certainly, an image may contain more types of regions. Multi-level thresholding is an extension of bi-level thresholding technique that allows for segmentation of pixels into multiple classes (i.e. the resulting image is no longer binary, but rather consisting of a very limited set of gray levels). For example, if the image histogram contains three modes, then it is possible to segment the image using two thresholds as shown in Fig. 2. These thresholds divide the value set into three non overlapping ranges, each of which can be associated with a unique value in the resulting image.

The gray level range $[0, L]$ of the original image I , is divided into n ranges, $[0, t_1], [t_1, t_2], \dots, [t_{n-1}, t_n], [t_n, L]$, such that each range represents a class in the image. The formula of the thresholded image I_t is defined as follows:

$$I_t(x, y) = \begin{cases} m_1(t), & 0 \leq I(x, y) < t_1 \\ m_2(t), & t_1 \leq I(x, y) < t_2 \\ \dots & \\ m_{n-1}(t), & t_{n-1} \leq I(x, y) < t_n \\ m_n(t), & t_n \leq I(x, y) < L \end{cases} \quad (9)$$

Where m_i is the mean of the gray level range $[t_{i-1}, t_i]$.

Assuming that data of the image is modeled using Gamma distribution m_i can be estimated as follows [9]:

$$m_i^2(t_i) = \frac{\sum_{i=t_{i-1}}^{t_i-1} h(i) \cdot i^2 q^2}{\sum_{i=t_{i-1}}^{t_i-1} h(i)} \quad (10)$$

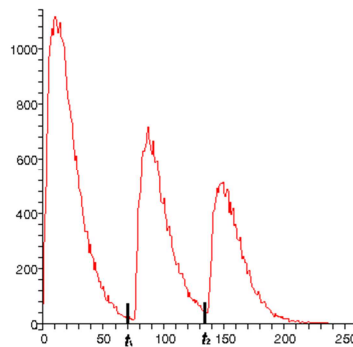


Fig. 2. Multi-modal histogram that can be partitioned by a single threshold

The cross entropy between the original multi-classes image and the multi-thresholded image is calculated as follows

$$H(t_1, t_2, \dots, t_n) = -\sum_{i=1}^n i h(i) \log(m_i) \quad (11)$$

The criterion function is found to be

$$\eta(t_1, t_2, \dots, t_n) = \sum_{k=1}^n H(t_k) \quad (12)$$

Each $H(t_k)$ is calculated by [2]

$$H(t_k) = \sum_{i=t_{k-1}}^{t_k-1} ih(i) \log\left(\frac{i}{m_B(t_k)}\right) + \sum_{i=t_k}^{t_{k+1}-1} ih(i) \log\left(\frac{i}{m_O(t_k)}\right) \quad (13)$$

Where $m_B(t_k)$ is the mean of the background and $m_O(t_k)$ is the mean of the object in the gray level range $[t_{k-1}, t_{k+1}]$.

The minimum cross entropy thresholding objective function (13) can be rewritten as

$$H(t_k) = \sum_{i=t_{k-1}}^{t_{k+1}-1} ih(i) \log(i) - \sum_{i=t_{k-1}}^{t_k-1} ih(i) \log(m_B(t_k)) - \sum_{i=t_k}^{t_{k+1}-1} ih(i) \log(m_O(t_k)) \quad (14)$$

Since the first term is constant for a given image, the objective function can be redefined as

$$\eta(t_k) = - \sum_{i=t_{k-1}}^{t_k-1} ih(i) \log(m_B(t_k)) - \sum_{i=t_k}^{t_{k+1}-1} ih(i) \log(m_O(t_k)) \quad (15)$$

The optimal threshold t_{opt} is determined by minimizing the cross entropy.

$$(t_k)_{opt} = \arg \min_{t_k} \{\eta(t_k)\} \quad (16)$$

The computational complexity for determining a single optimal threshold $(t_k)_{opt}$ is $O(L^2)$. The same result as in the bi-level thresholding. For n-thresholding problem $\arg \min_{t_1, t_2, \dots, t_n} \{\eta(t_1, t_2, \dots, t_n)\}$ can be solved in $O(nL^n + L^2) = O(nL^n)$, which is less than the original computational complexity $O(L^{n+1})$ for deriving n optimal thresholds since $n \ll L$ in practice [2].

In the next section, the new bi-level and multi-level methods will be applied on different images and the results will be evaluated to ensure their quality.

4 EXPERIMENTAL RESULTS

We implemented the proposed minimum cross entropy thresholding method using Gamma distribution using C#.NET programming language. In this section, we experiment the bi-level and multi-level methods for estimating the optimal thresholds. We tested our algorithms on several artificial images, and we applied it on real optical images to prove its merit.

4.1 ARTIFICIAL IMAGES

The proposed bi-level thresholding method was applied on two artificial images affected by Gamma noise. The original images are shown in Fig. 3. The thresholding results are shown in Fig. 4.



Fig. 3. Artificial images affected by Gamma noise

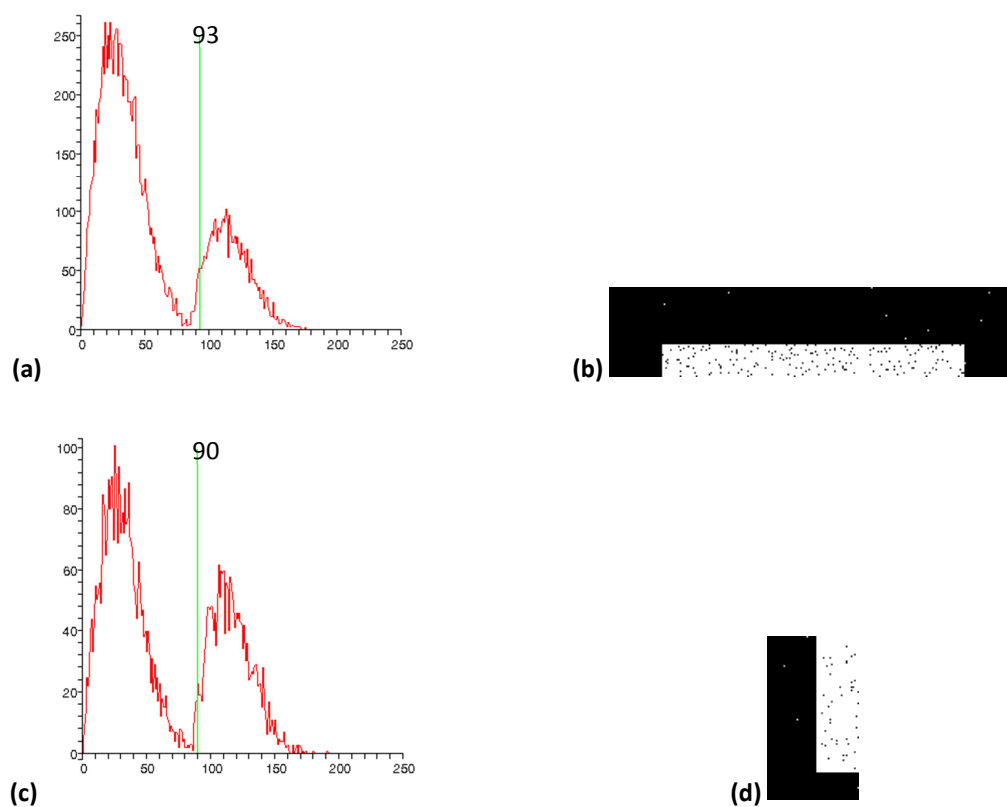


Fig. 4. (a, c) Bi-level thresholds (b, d) Our method thresholding results for artificial images

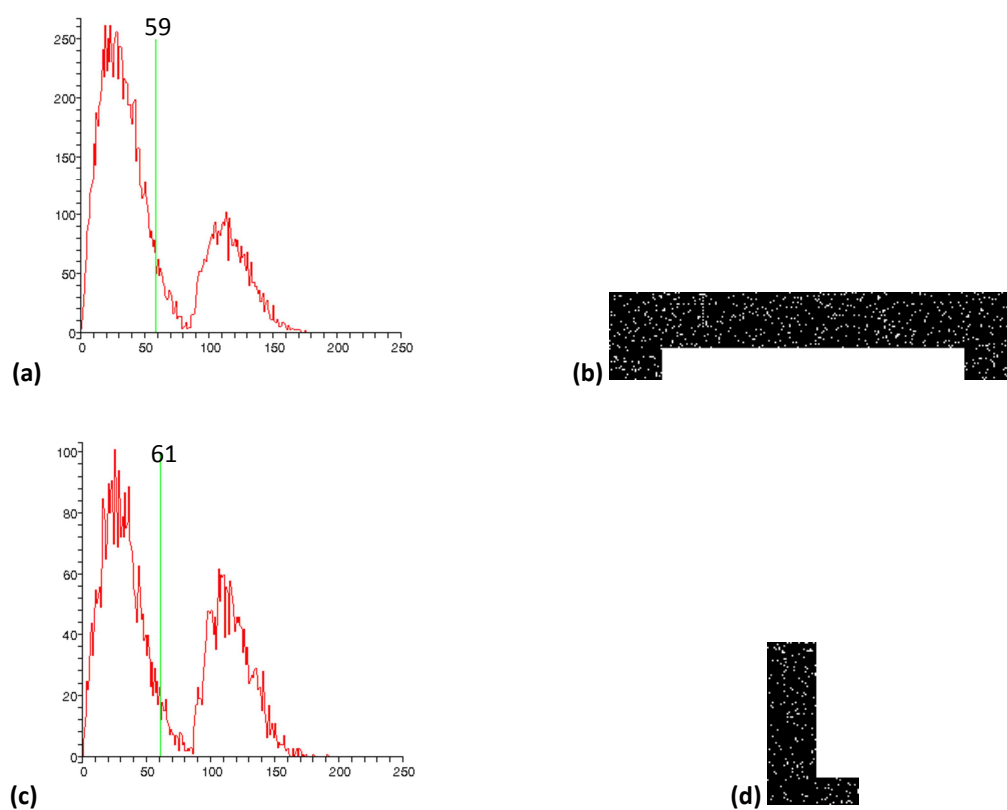


Fig. 5. (a, c) Bi-level thresholds (b, d) Gaussian thresholding results of artificial images

