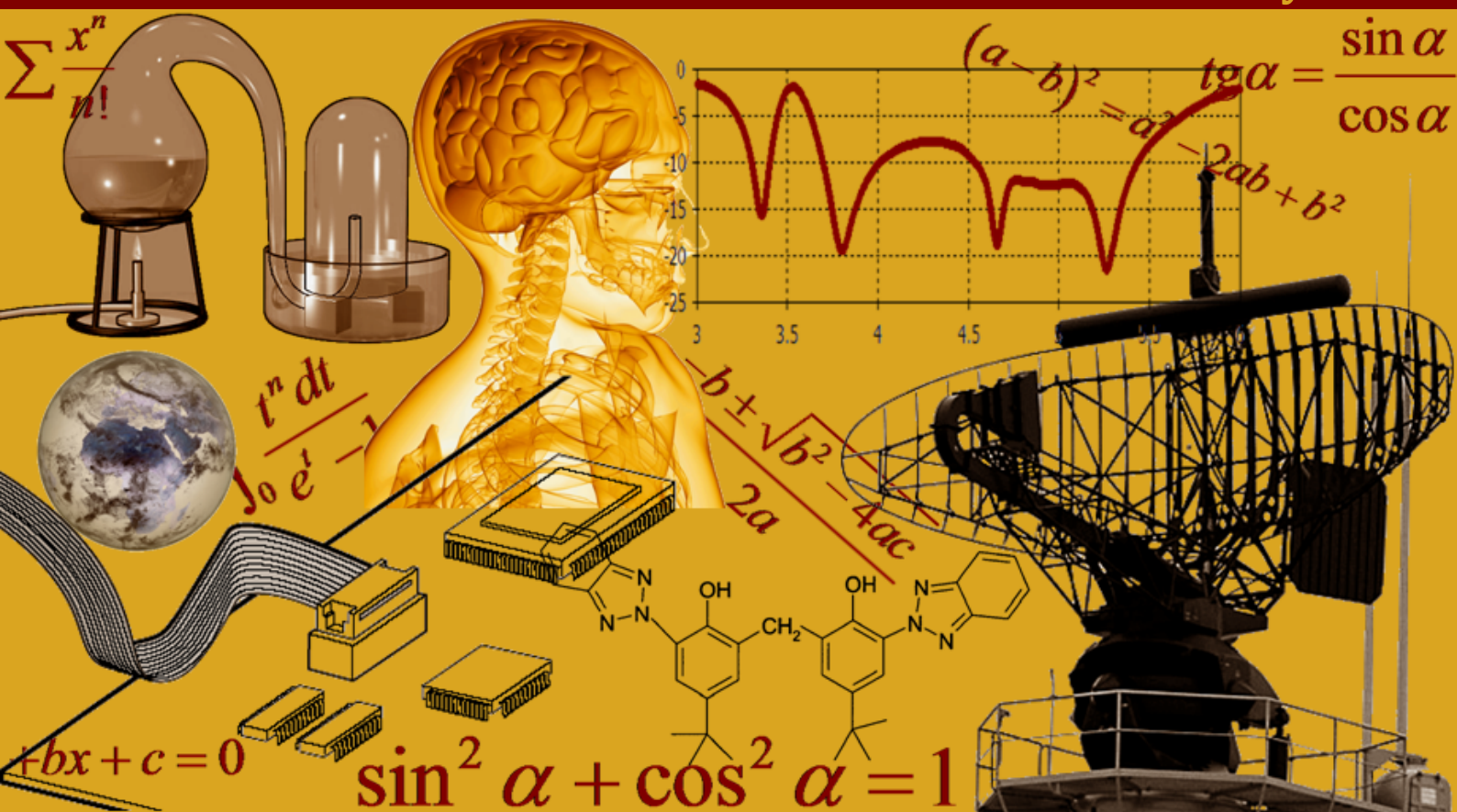


# INTERNATIONAL JOURNAL OF INNOVATION AND SCIENTIFIC RESEARCH

Vol. 30 N. 3 May 2017



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.

All research articles, review articles, short communications and technical notes are sent for blind peer review, with a very fast and without delay review procedure (within approximately two weeks of submission) thanks to the joint efforts of Editorial Board and Advisory Board. The acceptance rate of the journal is 75%.

Contributions must be original, not previously or simultaneously published elsewhere. Accepted papers are available freely with online full-text content upon receiving the final versions, and will be indexed at major academic databases.

## Table of Contents

DIP COATING CONVEYOR AUTOMATION SYSTEM FOR BRAKE SHOES using Programmable Logic Control (PLC)	326-329
<i><u>V. KRISHNA, D. MARK KINGSTON AGASSY, M. LOKESHWARAN, D. BHARATHI, and N. BAGYALAKSHMI</u></i>	
MICROCONTROLLER BASED HOME SECURITY SYSTEM USING GSM MODULE	330-337
<i><u>A. Arunkumar, P. Maikkannan, M. Nitheiswaran, and N. Bagyalakshmi M.E.</u></i>	
AUTOMATIC WASTE DESTROY USING GSM TECHNOLOGY	338-342
<i><u>V.P. Krishnammal, M. Vignesh, and T. Vinoth</u></i>	
PERFORMANCE ANALYSIS OF VARIOUS MULTIPLIER USING VHDL	343-348
<i><u>V.P. Krishnammal, S. Anbuselvi, and K. Janani</u></i>	
AUTOMATION OF CALIBRATION USING CMMS TECHNOLOGY	349-352
<i><u>C. Stalin Jose, K.R. Ganapathi, K. Karthikeyan, C. Mahesh, and M.V. Muruga Vignesh</u></i>	
SECURED HUMAN IDENTIFICATION USING FINGER VEIN	353-356
<i><u>R. Aasir Allwin, M. Joanna Felcy, S. Jothijob, and N. Bagyalakshmi</u></i>	
Automatic Engine Ignition Based on Traffic Signal Using Micro-Controller	357-363
<i><u>M. Anbarasan, A. Ajeeth Kumar, P. Ranjith Kumar, and A. Subashini</u></i>	
DAM AUTOMATION USING ARDUINO	364-369
<i><u>V. Rajendran, I. Shilpa, S. Veeravalavan, and M. Anbarasan</u></i>	
WIND MILL AUTOMATION USING ARDUINO AND SCADA SYSTEM	370-376
<i><u>R. Rahul, S. Ragul Raj, S. Vidhya, and M. Anbarasan</u></i>	
Segmentation for Video Sequence	377-384
<i><u>M. Ganeshwade Mandakini, Daivashala R. Deshmukh, and K. Vengatesan</u></i>	
By Using SIFT Algorithm: Privacy Policy Inference of User-Uploaded Images on Content Sharing Sites	385-388
<i><u>Shraddha Babasaheb Kote, M. Ganeshwade Mandakini, and K. Vengatesan</u></i>	
Cipher Text Attribute Based Encrypted Data Sharing With Escrow in Cloud Computing	389-394
<i><u>N. Jayapriya, V. Maheswari, M. Moovarasi, and G. Shanthi</u></i>	
POETRY VISUALIZATION	395-401
<i><u>P. Renuka Devi, T.M. Thaarane, R. Ramya, and S. Shruthi</u></i>	
Data Optimization and Secure Data Transfer by Dynamic Sensing and Routing in Rechargeable Sensor Networks	402-407
<i><u>G. RAJALAKSHMI, A.P. SHOPE CHIDIYA, A. VINITHA, S. ARCHANA, and S. PARVATHI</u></i>	
Sentimental and Latent Analysis of Twitter based Product Reviews	408-415
<i><u>R. Sathishkumar, T.M. Rino Simon, D. Abishake, M. Ajith Kumar, and Max Sherwin</u></i>	
Retrieve system of an intelligent ambulance using designate traffic shifting	416-419
<i><u>M. RAJAKUMARI, K. ROHINEE, K. SRI SANGEETHAA, V. SUGANYA, and S. VIMALA</u></i>	
EFFICIENT METHOD FOR IMAGE CLASSIFICATION USING ACO	420-427
<i><u>D. Vinod Kumar and P. Selvakumar</u></i>	
RTPG BASED BUILT IN SELF TEST FOR TEST COMPRESSION	428-435
<i><u>D. Ramya, R. Vanithamani, D. Yasmin, and K. Elamathi</u></i>	
VLSI Implementation of Compression Engine using DWT/IDWT for JPEG 2000 in VHDL	436-441
<i><u>P.S. Neethu and B. Gowri Shankari</u></i>	
VIRTUAL REALITY BASED ON HUMAN COMPUTER INTERACTION	442-445
<i><u>M. Gayathri, R. Kasthuri, K. Kavalvizhi, and J. Privadharshini</u></i>	
A New Approach For Reducing Ripples In Transformer-less DC DC Converter For High Power Application	446-452
<i><u>S. RAJARETHINAM, BHARATH RAI, R. MANOJ, and N. JANAKI</u></i>	

Modeling And Analysis Of Series-Switch Five-Level Dual-Buck Full-Bridge Inverters For Grid-Tied Applications	453-461
<i><u>P. SELVAKUMAR and R. GANDHI</u></i>	
PHOTOVOLTAIC WATER PUMPING SYSTEM BASED ON MAXIMUM POWER POINT TRACKING TECHNIQUES	462-471
<i><u>M. VIJAY and S. Vijayakumar</u></i>	
ARDUINO BASED AUTOMATED MOBILE BRIDGE ACROSS THE RAILWAY PLATFORM	472-479
<i><u>S. Nagalaksmi, P.M. Natarajan, R. Abinaya, S. Hemalatha, and S. Meenaka</u></i>	
Experimental Evaluation of Mortar Embedded with PCM	480-487
<i><u>J. Esther Baby and R. Greesan</u></i>	
KINETIC ENERGY RECOVERY SYSTEM IN BICYCLE BY USING FLYWHEEL	488-492
<i><u>G. Arun Deesh, R. Kannan, S. P. Gokul, M. Gopal, and V. Gowtham Mani Balaji</u></i>	
ENERGY EFFICIENT SOLAR DRYER FOR SAGO INDUSTRIES	493-500
<i><u>M. VIJAY, S. Vimalraj, S. Vinith, K. Vishay Vincent, and P. Vijaymohan</u></i>	
FABRICATION OF SUGARCANE BUD REMOVAL MACHINE WITH ADVANCEMENTS	501-506
<i><u>R. Abarna, M. Dhayanethi, A.S. Elango, M. Elango, and R. Hari Prasanth</u></i>	
Fabrication and testing of Nature fibre Reinforced Hybrid Composites Banana / Bamboo	507-523
<i><u>M. Silambarasan, C. Dhanapal, and N. Srinivasan</u></i>	
DESIGN OF SOLAR STILL ON WATER DISTILLATION	524-527
<i><u>S. Manikandan, G. Mohanraj, M. Nandhakumar, P. Neelamanikandan, and M. Selvaraj</u></i>	
ANALYZING MECHANICAL PROPERTIES OF FRICTION STIR WELDED JOINTS OF SIMILAR AND DISSIMILAR ALUMINIUM ALLOYS	528-534
<i><u>V. Yogesh, P. Yasharkumar, S. Sathish Kumar, V. Vishnu, and S. Srinivasan</u></i>	
Design and Fabrication of Industrial Conveyor Using Crank Mechanism	535-539
<i><u>A. Vijay, N. Sivakumar, M. Prabhu, and R. Rathish</u></i>	
CHANGING COMPOSITE MATERIAL IN MAIN HELICOPTER ROTOR BLADE	540-544
<i><u>K. BALAJI, P. GRACEKUMAR, K. MAHIMAIPRABHU, M. MANIKANDAN, and R. RAGHUL</u></i>	

## DIP COATING CONVEYOR AUTOMATION SYSTEM FOR BRAKE SHOES using Programmable Logic Control (PLC)

V. KRISHNA<sup>1</sup>, D. MARK KINGSTON AGASSY<sup>1</sup>, M. LOKESHWARAN<sup>1</sup>, D. BHARATHI<sup>1</sup>, and N. BAGYALAKSHMI<sup>2</sup>

<sup>1</sup>Student, Department of EIE Adhiyamaan College of Engineering, Hosur, India

<sup>2</sup>Faculty, Department of EIE, Adhiyamaan College of Engineering, Hosur, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The present project is about the design and implementation of dip coating conveyor automation system for brake shoes based on Programmable Logic Controller (PLC) technology. The PLC correlates the operation parameters control required by the user and monitors the system during normal operations and under dipping condition. Tests of dip coating system is driven by three phase AC induction motor driver using Variable Frequency Drive (VFD) controller. PLC provides higher accuracy in regulation as compared to human works, PLC is proved as a versatile and wide effective tool in industrial control of electric drives. Here it is correlating hardware and software together to control parameters of DIP coating system.

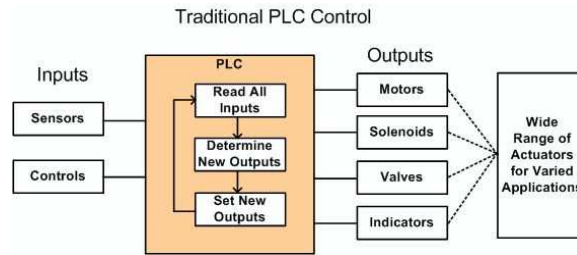
**KEYWORDS:** Dip Coating Conveyor, Programmable Logic controller (PLC), DOL, Variable frequency drive (VFD).

### 1 INTRODUCTION

The industries are coming up with some well developed technologies in recent years [8]. To avoid the manual work load automation were introduced as production rate increases in short span of time [6]. All the control devices such as communication related interfaces statistically enters the internet information center[1]. Control of equipment are done by computers. In most industries control of equipment are carried through PLC (Programmable Logic Controller), as it has many advantages with it [9]. The advantages are read as easy installation, inexpensive, flexible to applications [2]. PLC can be get connected with machines as an application in the manufacturing automation [3]. It gets connected to the external world by its inputs and outputs [4]. For driving the motor Variable Frequency Drive (VFD) is used and the system is operated by means of three phase AC motor. By using PLC the entire operation can be controlled and here parameters such as level, speed, temperature will monitored. Before the brake shoes gets dip coated it passes through three tanks to remove unwanted resins and materials. The tanks are maintained at a desired temperature. This project presents the PLC based monitored Dip Coating. PLC helps in correlating hardware and software control units [5].

### 2 PLC AS A SYSTEM CONTROLLER

PLC is a control system designed for automation processes in industries. Inputs are sensors and controls. Outputs are motors, solenoids, valves, indicators. The traditional PLC control read all inputs in the initial process and determine new outputs and finally set new outputs. The output application range differs depend on the variety of outputs.

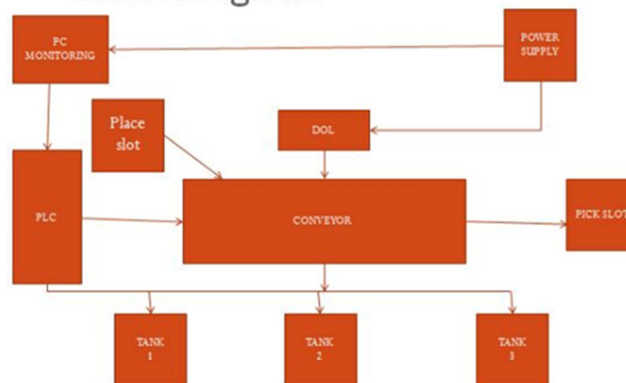


In this application, it controls through analog/digital inputs and outputs by varying the speed through VFD of an induction motor. Also the PLC reads the input and control the outputs according to the PLC program. This PLC is a Delta type of ISP software where the link is made to the system through RS232 cable. It has an advantage that the initial configuration can be expanded for the other applications as machine systems and computer related linking

### 3 CONTROL SYSTEM OF DIP COATING CONVEYOR

The brake shoes are placed in a rectangular slot containing steel carriers for brake shoes. They are passed through three different tanks containing three water filled beds maintained at a desired temperature, So as to remove the unwanted resins and oils in the brake shoes. The entire system is monitored by the PC and they are controlled by PLC [7]. Panel board in designed in a way that, it in builds all essential switches and controls for the process. The brake shoes then passes through the heater will reach dip coating reservoir where the enamel is coated. Finally brake shoes are picked at pick slot after passing through heater.

Block Diagram:



The configurations that are obtained from the setup are Computer to record the status of dip coating conveyor system, PLC being programmed with ladder logic diagram and connects PC through RS232, AC induction motor is used, where the speed is controlled by VFD (Variable Frequency Drive), Panel board contains entire signals from emergency switch to auto/manual switch, tank level indicators, startup switch and hooters, A rectangular plate containing ten hooks where ten brake shoes can be placed, as such 100 brake shoes can be coated during a cycle.

### 4 HARDWARE DESCRIPTION

PLC and Control circuit operations are carried in different items. Similar for heater control, motor control, sensors, main powers. Here the hardware is designed with series of MCB connected with terminal blocks. Transmitter is placed such that, The supply can be directed in a positive way. AC motors drives the system and VFD controls the speed, since torque is directly proportional to speed. High quality low cost motors are supplement. For short circuit and overload protection 2P 6A MCB is used. For 440VAC to 230VAC control transformer is used. In heater control SSR 40A 3P is for linear controlling of heater with 4-20Ma. For motor control contractor is used for turning on motor, For overload and tripping of contractor OLR is necessary, for short circuit and overload protection 3P 6A MCB is used.