Minimum cross entropy thresholding using Gaussian distribution proposed by Lee & Tam (1998) in [21] and Yin (2006) in [2] was applied on the artificial images shown in Fig. 3. The results are shown in Fig. 5.

We compared between Gaussian thresholding results and our results using four performance criteria which are: pixel successful classification percentage [4], pixel successful position preservation percentage [23], non-discrepancy percentage [4], and threshold success percentage [23]. This comparison that was illustrated in Tables 1 and 2 showed that our method gave better results. Gaussian thresholding results have some noise in the dark region, while our results have the noise in the light region. The reason for this is that the Gaussian does not work properly on images having non symmetric histogram.

Table 1. Comparison results between Gaussian thresholding and our method for the first artificial image

	Gaussian Thresholding	Our Method
Threshold	59	93
Pixel successful classification percentage	95.56%	98.58%
Pixel successful position preservation	37.25%	41.58%
Non-discrepancy percentage	77.6%	80.05%
Threshold success percentage	86.56%	88.03%

Table 2. Comparison results between Gaussian thresholding and our method for the second artificial image

	Gaussian Thresholding	Our Method
Threshold	61	90
Pixel successful classification percentage	96.92%	98.15%
Pixel successful position preservation	0%	45.35%
Non-discrepancy percentage	65.64%	81.5%
Threshold success percentage	79.38%	88.9%

After we discussed artificial images thresholding, real images will be experimented next.

4.2 REAL OPTICAL IMAGES

Five real images named "Word", "Head", "Lena", "Pepper", and "Camera Man" were used for conducting our experiments. Bi-level thresholding was applied on all four images. While multi-level thresholding was applied only on the images that has complex histogram, as we will see next. The original images are shown in Fig. 6.

4.2.1 BI-LEVEL THRESHOLDING RESULTS

The proposed bi-level method was applied on the five real images to obtain the optimal thresholds. The thresholds and the result images are shown in Fig. 7.

4.2.2 MULTI-LEVEL THRESHOLDING RESULTS

The image histograms of the last three real images shown in Fig. 6 are complex. For this reason, a sophisticated segmentation based on multi-level thresholding is made for each image. The results for "Lena", "Pepper", and "Camera Man" images are shown in Fig. 8, 9 and 10 respectively. The results showed that as the number of thresholds increases, the image quality improves.



Fig. 6. Real test images (a) Word (b) Lena (c) Pepper (d) Camera Man

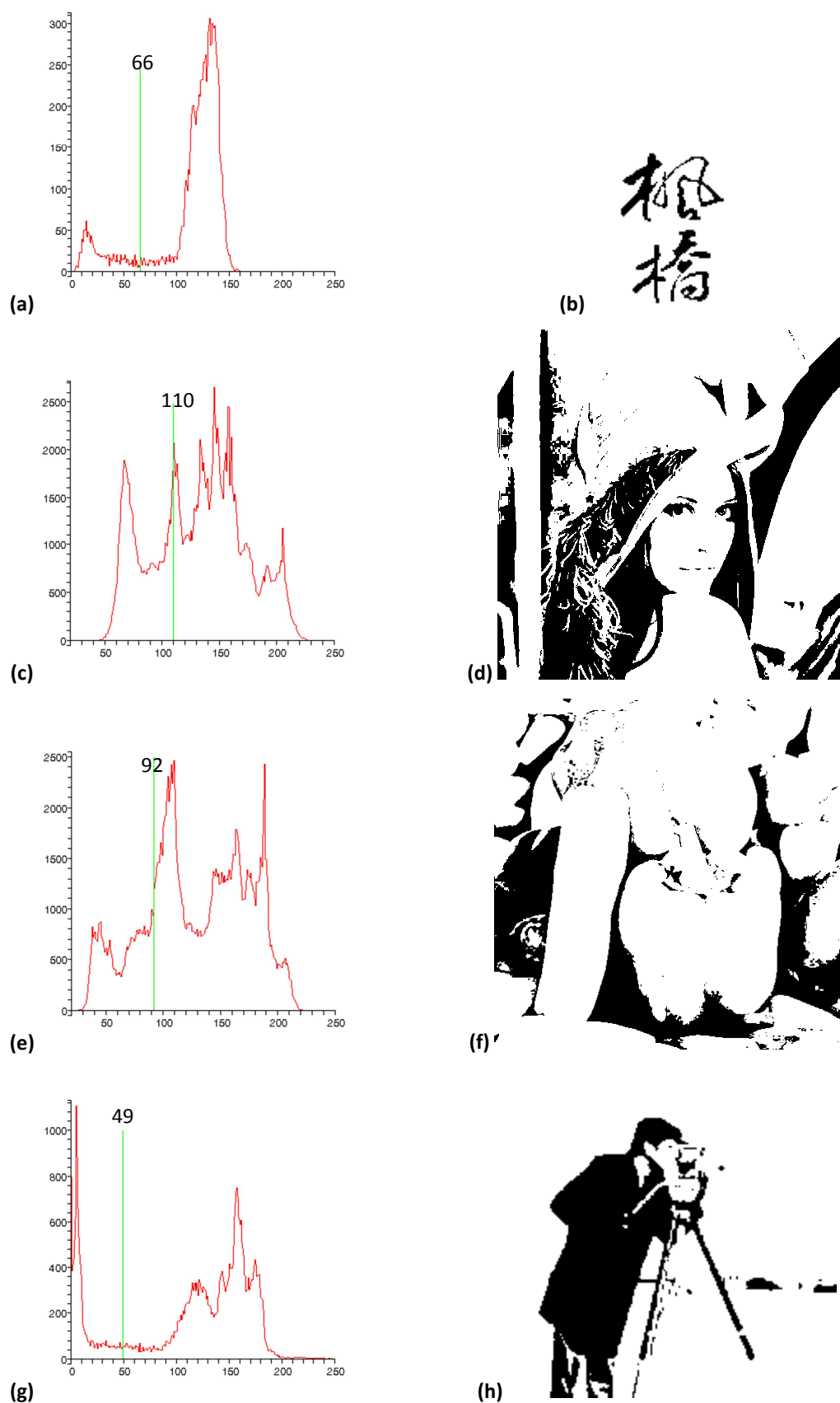


Fig. 7. (a, c, e, g) Bi-level thresholds (b, d, f, h) Our method thresholding results for real optical images