Operation Wise Instruments

SL NO	AREA OF OPERATION	ITEM	USAGE	QTY
1		SURGE PROTECTION FUSE MOV	FOR PROTECTION FOR HIGH VOLTAGE SPIKE	1
2		PLC-DVP4ES211-B	PLC FOR CONTROLLING	1
3	PLC AND CONTROL CIRCUIT	300-0V48P411	300-0V48 ADD ON MODULE FOR PLC	1
4		3P 6A MCB	FOR SHORT CIRCUIT AND OVERLOAD PROTECTION	1
5		SMPS	230VAC TO 24VDC CONVERSION	1
6		RELAY PATCH CARD	FOR SOLUTION ON PLC OUTPUT	1
7		CONTROL TRANSFORMER	FOR 480VAC TO 230VAC	1
8		3SP 800 3P	FOR LINEAR CONTROLLING OF HEATER WITH 4-20MA I/P	2
9	HEATER CONTROL	3P 20A MCB	FOR SHORT CIRCUIT AND OVERLOAD PROTECTION	2
10		DT8848A	PROCESS PID WITH 4-20MA CONTROLLING	2
11		CONTACTOR	FOR TURNING ON MOTOR	2
12	MOTOR CONTROL	2A	FOR OVERLOAD TRIPPING OF CONTACTOR	2
13		4 C/O RELAY WITH BASE	FOR MANUAL OPERATION	4
14		3P 6A MCB	FOR SHORT CIRCUIT AND OVERLOAD PROTECTION	1
15	SENSOR	CAPACITIVE SENSOR	FOR LEVEL DETECTION ON SOLUTION	1
16		FLOAT SENSOR	FOR LEVEL DETECTION ON WATER	2
17		EMERGENCY PB	FOR EMERGENCY TRIP	1
18		KEY SELECTOR SW	FOR AUTO MANUAL	1
19		PROCESS START/STOP PB	FOR TURNING ON THE PROCESS	1 SET
20	SIGNALING AND INDICATING	CONVEYOR START/STOP PB	FOR MANUAL OPERATION OF CONVEYOR	1 SET
21		RINSING MOTOR START/STOP PB	FOR MANUAL OPERATION OF RINSING MOTOR	1 SET
22		BLOWER START/STOP PB	FOR MANUAL OPERATION OF BLOWER	1 SET
23		PILOT LAMP	FOR LEVEL INDICATION	1
24		TOWER LAMP	FOR PROCESS INDICATION AND HOOTER	1
25	MAINING POWER	POWER ON RYB LAMP	FOR POWER ON STATUS	1 SET
26		3P 63A MCB	FOR SHORT CIRCUIT AND OVERLOAD PROTECTION	1

In sensors capacitive sensor is used in level detection on solution in the conveyor and float sensor is used in detecting water in tanks. Signaling and indication hardware units such as emergency PB for emergency trip and key selector switch for auto manual. Process start/stop, Conveyor start/stop, Rinsing motor start/stop PB's are used for their respective manual operations. Pilot lamp and Tower lamp for level indication and process indication and hooter. Main powers include Power on RYB lamp for power on status and 3P 63A MCB for short circuit and overload protection.

### 5 SOFTWARE DESCRIPTION

PLC is flexible, programmable, alternative to electrical circuit based control system since they are available in analog/digital devices. The programming method is ladder logic type. PLC provides a design circumstance in the form of software tools which allow the ladder diagram to develop, testify and verify. First the program is to be written in a ladder logic type later in will be converted into binary instruction codes that can be stored in Random Access Memory (RAM) or Erasable Programmable read-only memory (EPROM). Here in Delta PLC inputs are notified as X and outputs are as Y. Each input and output connection point in PLC has an address to identify input and output bit. PLC memory unit is classified into three different regions a. Discreet input, b. Output relay and c. Internal memory.

ID	DEV	ADDR	WORD	VAL
%ID_1_SV	D102	WORD	0	
%ID_1_MV	D104	WORD	0	
%ID_2_PV	D106	WORD	0	
%ID_2_SV	D108	WORD	0	
%ID_2_MV	D110	WORD	0	
_EMERGENCY	X0	BOOL	FALSE	
_MANUAL_SW	X1	BOOL	FALSE	
_TRIP_STS	X10	BOOL	FALSE	
_ACCEPT	X11	BOOL	FALSE	
_PROCESS_START	X2	BOOL	FALSE	
_PROCESS_STOP	X3	BOOL	FALSE	
_TK_1_LOW	X4	BOOL	FALSE	
_TK_2_LOW	X5	BOOL	FALSE	
_TK_3_LOW	X6	BOOL	FALSE	
_SDSENSOR	X7	BOOL	FALSE	
%_TK_1_LOW	Y0	BOOL	FALSE	
%_TK_2_LOW	Y1	BOOL	FALSE	
%_TK_3_LOW	Y2	BOOL	FALSE	
%_TW_RED_GREEN	Y3	BOOL	FALSE	
%_HOOTER	Y4	BOOL	FALSE	
%_BLOWER_1	Y5	BOOL	FALSE	
%_BLOWER_2	Y6	BOOL	FALSE	
%_CONVEYOR	Y7	BOOL	FALSE	
%UTO_MODE_ON	M0	BOOL	N/A	
%LL_TANK_HEALTHY	M1	BOOL	N/A	
%ID_1_ON	M2	BOOL	N/A	

The output values stored in PLC are used in setting and resetting the physical values of PLC. RS232 is cable by which the PLC and PC is get connected. The PC provides the software by which the file editing, printing, storage and operations of the program are monitored. The entire system can be controlled both in online and offline mode. When the PLC is in online

mode it is monitored and controlled via operations that are programmed already. This makes operations easier and also allow the PC to check the data for the operations.

## 6 RESULT

The system was tested during its operation with dip coating conveyor automation system for brake shoes. The PLC monitors the entire operation performed and different parameter were detected. It statistically proved that over a period of cycle hundred brake shoes can dip coated in twenty to twenty five minutes duration time.

Tank1(water) Dip Time	Tank2(water) Dip Time	Tank3(water) Dip Time	Conveyor Dip Time (Enamel)
0-3mins	0-3mins	0-3mins	0-3mins

## 7 CONCLUSION

Positive resulting experimental details were obtained previously describing PLC can be used in automation system with three phase AC induction motor, where speed is controlled by VFD as it provides high accuracy at constant speed.

The present work reveals that dip coating conveyor automation effectiveness with PLC based control system is satisfactory and affordable. In spite of being simple control methods this presents advantages such as constant voltage, economically beneficial, high accuracy, constant driving speed, higher efficiency. Since the dip coating conveyor automation system for brake shoes with PLC proves to be efficient and effective versatile tool in industrial automation application.

## REFERENCES

- [1] S. S. Peng, M. C. Zhou. 'Ladder Diagram and Petri- NetBased Discrete-Event Control Design Methods'. IEEE Transactions on Systems, Man, and Cybernetics- Part C, Applications and Reviews, Vol.34 No.4 pp. 523-531 Nov. 2004.
- [2] KsvNima Company. 'Application of dip coating with automation' North America, pp1-4, oct2010.
- [3] G. Kaplan. 'Technology Industrial electronics' IEEE Spectr., vol. 29, pp. 47-48, Jan. 1992.
- [4] B. maaref, S. nasri and P. sicard. 'Communication system for industrial automation' in proc. IEEE int. symp Industrial electronics, vol. 3, pp. 1286-1291, 1997.
- [5] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [6] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [7] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [8] Prof. Krishna Vasudevan, Prof. G. Sridhara Rao and Prof. P. Sasidhara Rao. 'Electrical Machines I' Indian Institute of Technology Madras, pp99-122.
- [9] Programmable Controllers. Part 1: General Information, 1992.
- [10] British Standard, BS EN 61131-1, 1994.
- [11] J. G. Gilberl, G. R. Diehl, 'Application of Programmable Logic Controllers to Substation Control and Protection', IEEE Transactions on Power Delivery, Vol. 9, No. 1, January, USA, pp. 384-388, 1994.
- [12] N. Aramaki, Y. Shimikawa, S. Kuno, T. Saitoh and H. Hashimoto, 'A new architecture for high-performance programmable logic controller,' in Proc. 23rd Int. Conf. Industrial Electronics, Control and Instrumentation, vol. 1, pp. 187-199, 1997.
- [13] A.Williams. 'Microcontroller projects using the Basic Stamp' (2nd Ed.). Focal Press, ISBN 978-1-57820-101-3, pp.339-362, 2002.

## MICROCONTROLLER BASED HOME SECURITY SYSTEM USING GSM MODULE

A. Arunkumar<sup>1</sup>, P. Maikkannan<sup>1</sup>, M. Nitheiswaran<sup>1</sup>, and N. Bagyalakshmi M.E.<sup>2</sup>

<sup>1</sup>UG students, Department of EIE, Adhiyamaan College Of Engineering, Hosur, India

<sup>2</sup>Assistant professor, Department of EIE, Adhiyamaan College Of Engineering, Hosur, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Security has becoming an important issue everywhere. Home security is becoming necessary now a days as the possibilities of intrusion are increasing day by day. Safety from theft, leaking of raw gas and fire are the most important factor of home security system gives the signals in terms of alarm. However, the GSM (Global System For Mobile Communication) based security systems provides enhanced security as whenever a signal from sensor occurs. A text message actions. This project suggests two ways for house security system. The first system uses sensors. Whenever there is a motion, vibration, fire accidents it gives security alert in terms of sending SMS which uses GSM-GPS module(sim900) is delivered to owner. The second system receives commands from registered user mobile and activates respective relay drivers (Lighting circuit, Anaesthetic gas dispenser, Buzzer).

**KEYWORDS:** GSM module, PIC microcontroller, Relay, Sensor, Signals, SMS.

### 1 INTRODUCTION

Automated home or intelligent home which indicates the automation if daily tasks with electrical appliances used in homes and offices. This could be control of lights, fans, viewing of house interiors for surveillance purpose or giving the alarm alteration or indication in case of gas leakage. Home security has changed a lot from the last century and will be changing in coming years[2]. Security is an important aspect of future in the smart home applications[1]. The new and emerging concept of smart homes offers a comfortable, convenient, and safe environment for occupants. Conventional security systems keep home owners and their property, safe from intruders by giving the indication in terms of alarm. However, a smart home security system offers many more benefits. This paper mainly focuses on the security of home when the user is away from the place. Two systems are proposed, one is based on GSM SMS sending and other uses relay driver to enable control and alarm circuits. The first system is SMS based and uses GSM technology to send the SMS to owner of home. The proposed system is aimed to security of home against intruders and fire. In any of above cases happens while the owners are out of their home then device sends SMS to the emergency number which is provided to the systems. The system is made of four major units: Sensor, GSM module(SIM900), PIC microcontroller (PIC16F877A), Relays.

The second system consists of relay drivers which will be enabled by controller when the controller receives commands from user registered mobile phone through GSM module. These relay drivers connected with respective load and lighting circuits, buzzers, anaesthetic gas dispense. MPLAB software is main source for make embedded coding for microcontroller of PIC family.

### 2 MARKET SURVEY/ EXISTING PROJECT

According to the market research, the common parameters or characteristics of home security system are 24 hours monitoring of the intruder, ease of use, reliability, efficient, fast and precise notification system. Today numbers of home security system are available in market. In paper [3], design which contains a home network including a GPRS/GSM gateway and three kinds of wireless security sensor nodes is presented. This system has a user interface and it can respond quickly

alarm incidents. In paper[4], a new method of moving object detection by combination of pixel illumination with its chroma in YUV colour space is implemented. The algorithm of maintenance with 3 key values is discussed in this paper. In case of swaying objects, it is very robust and effective way of false alarms. Paper[5] discusses detection and description based on an object oriented, statistical multi feature analysis of video sequence.

The system described in [6] monitors everything by moving cameras. The system can increase the efficiency of monitoring and can eliminate the blind spots of fixed cameras. In this system, a mobile manipulator is developed which is equipped with cameras at the arm end for purpose of monitoring. The system is based on SMS technology using any GSM modem/mobile is presented in[7]. The proposed remote control system works from anywhere in the world. A low cost short message system based home security system equipped motion sensor, smoke detector, temperature sensor, humidity sensor, and light sensor has been studied in [8]. The sensors are controlled by a microprocessor PIC18F877A through the SMS having password.

### 3 HARDWARE SYSTEM DESIGN

The system consists of microcontroller, sensor, relay, GSM module, LCD display, anaesthetic gas dispenser, lighting and buzzer circuit. PIC controller consists of 40 pins which are analogue, digital, oscillator, power supply, ground pins. LCD display has connected with controller for print the status like sending sms, vibration detected, motion detected, fire detected. Universal keypad interfaced with controller for open and close the door. Three input sensors are connected with controller are vibration, motion and temperature sensor to detect the intruder and change in corresponding parameter. GSM module interfaced with controller to send and receive the messages from and to the user mobile phone. This module consists of transmitter and receiver ports for serial communication. Output loads are interfaced with relay drivers which are 5V (dc) relays. When any one of these sensors generate output signal over the limit the controller receives the analogue signal and produces corresponding output signal as per program burned into it. Loads are individually powered by external power supply (5-9v dc, 230v ac) through relay drivers. Anaesthetic gas dispenser connected with relay and it will on when user sends sms as "#SPRAY". Each sensor is connected with conditioning circuit for amplification and filtering purposes. In relay circuit which is interfaced with lighting circuit, need power supply (230v) for on the lights. Door lock motor system connected with two relays for rotating in clockwise and anti-clockwise directions. GSM module connected with power supply unit of microcontroller and it will receive signals through RS232 cable. It contains sim pad at backside of module. When the module gets powered blue colour LED will on for states it is in power supply and working. If this module shares serial signals from or to controller the green colour LED will flash. Use proteus software, to simulate and verify the whole system design whether it works properly or not. Each wire connection is made with soldering kit because of it is robust and stands for long time.

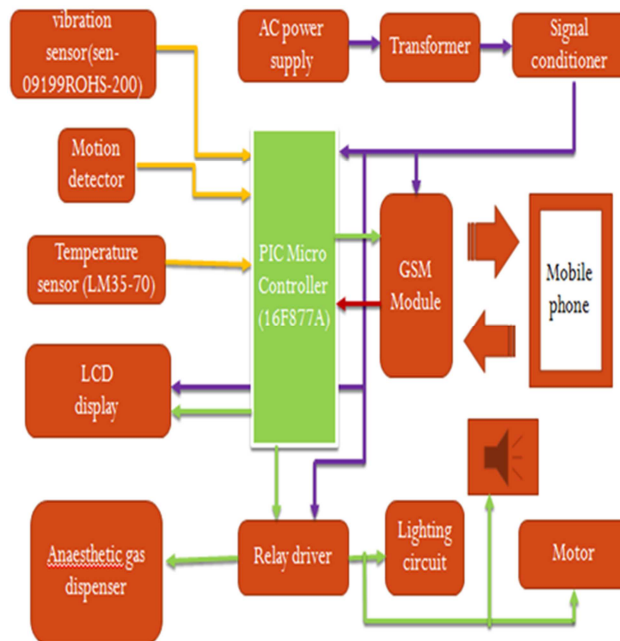


Fig.1. functional block diagram

PIC microcontroller:- Microcontrollers gives fantastic way of creating innovative embedded projects. A PIC microcontroller is a processor with built in memory and RAM and programmer can use it to control the devices(or build project around it). So it saves building a circuit that has separate external RAM, ROM and peripheral chips. What this really means for is that has a very powerful device that contains many useful built in modules e.g. EEPROM, Timers, Analogue, Comparator, UART. In fact the 8 pin(DIL) version of the 16F877A has an amazong number of internal peripherals. These are: Two timers, one 10 bit ADC with 4 selectable inputs, an oscillator(or you can use an external crystal), an analogue comparator, 1024 words of memory, 64 bytes of RAM, 128 bytes of EEPROM memory, external interrupts( as well as interrupt from internal peripherrals), external crystal can go upto 4Mhz, ICSP: PIC standard programming interface. Features : In fact a PIC microcontroller is amazingly powerful featured processor with internal RAM, EEROM, FLASH memory and peripherals. One of the smallest ones occupies the space of a 555 timer but has a 10 bit ADC, 1K of memory, 2 timers, high current I/O ports a comparator a watch dog timer.

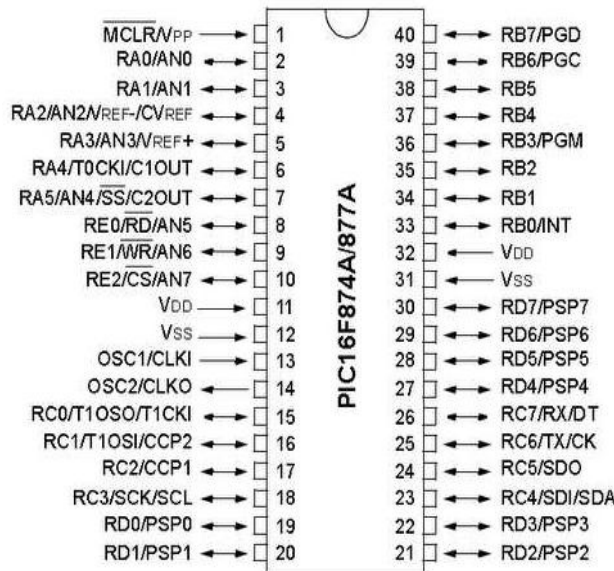
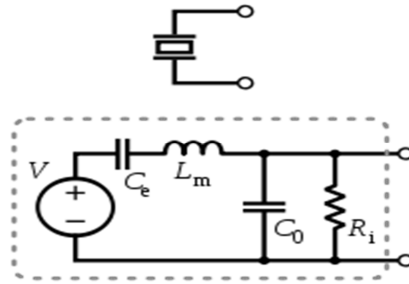


Fig.2. PIC microcontroller

Vibration sensor:- A piezoelectric sensor is a device that uses the piezoelectric effect, to measure change in pressure, acceleration, strain, weight or force by converting them to an electrical charge. The prefix ‘piezo’ means press or squeeze. Some materials used (especially gallium phosphate or tourmaline)are extremely stable at high temperature, enabling sensors to have a working range of up to 300°C. Tourmaline shows pyroelectricity in addition to the piezo electric effect, this is the abilikty to generate an electrical signal when the temperature of the crystal changes.