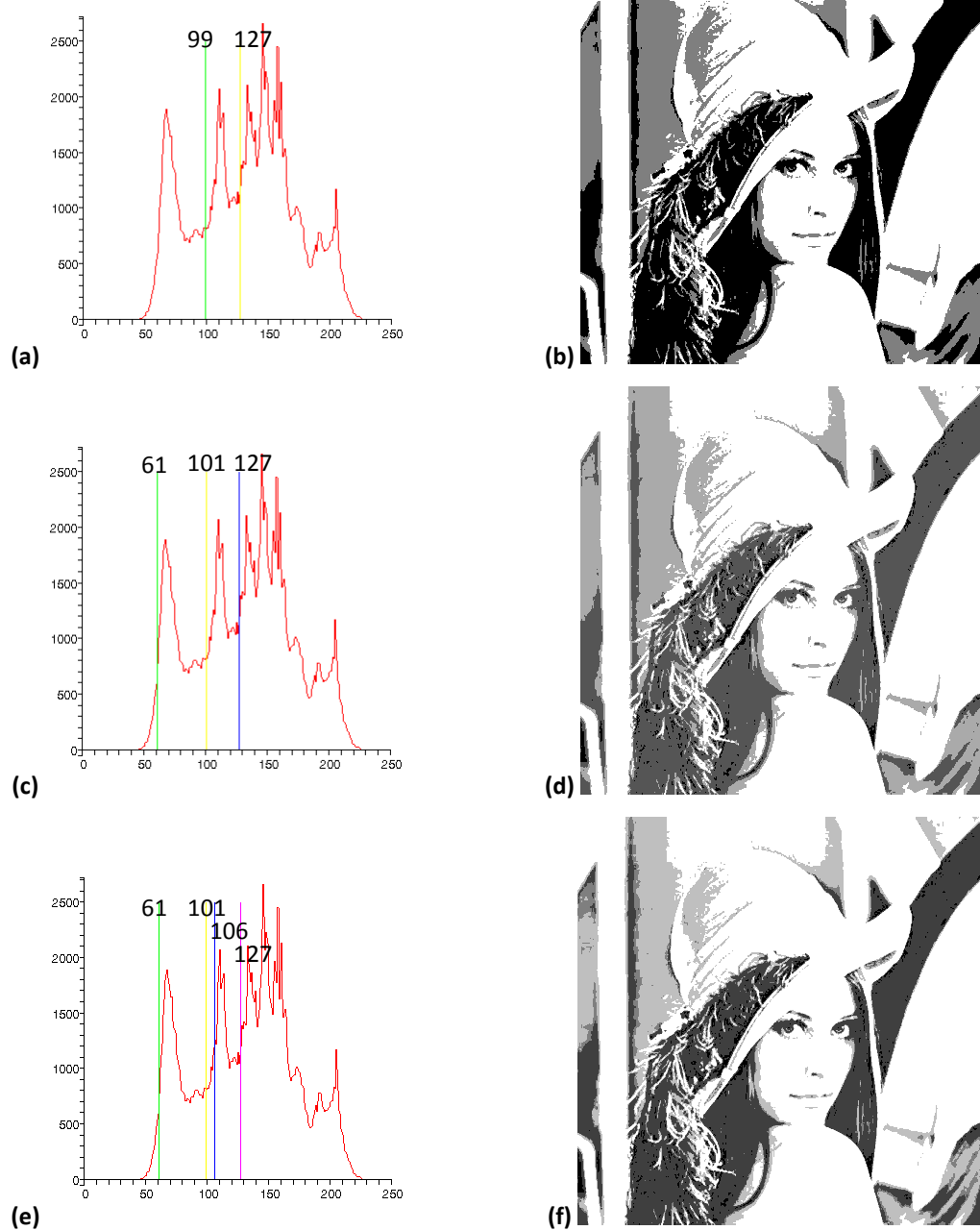


Fig. 8. (a, c, e) Multi-level thresholds (b, d, f) Thresholding results for image "Lena"

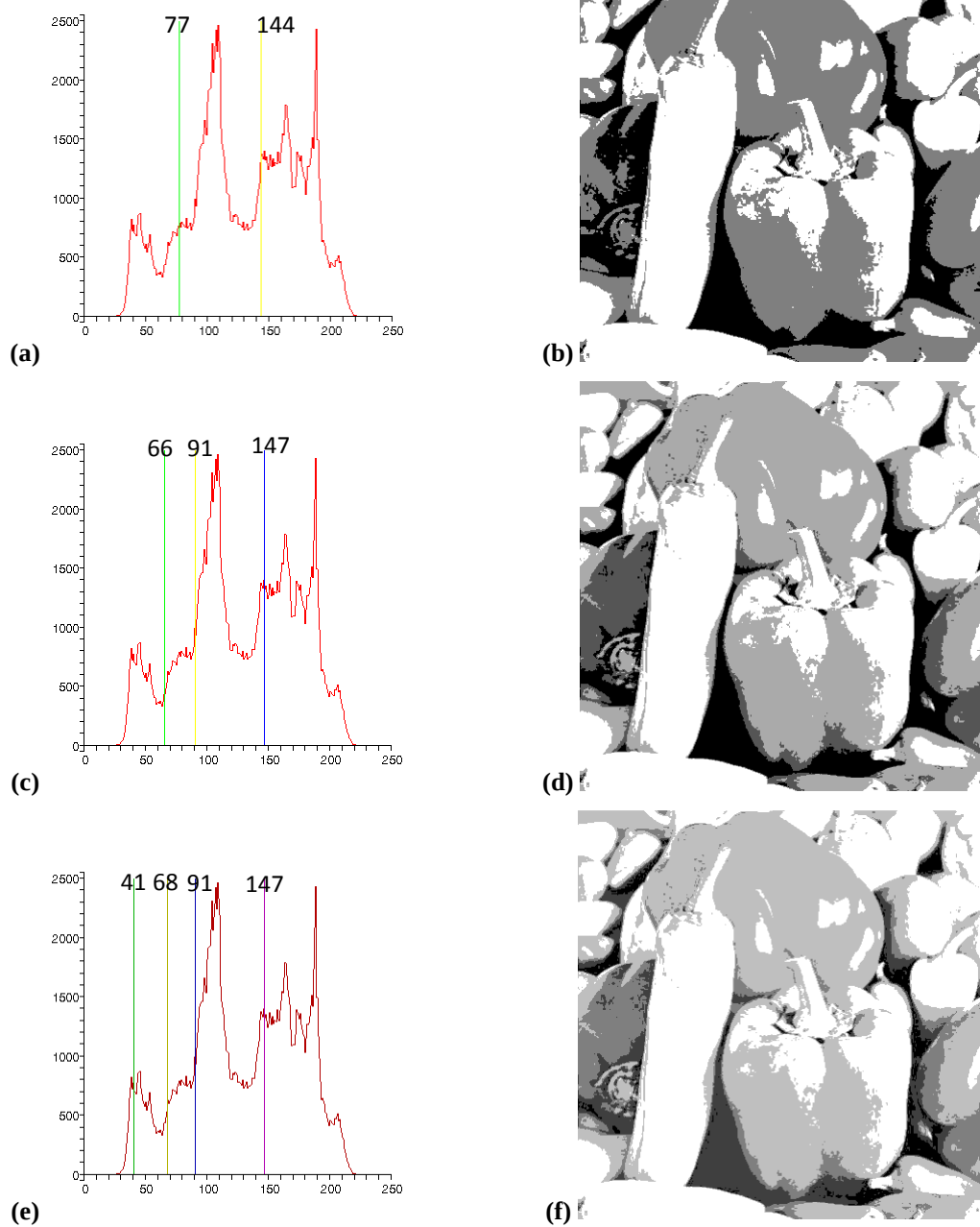


Fig. 9. (a, c, e) Multi-level thresholds (b, d, f) Thresholding results for image "Pepper"

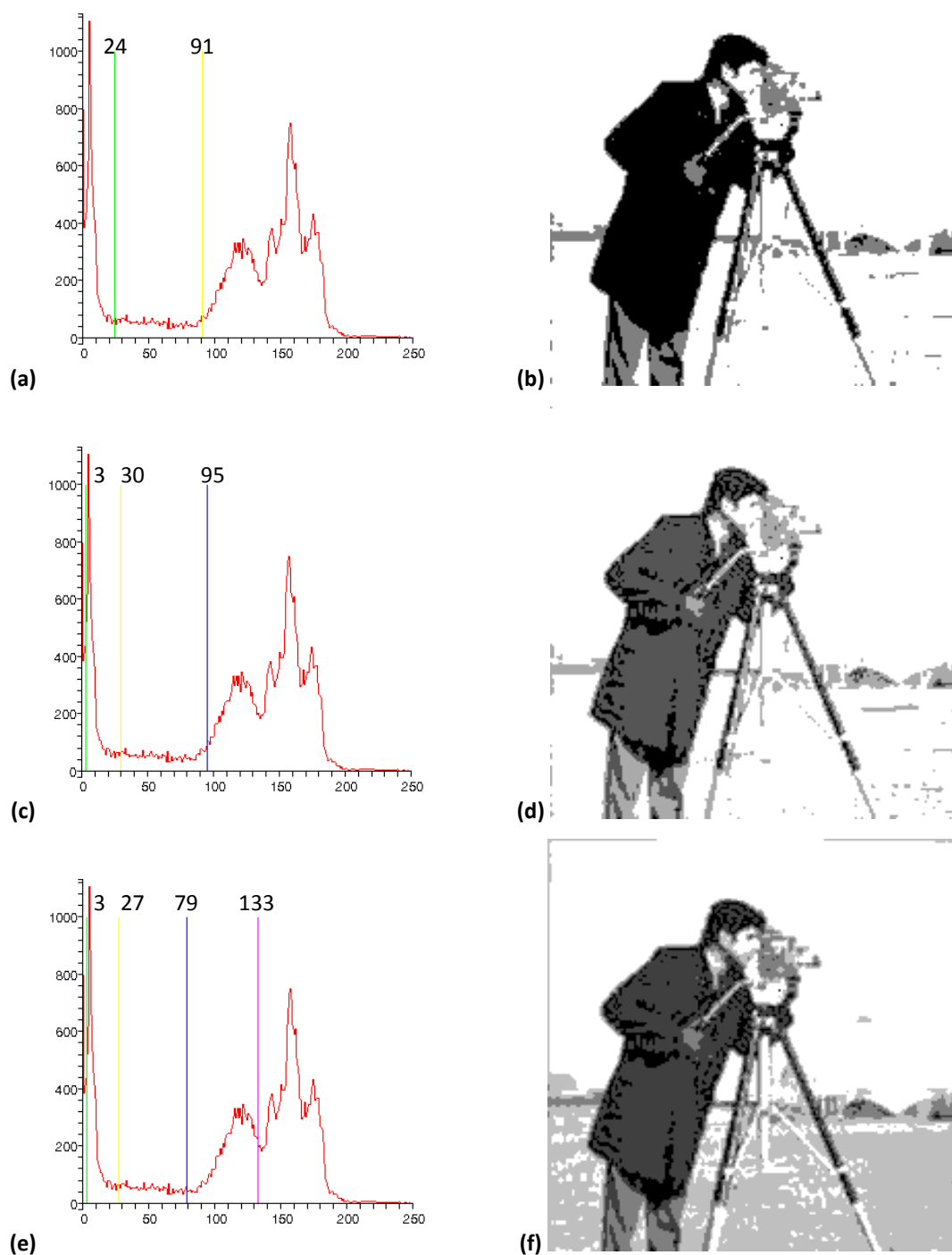


Fig. 10. (a, c, e) Multi-level thresholds (b, d, f) Thresholding results for image "Camera Man"

Multi-level thresholding results were not evaluated using the criteria mentioned earlier. These criteria are special for evaluating bi-level thresholding results only. Thus, cannot be extended to evaluate multi-level thresholding results.

Our method was applied on different artificial and real optical images. It produced very good results. These result images were evaluated to ensure their quality. The evaluation results were satisfactory. Finally, we conclude from all preceding results, that our proposed method performs best when the original image's histogram has overlapped modes.

5 CONCLUSION

In this paper, we have proposed a multi-level minimum cross entropy thresholding method using Gamma distribution. Due to the symmetric and non-symmetric nature of Gamma distribution, our method is more general than other minimum cross entropy thresholding methods based on Gaussian distribution. The experimental results are promising and encouraging future research for applying our method on complex image processing.

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Activity of Acetic Acid on *Bacillus stearothermophilus* and *Bacillus subtilis* Spores after Sublethal Heat Pretreatments

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ABSTRACT: This work has been led in view to find the influence of sublethal heat (45°C, 50°C, 60°C) on acid resistance of *B. subtilis* NCTC 3610 and *B. stearothermophilus* CNCH 5781 spores. Firstly, we have submitted *Bacillus* spores to 0.4% acetic acid pH 4.5 during the times of 1, 2 and 3 hours. Then another spores group were preheated at various sublethal temperatures, before be treated with acetic acid. The effect of acetic acid before and after preheat was evaluated by the culture of treated spores on agar medium and the number of colony obtained was compared with that of control culture (neither treated with heat nor acid) and control A culture (only treated with acid). We found that acetic acid was effective on the twice *Bacillus* spores with more effect on *B. stearothermophilus* CNCH 5781 spores. Furthermore we have noticed a significant increasing in percentages of recovery of colonies obtained from preheated and acid treated spores compared to those of control and control A cultures. This increase of recovery percentages could be demonstrated the manifestation of a "heat-induced acid resistance" phenomenon. Yet, this phenomenon was more accentuated for preheatings at 50 and 60°C during 3 and 2 hours, respectively for *B. subtilis* and *B. stearothermophilus* spores. This study suggest that sublethal heats could be play major role in protection of microorganisms to chemicals

KEYWORDS: sublethal heats, acid resistance, spores, *Bacillus*.

1 INTRODUCTION

The fight against microbial contamination is one major preoccupation in food industries, as far as microbial deterioration of foodstuffs can not only reduces the organoleptic and trading qualities of products, but can be also a cause of diverse food poisoning ([1]). Many cases of food poisoning issued from products made up of milk in Senegal, and street food in Cameroon were reported ([2]).

In industries of canned food, heat sterilization is the mostly used process in inactivation of sporulated forms in view to extend the preservative duration of product. Mean while, the intensity of heat treatment required for inactivation of

sporulated forms could affect nutritive and organoleptic values of food. This is how, we observe for example more and more substitution of sterilization processes at high temperatures ($T > 110^{\circ}\text{C}$) by those sterilized by chemicals agents ([3]) such as short-chain fatty acids (acetic acid, propionic acid), sorbic and benzoic acids ([4]). Acetic acid is a weak organic acid and preservative agent found in vinegar. Due to its activity and its non toxic character, acetic acid has an expanded use in food industries, but also in home works cooking. On the other hand, the use of acids pH generally with the values lower or equal to 4.5 is largely employed into growth control of microorganisms in foods ([5]).

Nevertheless, further studies have proved that the stay of spores at sublethal temperatures had as disadvantage to develop in these spores a heat-induced dormancy phenomenon ([6]) and/or a heat-induced thermoresistance phenomenon ([7]). Regarding the implications of such observations in the process of sterilization in general, but also in food and pharmaceutical products conservation in particular, the question here is to know if the conservation and treatment of foods at sublethal temperatures ($T < 100^{\circ}\text{C}$) for spores could also induce an increase of chemical resistance of spores contained in these foods. From this interrogation, we proposed ourself to evaluate the effect of sublethal heat on behavior of *B. stearothermophilus* and *B. subtilis* spores in presence of acetic acid.

2 MATERIAL AND METHODS

2.1 ACID REAGENT

The reagent used for evaluation of acid resistance and heat induced acid resistance phenomenon was made up of acetic acid solution 0.4% at pH 4.5.

2.2 BACTERIAL STRAINS

Microorganisms used for evaluate the two phenomenon above were made up of two *Bacillus* species. This material was supplied to us in form of *B. stearothermophilus* CNCH 5781 spores obtained from Institute Appert of Paris, France and *B. subtilis* NCTC 3610 spores obtained from the culture collection of the Microbiology Laboratory, Institute of Food Research, Reading, UK. They were preserved at a temperature of 4°C before use.

2.3 SPORES PRODUCTION AND PURIFICATION

The spores used in this work were preliminarily produced from spore stocks in two steps. Firstly spore stocks were heat-activated at 80°C for 10 min ([8]) and spread on plate nutrient agar. The plates were incubated for 24 h at 35°C for *B. subtilis* and 63°C for *B. stearothermophilus*, and vegetative cells were obtained. Secondly, the spores were obtained from vegetative cells. Spores of *B. subtilis* were obtained according to the protocol described by [9] and those of *B. stearothermophilus* were obtained as described by [10]. Spores of both species were purified according to the standard method described by [11]. Cleaned spores were suspended in distilled sterile water and stored at 4°C for three months at least to ensure their stability.

2.4 DETERMINATION OF ACID RESISTANCE OF *BACILLUS* SPORES WITH ACETIC ACID

Fifteen microliters of non preheated spores (at 4.8×10^8 UFC/mL) of both species were treated with an acetic acid solution 0.4% at pH 4.5 during 1, 2 and 3 hours. After treatment, in order to evaluate acid resistance by determination of percentage of recovery, the reactionnal mixture have been neutralized with a sodium hydroxide solution and one hundred microliters of appropriated decimal dilution of acid treated and heat-activated ([8]) culture were spread on GPB (*gélase glucosé au pourpre de bromocrésol*) agar medium. The preparations were incubated for 24 h at 35°C for *B. subtilis* and 63°C for *B. stearothermophilus*. After incubation, the number of colonies obtained from spores treated with acid (experimental culture or witness A spores) was enumerated and expressed in percentage of recovery as compared to that of non treated spore control (witness spore) subjected to same conditions, according to the formula below ([12]) :

$$\text{Percent of recovery (\%)} = (\text{Number of colonies of experimental culture} / \text{number of colonies of control culture}) \times 100$$

2.5 EVALUATION OF HEAT INDUCED ACID RESISTANCE PHENOMENON OF *BACILLUS* SPORES

Firstly, Fifteen microliters of spores suspensions (at 4.8×10^8 UFC/mL) of both species were pre-heated at fixed and sublethal temperatures of 45, 50, and 60°C during 1, 2 and 3 hours each according to the method described by [13].

Secondly, each preheated spore suspension was treated with an acetic acid solution 0.4% at pH 4.5 during 3 hours. Control heat-activated spores neither preheated nor acid treated were submitted at the same conditions. After treatment, the pH of the medium was neutralized with NaOH solution. One hundred microliters of appropriated decimals dilution was spread on GPB agar medium and culture was done as described above. After incubation, the number of colonies obtained from heat activated spores preheated and treated with acetic acid was enumerated and expressed in percentage of recovery as compared to that of non treated spores control (witnesses spores), according to the same formula given above ([12]).

2.6 STATISTICAL ANALYSIS

The experiments were conducted in triplicate and the results expressed in terms of means. The difference between the control and treatments was made using a one-factor ANOVA and the Student Newman-Keuls test with IBM SPSS 20.0 for window at a 95% confidence level. Office/Excel software permitted us to draw the different diagram.