Motion sensor:- Every object that has a temperature above perfect zero emits thermal energy(heat) in form of radiation. Humans, radiates at wavelength of 9-10 micrometers all time of the day. The PIR sensor is tuned to detects this IR wavelength which only emanates when a human being arrives in their proximity. The term “pyroelectricity” means: heat that generates electricity (here, an electric signal of small amplitude). Since these sensors do not have an infrared sources of their own, they are also termed as passive.

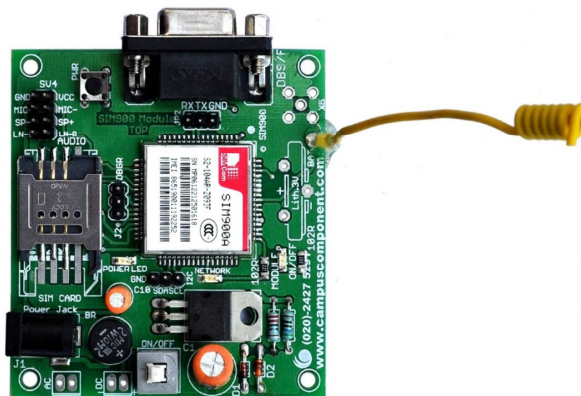


**Fig.3. vibration sensor**

**LDR sensor:-** A light dependent resistor or a photo resistor is a device whose resistivity is a function of the electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells, photo cells. It works on the principle of photo conductivity. LDR are light dependent devices whose resistance is increased in the dark place. The resistance is called dark resistance. It can be high at  $10^{12} \Omega$ . When light incident on the photo cell it usually takes about 8 to 12 ms for the changes in resistance to take place, while it takes one or two seconds for the resistance to rise back again to its initial value after removal of light. This is called resistance recovery rate. Types: 1. Intrinsic photo resistor 2. extrinsic photo resistor.

**Universal keypad:-** An electronic device which consists of numeric valued buttons and special character. It can be easily interfaced with other electronic devices through serial ports. It only handle digital signal for data transmission. Here encoder and decoder circuit are there.

**GSM module:-** Global system for mobile / general packet radio services TTL modem is SIM900 quadband GSM/ GPRS device, works on frequencies 850 Mhz, 1800 Mhz and 1900 Mhz. It is very compact in size and easy to use as plug in GSM modem. The modem is designed with 3v and 5v TTL interfacing circuitry, which allows user to directly interface with 5v microcontroller( PIC, AVR, Arduino, 8051, etc.) as well as 3v3 microcontroller (ARM, ARM Cortex XX). The baud rate can be configurable from 9600-115200 bps through AT(Attention) commands. This GPRS/GSM modem has internal TCP/IP stack to enable user to connect with internet through GPRS feature. It is suitable for SMS send and data transfer application in mobile phone to mobile phone interface.the modem can be interfaced with a microcontroller using USART(Universal Synchronous Asynchronous Receiver Transmitter) feature(serial communication).



**Fig.4.GSM module**

**Relay:-** Relays are essential for automation system and for controlling loads. Also, relays are the best way for galvanic insulation between high and low voltage portions of a circuit. There are hundreds of different relay types. It consists of power supply pins, digital input pins and output load pins. In figure [] the two terminal operates as a switch. When the contacts are 'in contact' then the current flows from terminal 1 to terminal 2. There are two types of contacts : NO(normally open) and NC(normally close). Normal open contact is a contact like the one showed in the previous illustration. When the contact is still, then no current flows through it(because it is an open circuit). On the other hand, a normal closed contact allows the current to flow when the contacts is still.

Anaesthetic gas dispenser: An electronic storage vessel having heating rod(silicon, carbon) and anaesthetic liquids. The liquid are chlorophorm , methanol, carbon mono oxide. These are can unconscious a person for 10 to 25 minutes. These are in the liquid form then converted into gaseous form while heating through electronic coupler.

#### **4 SOFTWARE DESIGN**

PIC Microcontroller (16F877A/76) is 40 pin IC chip made by Microchip technology. It can programm only through MPLab software tool. It is programming environment to code any microcontroller of microchip technology. This program have following parts are 1.port definition part, 2.function declaration, 3.main function. In Port defining part, what are the pins defined as input, output, analogue, digital pin. There are 12 define function lines in part1. In function declaration, 4 functions were declared as globally. Main function contains LCD status printing, Read sensor signal, check the whether sensor detect or not and send status to user mobile, check whether password right or not and send status to user mobile, command receiving unit and checking, relay activation unit. The below codes are main decision making part of program.

```
GSM_SEND("AT+CMGF=1");
GSM_SEND("+918760306084");
if(vib>=1){GSM_SEND("VibrationDetected");}
if(fire_flag>=1){
GSM_SEND(" Fire Detected"); }
if(motion>=1){
GSM_SEND(" Motion Detected"); }
LCD_DAT("WrongPassword");
LCD_DAT(" Enter Again...");
if(wr_pwd>2){
LCD_DAT(" SENDING SMS ");
GSM_SEND("AT+CMGF=1");
GSM_SEND("+918760306084");
GSM_SEND("WrongPassword Detected");
```

Software Tool: MPLAB is a proprietary freeware integrated development environment for the development of embedded application on PIC microcontrollers, and is developed by Microchip Technology. MPLAB X is the latest edition of MPLAB, and is developed on the netbeans platform. MPLAB and MPLABX support project management, code editing, debugging and programming of microchip 8-bit, 16-bit and 32-bit PIC microcontrollers.

It is supported by following compilers are MPLAB, MPSAM assembler, MPLAB ASW30 assembler, MPLLAB C compiler for PIC18, MPLAB C compiler for PIC24 and PIC DSCs.

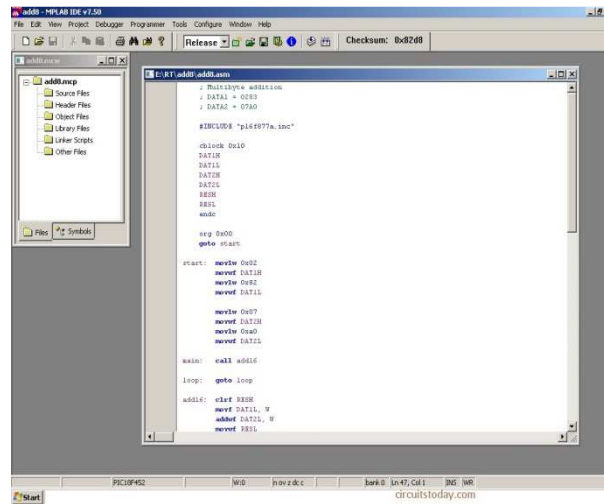


Fig.5. MPLAB software tool

## 5 SYSTEM WORKING FLOW

Power unit is the initial part of the system to generate 5V DC power supply to the controller, GSM module and LCD display. When the Dc supply reaches the units, all components are ready to start their work. PLC controller initialize its program and configure what are the pins will work as input and output. LCD display receives message from controller and prints the text as GSM security system initializing. Now, all the sensors are ready to sense the variation in corresponding parameters are vibration, temperature and motion. If anyone of these sensor will sense variation then send the analogue signal to the controller. Action only takes by controller when the sensor readings(measured value) reaches the limit value entered in the program. There is signal conditioning circuit for filter noise and amplifies weakened signal. In controller program there are many "if" condition statements to check whether the sensors are sense the parameter or not . If vibration sensor will enabled, controller choose decision "vibration detected" and send this information to GSM module. Like wise each statements are choosed and send to GSM module. This module generate the binary bits for text message to user mobile. According to user reply(#SPRAY, #LONN,#LOFF), controller take decision to take switch ON the relays connected with it.



Fig.6 .Received message1



Fig.7 .Received message 2



Fig. 8.Received message 3

**6 RESULT AND DISCUSSION**

The developed GSM based security system gives good response to the sensor and sends SMS when it detects the fire or temperature is increased above desired level or detection of intrusion at the windows, drilling at wall, doors, ceiling. The time taken by the system to deliver the SMS is dependent on the coverage area or range of the specified mobile network. If the mobile is in the range of the system then the SMS is delivered in 25-30 seconds. Relays are activated by controller according to coding burned into it. Relays are main devices to enable the output devices are lighting circuit, buzzer, anaesthetic gas dispenser, door motor. Advantages of the proposed system:- As the system is GSM based, there is no need to have extra mobile communication like web based protocols. Using microcontroller reduces the whole system cost, less expensive than PLC based system. Two way mobile communication create the way for send the commands from user side.

**7 CONCLUSION**

This project for enhanced home security system has been designed and verified with the mobile SMS alerts. The user can receives alerts anywhere through the gsm technology thus making the system location independent. Anaesthetic gas dispenser has enabled by SMS command and it released chlorophrom. Through this project we can enhanced and effective security for our home and offices.

**REFERENCES**

- [1] Prakash Kumar and Pradeep Kumar, "Arduino Based WirelessIntrusion Detection Using IR Sensor and GSM", International Journal of ComputerScience and Mobile Computing, Vol. 2,No. 5, 2013.
- [2] M. Mohamed Irfan and B.Rhaagul "GSM Based Home Security System Using PLC"International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering,Volume 5, Special Issue 1, March 2016.
- [3] Abhishek S. Parab and Amol Joglekar, "Implementation of Home Security System using GSM module and Microcontroller", International Journal of Computer Science and Information Technologies, Vol. 6 (3) , 2015.

- [4] C.Nagarajan and M.Madheswaran – ‘Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller’- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [5] C.Nagarajan and M.Madheswaran - ‘Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis’- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [6] C.Nagarajan and M.Madheswaran - ‘Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis’- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [7] Nikhil Agarwal and G.Subramanya Nayak, “Microcontroller based Home Security System with Remote Monitoring”, International Conference on Electronic Design and Signal Processing (ICEDSP) ,2012.
- [8] Khanna Samrat and Vivekanand Omprakash, Wireless home security with mobile, International Journal of Advanced Engineering Technology , Vol.II/ Issue IV 2011.
- [9] Omorogiuwa Eseosa and Elechi Nigeria,” GSM Based Intelligent Home Security System for Intrusion Detection” .. International Journal of Engineering and Technology, Volume 4 No, 2014.
- [10] Mae , Y,Sasao , N, INNoue ,K. Arai,T. “Person Detection by Mobile Manipulator for Monitoring”, SICE Annual Conference, pages-2801-2806, 2003.
- [11] D.Naresh, B.Chakradhar, S.Krishnaveni, “Bluetooth Based Home Automation and Security System Using ARM9”, International Journal of Engineering Trends and Technology (IJETT) – Volume 4, Issue 9, Sep 2013.

## AUTOMATIC WASTE DESTROY USING GSM TECHNOLOGY

V.P. Krishnammal<sup>1</sup>, M. Vignesh<sup>2</sup>, and T. Vinoth<sup>2</sup>

<sup>1</sup>Asst.Professor, EIE Department, Adhiyamaan college of Engineering, Hosur, India

<sup>2</sup>Student, EIE Department, Adhiyamaan college of Engineering, Hosur, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Automatic Waste Destroy using GSM technology, the dustbins are split off as two half and it is located throughout the city or the Campus, these dustbins are provided with low cost embedded device which helps to track the level of the dustbins and an unique ID will be provided for every dustbin in the city so that it is easy to identify which garbage bin is full. When the level reaches the threshold limit, the device will destroy automatically and it can be accessed by the concern authorities from their place with the help of GSM and an immediate action can be made to clean the dustbins.

**KEYWORDS:** GSM, microcontroller, IR sensor.

### 1 INTRODUCTION

Now a days, the dustbins are placed in cities or campuses which are overflowing due to increase in waste every day. It creates unhygienic condition for the people and creates bad smell around the surroundings this leads in spreading some deadly diseases & human illness, to avoid such a situation to design a "AUTOMATIC WASTE DESTROY USING GSM TECHNOLOGY". In this proposed system the dustbin is split into two half, one is biodegradable and another one is non-biodegradable. The dustbin is provided with low cost embedded device. When the limit reaches, IR sensor senses the waste which is in dustbin, then the relay act as electrically controllable switch is turned on to heating the coil. The door will get closed automatically until the temperature becomes to the room temperature.

When the waste is destroyed, collect the ash from the bin by the concern authorities with the help of GSM. The polluted air from the chimney, which is filtered by using CITYCARB F7 filter to reduce the Polluted air by 93%. While in another side is non-biodegradable waste such as plastics, glasses, etc.. When the bin reaches the limit, IR sensor senses the waste and sends the message to the concern authorities by using the help of GSM.

### 2 LITERATURE REVIEW

Internet of Things: Challenges and state-of-threat solutions in Internet-scale Sensor Information Management and Mobile analytics by Arkady Zaslavsky, Dimitrios Georgakopoulos. This paper gave us the details about mobile analysis and sensor information management that will help in data segregation of various dustbins[1].

City Garbage collection indicator using RF (Zigbee) and GSM technology. This paper gave the details for the module required for the transmission of the data to the receiver side and also the main channel follow of the project. Initially we used GSM technology for our project but later on decided to us Wi-Fi module for the ease of data transmission .

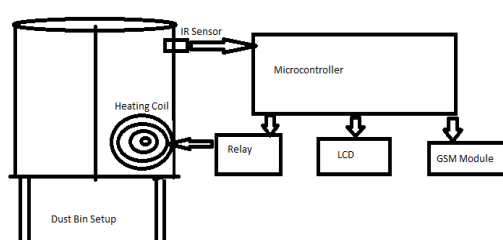
Smart Garbage Management System by Vikrant Bhor.et.al. provided us with additional details and designs needed for flow and management of garbage while collection[3].

M. Al-Maaded, et.al analysed the important to understand the societal concerns over the increased rate of resource consumption and waste production and therefore the policy makers have encouraged recycling and reuse strategies to reduce the demand for raw materials and to decrease the quantity of waste going to landfill[4].

C.Raghumani Singh, M.Dey, The objective of the study was to determine the characterization of the waste and the current system of management activities. The paper highlights an overview of the current municipal solid waste management (MSWM) system of Thoubal Municipality and it concludes with a few suggestions, which may be beneficial to the authorities to work towards further improvement of the current management systems[5].

### 3 PROPOSED SYSTEM

Considering the Waste Destroy System, the smart garbage bin can be expensive but considering the amount of dustbin needed in India, expensive garbage bin would not be a prior experiment to reduce the waste generated in a day completely that is why we have decided to use heating coils to destroy and recycle it quickly and also make it efficient in applications.



*Fig.2. Block diagram*

## 4 SYSTEM ARCHITECTURE

### 4.1 MICROCONTROLLER (ATMEGA328)

Circumstances that we find ourselves in today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development has made it possible to store thousands of transistors in to one chip. That was a prerequisite for production of microprocessors, and the first computers were made by adding external peripherals such as memory, Input-output modules, timers and other. Further increasing of the volume of the package resulted in criterion of integrated circuits. These integrated circuits contained both processor and peripherals. The Features are High Performance, Low Power AVR® 8-Bit Microcontroller, Advanced RISC Architecture, 131 Powerful Instructions, Most Single Clock Cycle Execution, 32 x 8 General Purpose Working Registers Fully Static Operation, Peripheral Features, Two 8-bit Timer/Counters with Separate Pre scalers and Compare Modes, One 16-bit Timer/Counter with Separate Pre scalers, Compare Mode. Real Time Counter with Separate Oscillator, 8-channel 10-bit ADC, on-chip Analog Comparator.

### 4.2 IR SENSOR

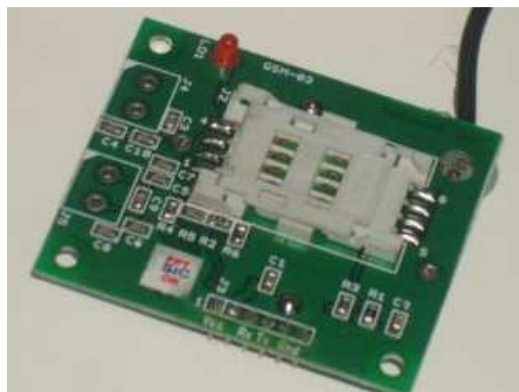
An IR sensor is a device which consists of a pair of an IR LED and a photodiode which are collectively called a photo-coupler or an opto-coupler. The IR LED emits IR radiation in the range of 760 nm wavelength, reception and/or intensity of reception of which by the photodiode dictates the output of the sensor. Such LEDs are usually made of gallium arsenide or aluminum gallium arsenide. They are along with IR receivers used as sensors. The appearance is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible to identify whether the LED is working or not, unlike a common LED. To overcome this problem, the camera on a cellphone can be used. The camera can show us the IR rays being emanated from the IR LED in a circuit.



*Fig.2.IR sensor*

#### **4.3 GSM MODULE**

A GSM is a wireless modem that works with GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line with a wireless modem sends and receives data through radio waves. . the GSM module has some characteristics like Reading, writing and deleting SMS messages, sending SMS messages, Monitor the signal strength, Monitor the charging status and charge level of the battery, Reading, writing and searching phone book entries.



*Fig .3. GSM module*

#### **4.4 LCD**

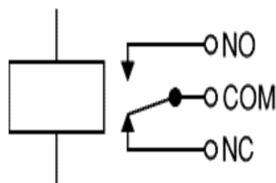
LCD stands for Liquid Crystal Display. LCD is finds the wide spread use of replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining price of LCDs.
2. The ability to display a numbers, characters and graphics. This is contrast to LEDs, which are limited to a numbers and characters.
3. Ease of programming for characters and graphics.

These components are “specialized” for used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.

#### **4.5 RELAY**

A relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances. The relay allows the isolation of two separate sections in a system with two different voltage sources i.e., a small amount of voltage/current on one side can handle a large amount of voltage/current on the other side but there is no chance that these two voltages mix up.



**Fig 4. Relay**

When current flowing through the coil, a magnetic field is created around the coil, when the coil get energized. This causes the armature to be attracted with the coil. The armature's contact act like a switch and closes or opens the circuit. When the coil is not energized, a spring pulls the armature to its normal state of open or closed. There are all types of relays for all kinds of applications.