3 RESULTS AND DISCUSSION

The results compiled in figure 1 present effect of acetic acid treatments on recovery of colonies issued from *B. subtilis* and *B. stearothermophilus* spores. These results show that all percentage of recovery obtained from cultured treated spores (control A culture) was statistically lower than those of control spore (not treated) with an acetic acid solution 0.4% at pH 4.5. Indeed, we find that the decrease of the percentage of recovery is more pronounced with the duration of acid treatment with values of 54.23% and 43% respectively for *B. subtilis* and *B. stearothermophilus* spores species treated with acid during three hours. This increase in sensitivity of spores at the acetic acid was converted by a significant reduction ($p < 0.05$) of recovery percentages, which could be justified by an effective sporistatic activity of acetic acid ([14]). Mean while, this antigerminative activity of acetic acid could be explained either by a covalent-bond of acetic acid on spores components (or terguments) ([15]), or by an acidification of sporal core ([4]) contributing to reinforce the dormancy of spore. We can also notice a sensibility to acetic acid mostly marked on *B. stearothermophilus* spores compared to those of *B. subtilis*, which confirms the observation established formally on the variability of microorganisms resistance ([7]). This difference of sensibility could be linked to growing conditions of each species ([16]) but also could be explained by possible difference in number and accessibility on sites of fixation of acid substances on spore's components of different species ([17]).

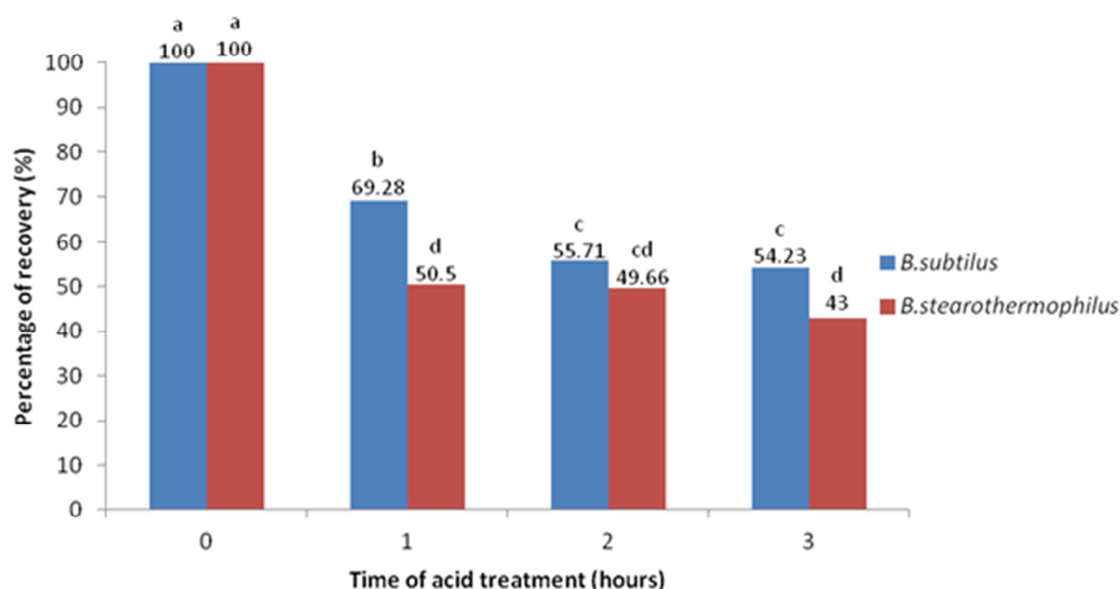


Figure 1: percentage of recovery of the colonies issued from *B. subtilis* and *B. stearothermophilus* spores treated with an 0.4% acetic acid solution at pH 4.5 during 1, 2 and 3 hours (control A culture). Different letter squares of recovery percentage indicate significant difference using Student Newman-Keuls test ($p < 0.05$).

The figure 2 and 3 below present respectively the results of effect of sublethal temperatures (45°C, 50°C, 60°C) on the recovery of colonies from *B. stearothermophilus* and *B. subtilis* spores treated with acetic acid during 3 hours.

The results given by figure 2 below reveals the recovery percentages which are found between 66.67% and 97.5% respectively for *B. stearothermophilus* spores preheated at 50 and 60°C during 2 hours before their treatment with acetic acid 0.4%, pH 4.5. Concerning *B. stearothermophilus* spores preheated and treated with acetic acid 0.4% at pH 4.5 during 1 and 2 hours, we noticed the same observations of as those produced by figure 2 below. The analysis of figure values reveals that all recovery percentages of the preheated *B. stearothermophilus* spores and treated with acetic acid pH 4.5 during 3 hours are statistically higher than those of spores non preheated and treated with acetic acid (control A spores).

The figure 3 shows a variation of recovery percentages between 89,28 and 121,42%, respectively for *B. subtilis* spores preheated at 45 and 50°C during 2 and 3 hours before the acid treatment. The analysis of values on this figure brings out similar conclusion as that of figure 2. Similar observations as those carried on figure 3 were made with results obtained from spores of each species preheated and treated with acetic acid at pH 4.5 during 1 and 2 hours.

The increase of percentages of recovery as observed in figure 2 and 3 could illustrate a greater resistance of two *Bacillus* spores to acetic acid 0.4%, pH 4.5. These results clarify those of [18] which revealed a similar effect on *B. subtilis globigii* spores treated with peracetic acid. In fact these authors showed that the spores of *B. subtilis globigii* subjected to a temperature of 4 ° C during 134 weeks were significantly more resistant to peracetic acid 0.04% compared with control untreated spores. Reference [7] explained this heat-induced resistance phenomenon by structural and conformational modifications of subsurface molecules (mainly those of tunic coat) in presence of sublethal temperatures, which will reduce the spore's permeability for chemicals. In fact these chemicals may simply react with the spore coats, thus reducing the amount of toxic agent which can attack more-central spore molecules such as enzymes or DNA in the spore core ([19]) and consequently could decreased spore's sensibility to effect of chemical agents. This heat-induced resistance phenomenon could be called heat-induced acid resistance. Thus, it appears that acid resistance can also be an inductible phenomenon at same title as thermoresistance ([7]).

In addition we notice on the basis of different recovery percentages shown in the Figure 2 and 3 that this phenomenon is more pronounced in *B. subtilis* spores compared to those of *B. stearothermophilus*. These results are in contradiction with the observations of [20] on the heat resistance of *Bacillus* spores and reinforce the hypothesis that heat-induced resistance would also vary from one species to another in within the same genus or a different strain within the same species.

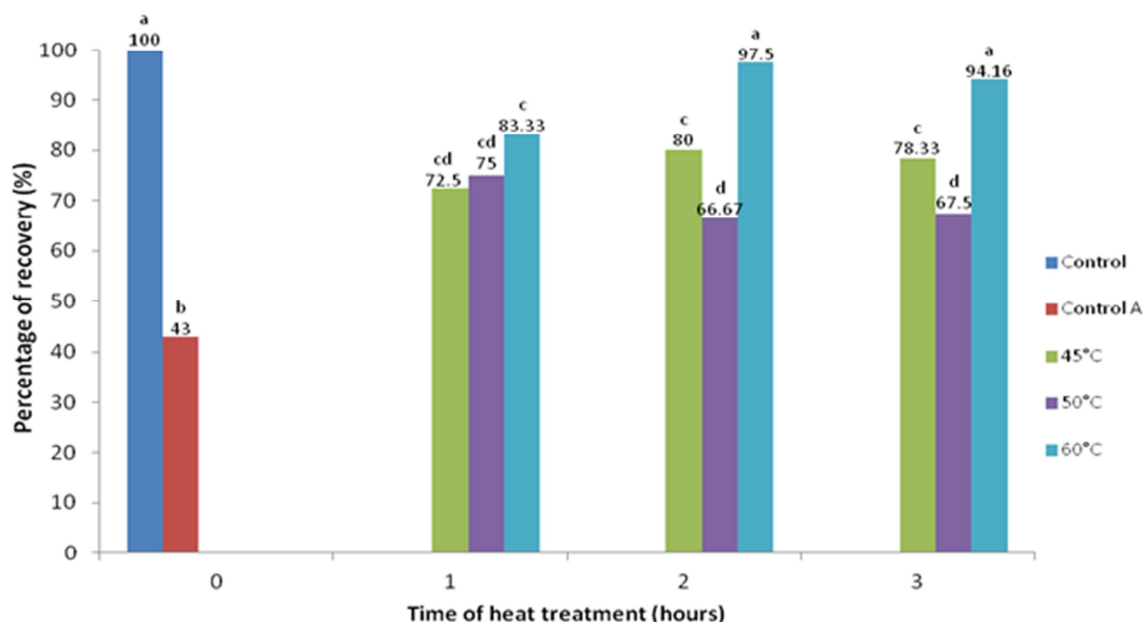


Figure 2: percentage of recovery of the colonies issued from *B. stearothermophilus* spores preheated at 45°C, 50°C and 60°C then treated with acetic acid 0.4% at pH 4.5 during 3 hours. Different letter squares of recovery percentage indicate significant difference using Student Newman-Keuls test ($p < 0.05$).