## 5 RESULTS AND DISCUSSION

When the power supply is on, it convert the 230V AC to 5V DC. This DC voltage will be turn ON the microcontroller, and then controller goes to initialization mode after then using keypad we can change the mobile number in the program. When the level reaches the limit, IR sensor senses the waste which is in the dustbin. Then the relay is switched ON to the heating coil. The door will closed automatically until the temperature becomes to the room temperature. When the waste is destroy, it converted in to Ash content from the bin and the other hand Non-biodegradable wastes reaches the limit, Both particles in the bin are collected by the concern authorities with the help of GSM.



**Fig.5. Hardware Kit**



**Fig.6. Hardware Kit with Mechanical Setup**

## 6 CONCLUSION

The implementations of Automatic waste destroy using GSM technology that includes IR sensor, Microcontroller and GSM module. In biodegradable waste gets destroyed automatically and converts into ash particles to reusing in industrial application and agricultural purpose. On the other hand non-biodegradable wastes are sends to particular industries for reusing purpose.

## REFERENCES

- [1] Arkady Zaslavsky, Dimitrios Georgakopoulos” Internet of Things: Challenges and State-of-the-art solutions in Internet-scale Sensor Information Management and Mobile Analytics” 2015 16th IEEE International Conference on Mobile Data Management “City Garbage collection indicator using RF (Zigbee) and GSM technology”
- [2] Vikrant Bhor, Pankaj Morajkar, Maheshwar Gurav, Dishant Pandya4 “Smart Garbage Management System” International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 IJERTV4IS031175 Vol. 4 Issue 03, March-2015
- [3] C.Nagarajan and M.Madheswaran - ‘Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter’ - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [4] C.Nagarajan and M.Madheswaran - ‘Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques’- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [5] C.Nagarajan and M.Madheswaran, “Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation” has been presented in ICTES’08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [6] M.Al-Maaded,N.K.madi, Ramzan kahraman, A.Hodzic, N.G.Ozerkan, An Overview of Solid Waste Management and Plastic Recycling in Qatar, Springer journal of Polymers and the environment, MARCH 2012, Volume 20, Issue 1, pp 186-194.
- [7] Raghmani Singh, C. Dey, M. Solid waste management of Thoubal Municipality, Manipur- a case study Green Technology and Environmental Conservation (GTEC 2011), 2011 International Conference Chennai 21 – 24
- [8] Latifah, A., Mohd, A. A., & Nurlyana, M. (2009) . Municipal solid waste management in Malaysia: Practices and challenges. Waste Management, 29,2902-2906.
- [9] Vicentini, F. Giusti, A., Rovetta, A., Fan, X., He, Q., Zhu, M., & Liu, B. (2008). Sensorized waste collection container for content estimation and collection optimization. Waste Management.29, 1467-1472.
- [10] “ RFID and Integrated Technologies for Solid Waste Bin Monitoring System . Proceedings of the World Congress on Engineering 2010, June 30 - July 2, 2010, Vol I.

## PERFORMANCE ANALYSIS OF VARIOUS MULTIPLIER USING VHDL

V.P. Krishnammal<sup>1</sup>, S. Anbuselvi<sup>2</sup>, and K. Janani<sup>2</sup>

<sup>1</sup>ASST PROF/EIE /ACE, India

<sup>2</sup>UG STUDENT/ EIE/ACE, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** In early days of Computers, Multiplication was implemented generally with a sequence of addition, subtraction and shift operations. Multiplier modules are common to many DSP applications. Since multipliers are rather complex circuits and must typically operate at a high system clock rate, reducing the delay of a multiplier is an essential part of satisfying the overall design. The various multiplier used are Array, Wallace and Vedic Multiplier. The Razor flip-flop is a timing fault detection technique that employs double sampling by the main and shadow Flip-Flops. Different types of multiplier are going to implement using XILINX ISE Design Suite 14.5 software and the performance will analysed with ordinary multiplier.

**KEYWORDS:** Ripple Carry (RCA) Adder, Vedic Multiplier (VM), Urdhava Tiryakbhyam Sutra, Array Multiplication.

### 1 INTRODUCTION

The vast variety of application areas for multipliers exhibits different requirements for Speed, Area, Power consumption and other specifications. Based on these requirements which are imposed from the system that the multiplier will be operating in, different characteristic of the multiplier will be given different priorities.

Multipliers are key components of many high performance systems such as microprocessors, digital signal processors and FIR filter system's performance is generally determined by the performance of the multiplier because the multiplier is generally the slowest element in the system This is even more important for Battery-powered applications where the energy budget is extremely limited. Low-power design has become a new area in VLSI technology and power-aware design is inevitable in the new Electronic Design Automation(EDA) tools.

### 2 MULTIPLIER

In this paper a simple 8 bit digital multiplier is proposed which is based on Urdhva Tiryakbhyam (Vertically Crosswise) Sutra, of the Vedic Maths. Two binary numbers (8-bit each) are multiplied with this Sutra. The simplest scheme for multiplication, known as shift-and-add scheme, consists of cycles of shifting and adding with hardware or software control loops. Razor relies on a combination of architecture and circuit level techniques for efficient error detection and correction of delay path failures. The main flip-flop and shadow latch will latch the correct data

Array multiplier is taken which is to compare the results with Vedic multipliers. The results are compared in terms of power, delay and area. The timing report of the performed multiplier has been given as an input for the razor flip-flop.

#### 2.1 ARRAY MULTIPLIER

Array multiplier is well known due to its regular structure. Multiplier circuit is based on add and shift algorithm. Each partial product is generated by the multiplication of the multiplicand with one multiplier bit. The partial product are shifted according to their bit orders and then added.

The addition can be performed with normal carry propagate adder. N-1 adders are required where N is the multiplier length.

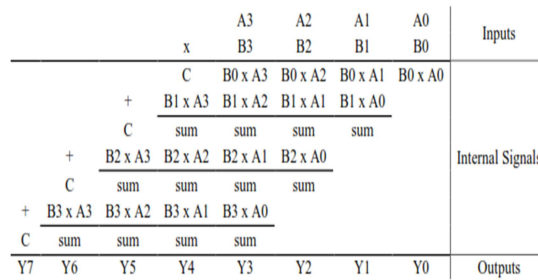


Fig. 1.

Although the method is simple as it can be seen from this example, the addition is done serially as well as in parallel. To improve on the delay and area the CRAs are replaced with Carry Save Adders, in which every carry and sum signal is passed to the adders of the next stage. Final product is obtained in a final adder by any fast adder (usually carry ripple adder). In array multiplication we need to add, as many partial products as there are multiplier bits.

2.2 WALLACE TREE MULTIPLIER

Several popular and well-known schemes, with the objective of improving the speed of the parallel multiplier, have been developed in past. Wallace introduced a very important iterative realization of parallel multiplier. This advantage becomes more pronounced for multipliers of bigger than 16 bits.

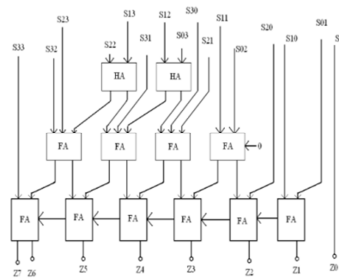


Fig. 2. bit Wallace architecture

2.3 VEDIC MULTIPLIER

Vedic mathematics is also known as “speed mathematics”. This type of mathematics is used to reduce the time consumption. The word ‘Vedic’ is derived from the word ‘Veda’ which means store-house of all knowledge. Ancient and medieval Indian mathematical works, all composed in Sanskrit, usually consist of a section of Sutras in which a set of rules or problems were stated with great economy in verse in order to aid memorization by a student.

The design starts first with Multiplier design, that is 2x2 bit Multiplier. Here “urdhva Tiryakbhyam Sutra” or “Vertically and crosswise Algorithm” for multiplication has been effectively used to develop digital multiplier architecture. This algorithm is quite different from the traditional method of multiplication, that is to add and shift the partial products. This sutras shows how to handle the multiplication of larger number by breaking into the smaller number of size. The Multiplier has the advantage that as the number of bits increases, gate delay and area increases very slowly as compared to other multipliers. Therefore it is time, space and power efficient. It is demonstrated that this architecture is quite efficient in terms of silicon area/speed.



### 3 RAZOR FLIP FLOP

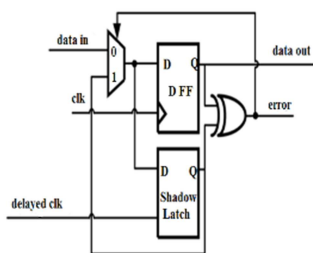


Fig. 4. Diagram for Razor Flip Flop

A combination of circuit and architectural techniques for low cost in-situ error detection and correction of delay failures. At the circuit level, each delay-critical flip-flop is augmented with a so-called shadow latch which is controlled using a delayed clock. The operating voltage is constrained such that the worst-case delay is guaranteed to meet the shadow latch setup time, even though the main flip-flop could fail. The razor technology is a breakthrough work, which largely eliminates the safety margins by achieving variable tolerance through in situ timing error detection and correction ability. This approach is based on a razor flip-flop, which detects and corrects delay errors by double sampling.