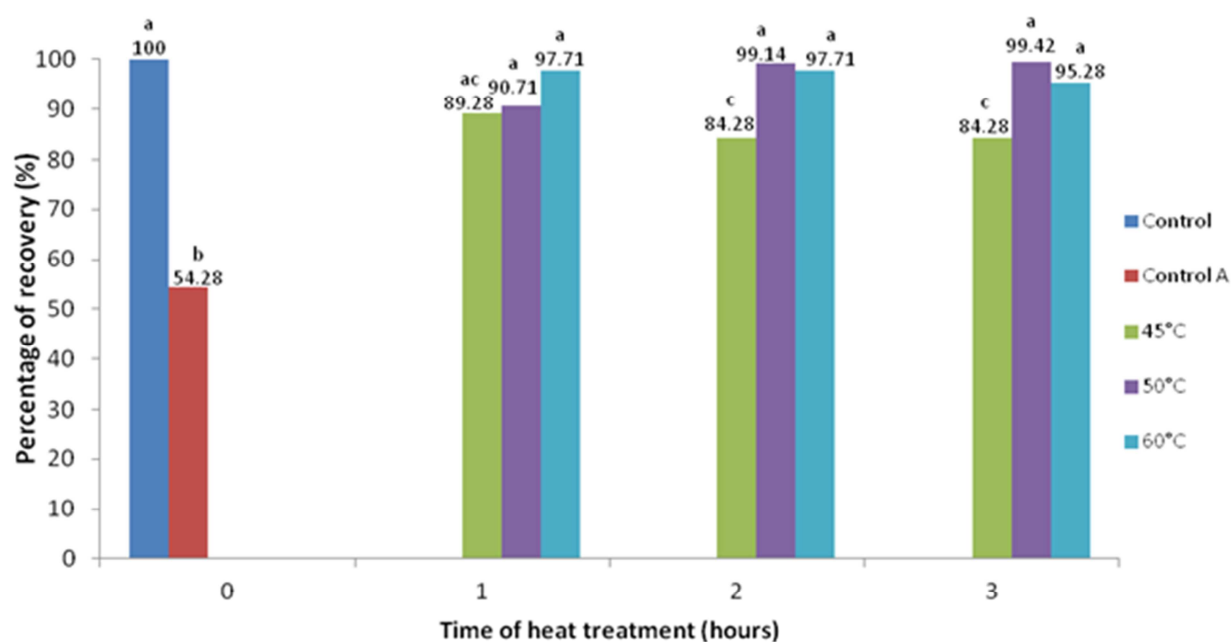


Figure 3: percentage of recovery of the colonies issued from *B. subtilis* spores preheated at 45°C, 50°C and 60°C then treated with acetic acid 0.4% at pH 4.5 during 3 hours. Different letter squares of recovery percentage indicate significant difference using Student Newman-Keuls test ($p < 0.05$).

4 CONCLUSION

At the end of our study, it can be noticed that preheatings at the temperatures of 45, 50 and 60°C induce on the two species of spores a certain increase of resistance to acetic acid. This phenomenon could be called in the example of heat-induced thermoresistance, a heat-induced acid resistance. Mean while, this phenomenon is less pronounced for preheatings at 45 and 50°C during 2 hours, on the other hand, it is more accentuated for preheatings at 50 and 60°C during 3 and 2 hours, respectively for each case on *B. subtilis* and *B. stearothermophilus*. This heat-induced acid resistance phenomenon can explain the damage of some acidic foodstuffs kept at low temperatures but also the resurgence of certain diarrhoeic diseases raise by some *Bacillus* species.

ACKNOWLEDGEMENTS

We would like thank the Microbiology Laboratory, Institute of Food Research of Reading, UK and Institut Appert, Paris for providing us with bacterial spores strains.

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Secure Mobile Cloud Computing Using Improved Identity Management Protocol with RC-5 Algorithm

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ABSTRACT: The analysis of the impact of mobile computing on the various services shows how the mobile computing has changed each service. As mobile computing has become more popular over the past decade, it has been under continuous development with advances in hardware, software, and network. Mobile computing has various applications in our everyday life. The convergence of Internet and mobile computing enables personalized access to online services anywhere and anytime. Entities (e.g., users, services) have to authenticate themselves to service providers in order to use their services. An entity provides personally identifiable information that uniquely identifies it to a Service Provider. Due to the rapid spread of smart phones and social network service, the use of Internet applications has increased and their need for bandwidth has begun to exceed the capacity of 3G networks. This has caused a reduction in speed and service quality. The increase in mobile network users has caused identity management problems for mobile service providers. Therefore, in this paper, proposed system is designed to overcome this problem Improved Identity Management protocol is used to break up loads, which are allowed by the existing Identity Management 3G protocol's mutual authentication via mobile operator process, by sending some parts to an Internet application service provider to enhance mobile and ID management at the service provider and by reducing the network and process loads from information handling and packet transmission. The proposed system used the RC-5 algorithm to increase the speed and security in mobile cloud computing providing private key and public key with existing method and it is fulfilling the needs of cloud users and Providers.

KEYWORDS: Communication Protocol, Social Network, Message Encryption, User Identity management.

1 INTRODUCTION

Cloud Computing is a natural fit for mobile security [1]. Typical handsets have input constraints and practical computational and power limitations, which must be respected by mobile security technologies in order to be effective. Cloud Computing is technology for next generation Information and Software enabled work that is capable of changing the software working environment. It is interconnecting the large-scale computing resources to effectively integrate, and to computing resources as a service to users. Cloud computing allows users to use applications without installation any application and access their personal files and application at any computer with internet or intranet access.

Cloud computing has brought new challenges and opportunities for authentication. There is increasing demand for usable authentication to access services and data for both enterprises and consumers. Identity management is one of the most critical factors that influence the success of Internet business applications. Identity management (denoted IdM hereafter) is about recognizing and verifying the correctness of Identities in Online environments.

Trust management becomes a component of IdM whenever different parties rely on each other for identity provision and authentication. IdM [2] and trust management therefore depend on each other in complex ways because the correctness of

identity itself must be trusted for the quality and reliability of the corresponding entity to be trusted. IdM is also an essential concept when defining authorization policies in personalized services when talking about authentication; it is helpful to give some basic definitions regarding this matter.

The process of authentication [3], or also verification validates a claimed identity by matching it to a known set of identities. In contrast, identification has a different purpose. When identifying a person, that person does not his or her identity. Rather, the system has to find out itself that who is interacting, through matching certain characteristics of a client to models in the database. This is accomplished in a one-to-many matching process.

In the recent world, where the number of mobile users has raised to infinity, the network traffic overload and user identification found to be the main concern for service provider and mobile operators. As we can see, the heavily used social networks like face book and twitter also provide their mobile applications which cause heavy traffic management problem for mobile operators and network companies. It also causes the user identification problems to the service providers. To overcome all these limitations many communications protocols are being used by many mobile operators and service providers. The widely used in recent time is IDM3G [4]. We are proposing the improved version of this protocol. This protocol will minimize the traffic overload problems in mobile computing and will provide the unique user identification mechanism [5] Our proposal minimizes degradation in MO and maintenance by constructing a trusted base with cross certification between service providers and MO.

2 RELATED WORK

A communications protocol defines the rules for sending blocks of data one node in a network to another node. Protocols are normally defined in a layered manner and provide all or part of the services specified by a layer of the OSI reference model. A protocol specification defines the operation of the protocol and may also suggest how the protocol should be implemented. Protocols are usually implemented by writing a number of programs (processes) which communicate with one another through queues and by function calls. One or more timers are also usually required to ensure correct operation of the protocol.

2.1 PGP STANDARD PROTOCOL

Encryption of e-mails and any other forms of communication is vital for the security, confidentiality, and privacy of everyone. This is where PGP comes in and this is why PGP is so popular today. Pretty Good Privacy (PGP), developed by Phil Zimmermann, is a public-key cryptosystem. PGP works by creating a circle of trust among its users. In the circle of trust, users, starting with two, form a key ring of public key/name pairs kept by each user. Joining this "trust club" means trusting and using the keys on somebody's key ring. Unlike the standard PKI infrastructure, this circle of trust has a built-in weakness that can be penetrated by an intruder. However, since PGP can be used to sign messages, the presence of its digital signature is used to verify the authenticity of a document or file.

This goes a long way in ensuring that an e-mail message or file just downloaded from the Internet is both secure and untampered with Improved Identity Management Protocol authenticate messages between SP and MO using key-pairing mechanism of PGP. MO issues paired public key before the beginning of services and generates corresponding private keys for each SP. Both generated keys are used for encrypting messages and verifying security associations between SP and MO.

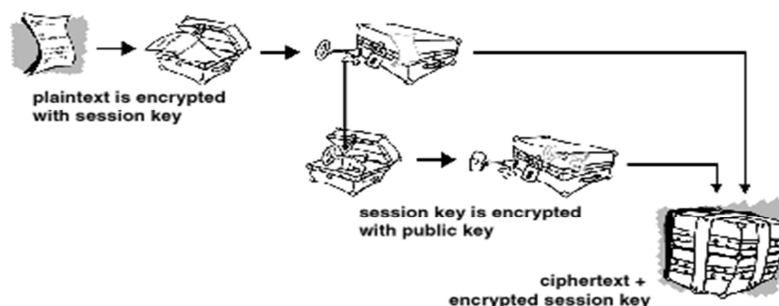


Figure 1-PGP Encryption work

2.2 UMTS-AKA

The UMTS-AKA (Authentication and Key Agreement) is a 3G mobile network technique designed for wireless networks. The Third Generation), a joint initiative of telecommunication standardization organizations from the United States, Europe, Japan and Korea, defined the UMTS Authentication and Key Agreement (UMTS-AKA) mechanism as their core element for entity authentication, user identity management, confidentiality and integrity). The UMTS-AKA mechanism [6] uses a pre-shared secure key (K) between the mobile operator (MO) and the UMTS subscriber identity module (USIM) of the mobile phone to perform authentication and key agreement. The USIM is a cryptography-enabled smart card identified by a unique 15-digit number, called international mobile subscriber identity (IMSI). The USIM and the mobile operator can perform mutual authentication by a challenge and response mechanism. The UMTS-AKA mechanism can achieve a mutual authentication between the mobile user and MO while preserving mobile user's identity privacy and location confidentiality.

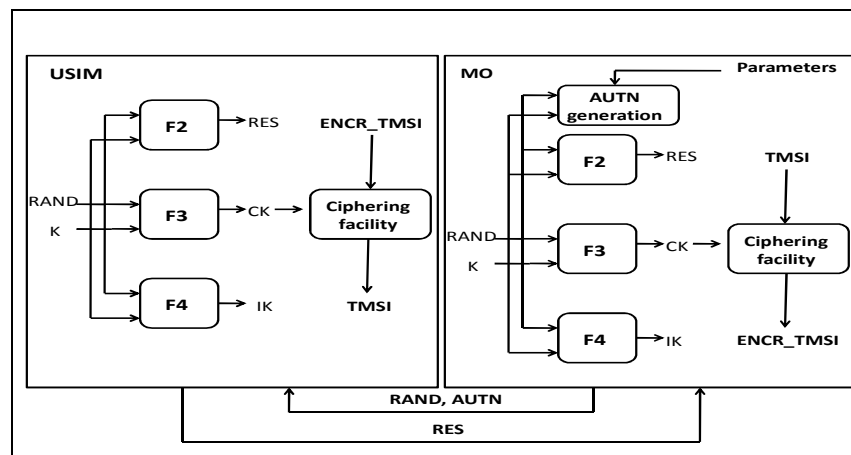


Figure 2- Simplified AKA-UMTS Mechanism

However, the figure 2 UMTS-AKA mechanism cannot help a mobile device user and the user's service provider to authenticate each other. In Improved Identity management protocol, this relationship exists between two independent individuals or between users and the service provider.

2.3 IDM3G PROTOCOL

IDM3G [7], based on a UMTS-AKA protocol on the 3G mobile network, figure 3 focuses on cross-certification and administration between the service provider and users. Authentication and Key Agreement (UMTS-AKA) mechanism as their core element for entity authentication, user identity management, confidentiality and integrity. The UMTS-AKA mechanism uses a pre-shared secure key (K) between the mobile operator (MO) and the UMTS subscriber identity module (USIM) of the mobile phone to perform authentication and key agreement. The USIM is a cryptography-enabled smart card identified by a unique 15-digit number, called an International mobile subscriber identity (IMSI)[8]. The USIM and the mobile operator can perform mutual authentication by a challenge and response mechanism.

The IDM3G protocol has two preceding phases as follows:

1. The user inputs a PIN to login in USIM according to the 3GPP specifications.
2. The USIM and MO finish mutual authentication according to the UMTS-AKA. During this period, the CK (for data encryption) and the IK (for integrity protection) are computed by both USIM and MO [9]. In addition, MO generates ENCR_TMSI by encrypting TMSI, and then sends ENCR_TMSI to USIM. The CK, IK, Auth, RAND and XRES compose a group of UMTS_AKA authentication elements called an authentication vector (AV), which is stored by MO during this connection. The IDM3G protocol is initiated when the user wants to connect to and to do so, they must authenticate with each other.

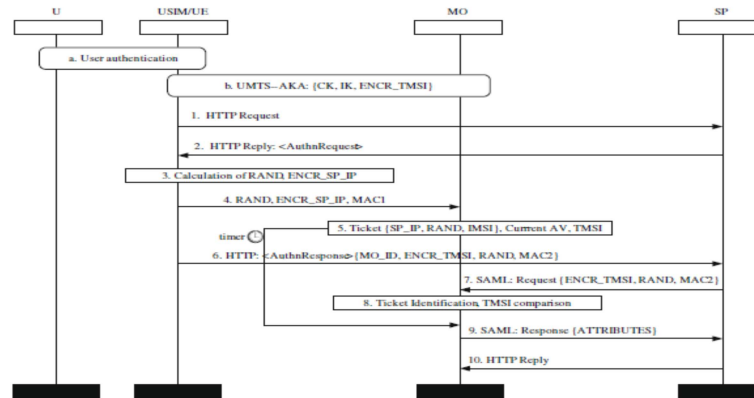


Figure 3-IDM3G Protocol Flowchart

In IDM3G the computation cost contains one random number generation, two message integrity checks, and six message exchanges, as well as ten computations for symmetric en/decryption. Our scheme integrates IDM3G to handle digital rights management over 3G networks [10]. In Table 1 lists the number of computations and transmission rounds in our proposed scheme with IDM3G incorporated. As showing the following table, in the online registration stage and login and access service stage. As well as, the number of symmetric key en/decryptions in the online registration stage and login and access service stage of our scheme is six times more than IDM3G.

Table 1: Number of exchanged messages

Protocol	Number of messages exchanged with the user client	Number of total messages
Liberty artefact profile for SSO	8	10
Liberty browser POST profile for SSO	8	8
Liberty-enabled client and proxy profile for SSO	6	12
Microsoft .Net Passport	8	8
IDM3G	5	7

2.4 USER IDENTITY MANAGEMENT AND AUTHENTICATION

An identity management infrastructure is a collection of technology and policy that enables networked computer systems to determine who has access to them, what resources the person is authorized to access, while protecting individual privacy and access to confidential information and before authentication starts, the authentication consumer lists the access. Identity management is one of the most critical factors that influence the success of Internet business applications. Whether an application runs on-premises or in the cloud, it typically needs to know something about its users. Toward this end, the application commonly demands that each user provides a digital identity, a set of bytes that describes that user. Based on what these bytes contain and how they're verified, the application can determine things such as who this user is and what they're allowed to do.

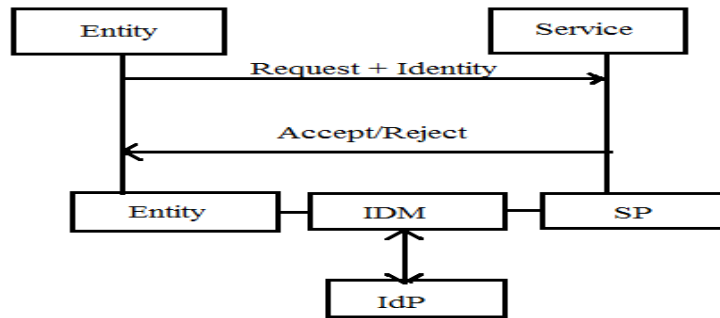


Figure 4- Authentication using third party Identity management.

Whether an application runs on-premises or in the cloud, it typically needs to know something about its users. Toward this end, the application commonly demands that each user provides a digital identity; a set of bytes that describes that user. An identity service in the cloud can address these issues. Because it provides a digital identity that can be used by people, by on-premises applications, and by cloud applications, a cloud identity service can be applied in many different scenarios. An identity is a set of unique characteristics of an entity: an individual, a subject, or an object. Entity identifiers are used for authentication to service providers (SPs) where Figure 4 gives Authentication using third party Identity management. Identifiers provide assurance to an SP about the entity's identity, which helps the SP to decide whether to permit the entity to use a service or not. Entities may have multiple digital identities.

3 PROPOSED WORK

The primary objective of the proposed system is to improve the existing IDM3G protocol. for mobile cloud computing. Figure6 shows the current communication protocol which has some limitation such as improper user authentication and miscommunication between mobile operator and service provider. Here one running android application is there which is on services provider's server. Service provider like facebook or make my trip application and one mobile operator where there is no interaction between mobile operator and service provider which causes the authentication problem and traffic overload on service provider's side

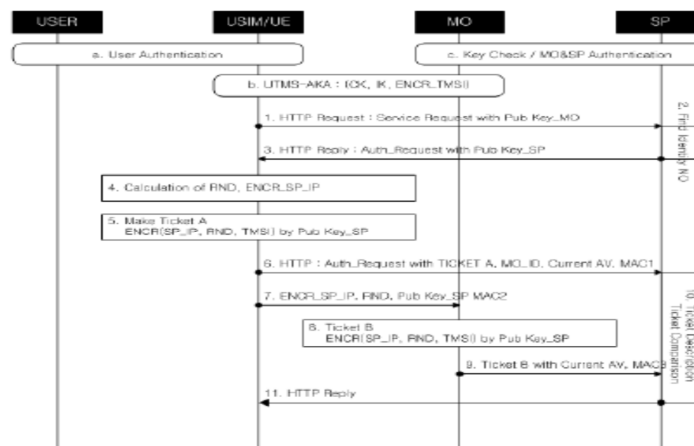


Figure 5- I²DM Protocol

to demonstrate the user authentication problems and to overcome it, user need to process each http request of mobile user protected and route it through mobile operator. Figure 5 shows the I²DM protocol [11] used to overcome the existing protocol limitations. The message exchange is mainly based of secure encrypted message transmission between various parties like mobile operator, user and service provider. This method generates the secret key for particular user on mobile operator end and passes this key to service provider. So when user tries to login to the service providers account, it will be authenticate through this key as well. It will help to mobile operators to keep the user authentication log. I²DM is simple, based on existing standards, guarantees easy implementation, functions technically, and is compatible with user terminal equipment. Requirements related to communication, implementation and protocol are categorized The I²DM, based on the

IDM3G protocol, is expected to yield improvements in both performance and security. IDM3G[12][13] is expected to load to MO itself because the timer operates while receiving USIM/UE information from SP. The new thing is to implementing a new protocol for user authentication for mobile devices which is quiet easy and robust than existing IDM3G protocol. The comparison is based on number of messages exchanged between different parties like user, mobile operator and service provider.

In the field of computing, Mobile Cloud Computing has brought a new dimension to Networking Service. The main vision of this service is interconnected "Mobile Cloud" where application providers and enterprises will be able to access valuable network and billing capabilities across multiple networks, making it easy for them to enrich their services whether these applications run on a mobile device, in the web. In this paper, the data security issues considering on mobile cloud computing [14] and securing mobile cloud computing user's privacy.

3.1 RC5 ALGORITHM IMPLEMENTED TO GENERATE THE PUBLIC KEY

The use of RC5 algorithm for encryption ,cloud computing can be applied to the data transmission security. Transmission of data will be encrypted, even if the data is stolen, there is no corresponding key cannot be restored. Only the user knows the key, the clouds do not know the key. Also, because the properties of encryption, the cloud can operate on cipher text, thus avoiding the encrypted data to the traditional efficiency of operation. User's privacy is protected because user's files are encrypted in cloud storage.

RC5 algorithm is fast symmetric block cipher and same key used for encryption and decryption, where Plaintext and cipher text are fixed-length bit sequences (blocks).

Algorithm divided in three parts :Key Expansion, Encryption Algorithm, Decryption Algorithm.

i. Requirements of key expansion:

Filling the expanded key table array $S[0...t-1]$ with random binary words. "t" – Size of table "S" $\Rightarrow 2(r+1)$. S table is not an "S-box" like DES. Entries in S sequentially, one at a time. Random binary words are derived from the K.

ii. Encryption Algorithm:

Two w-bit words are denoted as A and B

```
A = A + S[0];
B = B + S[1];
for i = 1 to r do
A = (( A ⊕ B ) <<< B ) + S[ 2 * i ];
B = (( B ⊕ A ) <<< A ) + S[ 2 * i + 1];
```

The output is in the registers A and B. Work is done on both A and B, unlike DES. Where only half input is updated.

iii. Decryption Algorithm:

Two w-bit words are denoted as A and B

```
for i = r down to 1 do
B = (( B - S[ 2 * i + 1 ] ) >>> A) ⊕ A;
A = (( A - S[ 2 * i ] ) >>> B) ⊕ B;
B = B - S[1];
A = A - S[0];
```

iv. The output is in the registers A and B:

Data dependent rotations – amount of rotation is not pre-determined.

3.2 RSA ALGORITHM

By Rivest, Shamir & Adleman of MIT in 1977 best known & widely used public-key scheme based on exponentiation in a finite (Galois) field over integers modulo a prime uses large integers (eg. 1024 bits) security due to cost of factoring large numbers One of the interesting things about RSA is that user can tell anyone about how the encryption works; however, this knowledge is not sufficient to be able to decrypt the ciphertext. Only the chosen few who have extra information can decrypt

the message. three approaches to attacking RSA: brute force key search (infeasible given size of numbers) mathematical attacks (based on difficulty of computing $\phi(N)$, by factoring modulus N) timing attacks (on running of decryption) RSA is correct algorithm for this kind of scenario but when it is the matter of cloud then user have to consider the parameters like computational cost and additional storage required for using specific algorithm. In this case RC5 has the advantage over RSA.

4 RESULT ANALYSIS

The proposed method builds the point of contact between service provider and mobile operator and thus allows them to keep log of user authentication and their access. Also this method minimizes the number of requests between user, service provider and mobile operator. The propose system which is designed to improve the communication protocol in mobile computing. By improving means just to overcome the limitations of existing protocols. The Improved identity management protocol will minimize the network overhead for network companies which ultimately maintain the balance between profit and investment for network companies.

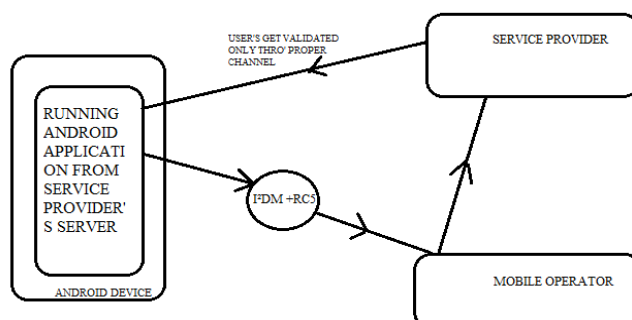


Figure 6- Improved Identity Management Protocol.

The protocol for mobile cloud computing which has several advantages over the existing IDM3G Protocol. The proposed method builds the point of contact between service provider and mobile operator and thus allows them to keep log of user authentication and their access. Also this method minimizes the number of requests between user, service provider and mobile operator. Figure 7 shows the comparison of the existing and proposes protocol using formula which generates output graph with the number of session and the message exchange. The mobile apps like social networking and banking apps really needs the log with mobile operator. Users have used the mobile operator with less message communication.

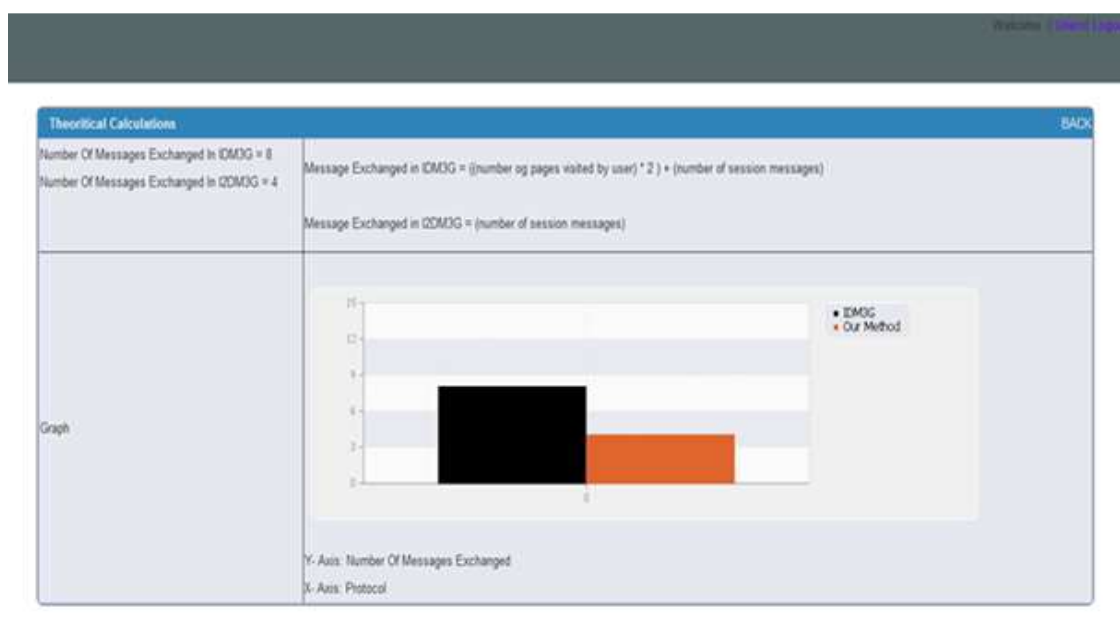


Figure 7- Output of IDM3G and I^2DM Protocol Comparison Graph

5 CONCLUSION

This paper proposes a system which is designed to improve the communication protocol in mobile computing. By improving means just to overcome the limitations of existing protocols. The Improved identity management protocol will minimize the network overhead for network companies which ultimately maintain the balance between profit and investment for network companies.

In our proposed scheme, we successfully improve upon IDM3G to design a fair and secure digital rights management of multimedia over 3G networks, which makes our proposed scheme more practical and easy to implement in the future. It also provides strong SP management and ease of use. And strong SP management may be more secure for implementation of in cloud computing environments Mobile cloud computing is one of mobile technology trends in the future since it combines the Advantages of both mobile computing and cloud computing, thereby providing optimal services for mobile Users.

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