### 4 SIMULATION AND RESULT

#### 4.1 SIMULATION FOR ARRAY MULTIPLIER

The output response of array multiplier is shown in figure 4.1

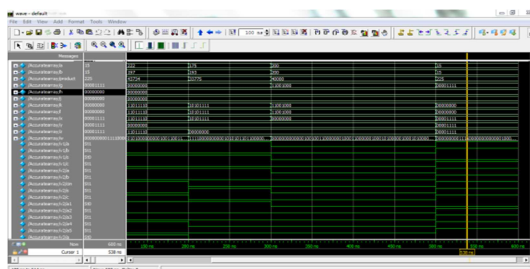


Fig. 5. output for 8 bit array multiplier

#### 4.2 SIMULATION FOR VEDIC MULTIPLIER

The output response of vedic multiplier is shown in figure 4.2

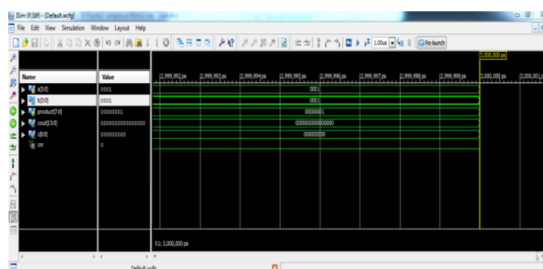


Fig. 6. output for 8 bit vedic multiplier

#### 4.3 SIMULATION FOR ARRAY MULTIPLIER WITH RAZOR

The output response of array multiplier with razor is shown in figure 4.3

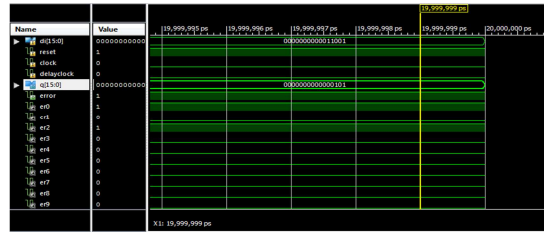


Fig. 7. output for 8 bit array multiplier with razor

#### 4.4 SIMULATION FOR VEDIC MULTIPLIER WITH RAZOR

The output response of Vedic multiplier with razor is shown in figure 4.4

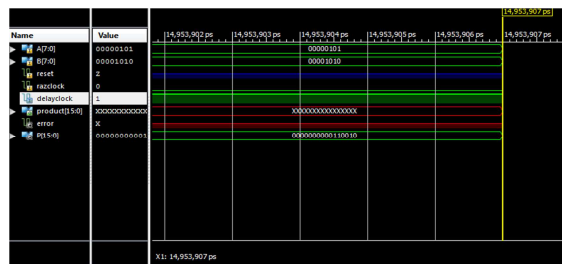


Fig. 8. output for 8 bit vedic multiplier with razor

#### 4.5 RTL DIAGRAM FOR VEDIC MULTIPLIER

The schematic diagram of RTL for Vedic Multiplier is shown in fig4.5

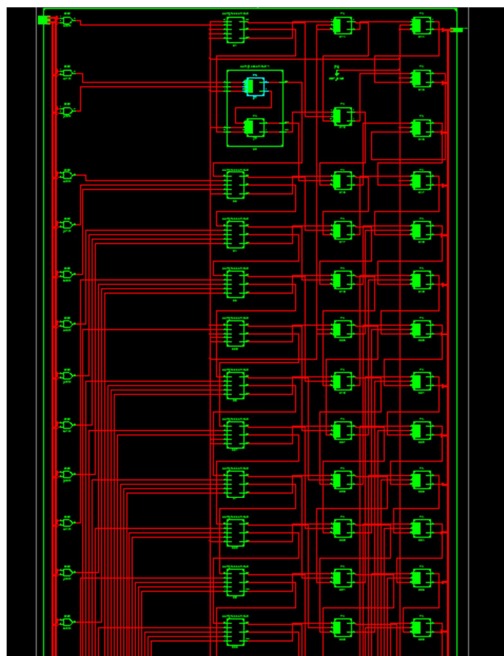


Fig. 9. RTL Diagram for Vedic multiplier

**5 RESULT AND DISCUSSION**

	<b>Array Multiplier</b>	<b>Wallace Multiplier</b>	<b>Vedic Multiplier</b>
Memory Usage	236Mb	216Mb	146Mb
Time Delay	21.689ns	20.34ns	16.70ns
Power Report	16.57mw	15.88mw	14.23mw

**6 CONCLUSION**

This sutra is applicable to all cases of multiplication. The results show that Urdhava Tiryakbhyam sutra used to implement high speed complex multiplier efficiently in digital signal processing algorithms by decreasing propagation delay (ns). The Vedic multiplier is much more efficient than Array multiplier in terms of execution time (speed). An awareness of Vedic mathematics can be effectively increased if it is included in engineering education. In future, all the major universities may setup appropriate research centers to promote research works in Vedic mathematics.

**REFERENCES**

- [1] Implementation of power efficient vedic multiplier By sreenivas and kayalvizhi at April 2013.
- [2] Design of High Speed 32 Bit Multiplier Architecture Using Vedic Mathematics and Compressors By Deepak Kurmi, V. B. Baru.
- [3] A Revive on 32x32 Bit Multiprecision Dynamic Voltage Scaling Multiplier with Operands Scheduler By Ms.Shreya A.Mahajan, Mrs.S.N.Rawat.
- [4] Quantifying and Enhancing Power Awareness of VLSI Systems by Manish Bhardwaj, Rex Min, and Anantha P. Chandrakasan.
- [5] Harpreet Singh Dhillon and Abhijit Mitra " a reduced bit Multiplication Algorithm for digital airthmatics " International Journal of Computational and Mathematical Sciences 2.2 @www.was et.orgSpring2008
- [6] Honey Durga Tiwari, Ganzorig Gankhuyag, Chan Mo Kim and Yong Beom Cho "Multiplier design Based on ancient Indian Vedic Mathematician", International SoC Design Conference, pp-6568, 2008
- [7] C.Nagarajan and M.Madheswaran – ‘Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller’- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [8] C. Nagarajan and M. Madheswaran - ‘Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis’- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [9] C. Nagarajan and M. Madheswaran - ‘Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis’- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [10] ParthMehta and Dhanashri Gawali, ""Conventional versus Vedic mathematics method for Hardware implementation of a multiplier""International conference on Advances in Computing Control, and Telecommunication Technologies, pp - 640-642,2009.
- [11] Ramalatha, M.Dayalan, K D Dharani, P Priya, and S Deoborah, High speed energy efficient alu design Techniques",International Conference on Advances In Computational Tools for Engineering Applications (ACTEA) IEEE pp. 600-603 July 15-17, 2009.

## AUTOMATION OF CALIBRATION USING CMMS TECHNOLOGY

*C. Stalin Jose<sup>1</sup>, K.R. Ganapath<sup>2</sup>, K. Karthikeyan<sup>2</sup>, C. Mahesh<sup>2</sup>, and M.V. Muruga Vignesh<sup>2</sup>*

<sup>1</sup>Assistant Professor-Department of EIE, Adhiyamaan College of Engineering, Hosur, India

<sup>2</sup>UG Student-Department of EIE, Adhiyamaan College of Engineering, Hosur, India

---

Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Instrument calibration is one of the primary processes used to maintain instrument accuracy. Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that would cause inaccurate measurements is a fundamental aspect of instrumentation design. Although the exact procedure may vary from product to product, the calibration process generally involves using the instrument to test samples of one or more known values called “calibrators.” The results are used to establish a relationship between the measurement technique used by the instrument and the known values. Computerized Maintenance Management Systems are increasingly being used to manage and control plant and equipment maintenance in modern manufacturing and service industries. Computerised systems are now being installed in preference to the manual (paper based) preventive maintenance systems that have been around for many years. In recent years’ private companies have come to recognize the value of these systems as a maintenance performance and improvement tool. The main objective of this project is to automate the calibration process with help of Calibration Software in TPS-1, EXPN, NLC India Ltd., Neyveli. In present situation, the calibration and data entry are done manually. This automated system of calibration will increase the accuracy of calibration, time management and less human employment. The miniature of automated calibration system and data entry is actually done with the help of Arduino Software.

**KEYWORDS:** automation, calibration, CMMS technology.

### INTRODUCTION

Instrument calibration is one of the primary processes used to maintain instrument accuracy. Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range. Eliminating or minimizing factors that causes inaccurate measurements is a fundamental aspect of instrumentation design.

Although the exact procedure may vary from product to product, the calibration process generally involves using the instrument to test samples of one or more known values called “calibrators.” The results are used to establish a relationship between the measurement technique used by the instrument and the known values. The process in essence “teaches” the instrument to produce results that are more accurate than those that would occur otherwise. The instrument can provide more accurate results when samples of unknown values are tested in the normal usage of the product.

Calibrations are performed using only a few calibrators to establish the correlation at specific points within the instrument’s operating range. While it might be desirable to use a large number of calibrators to establish the calibration relationship, or “curve”, the time and labour associated with preparing and testing a large number of calibrators might outweigh the resulting level of performance.

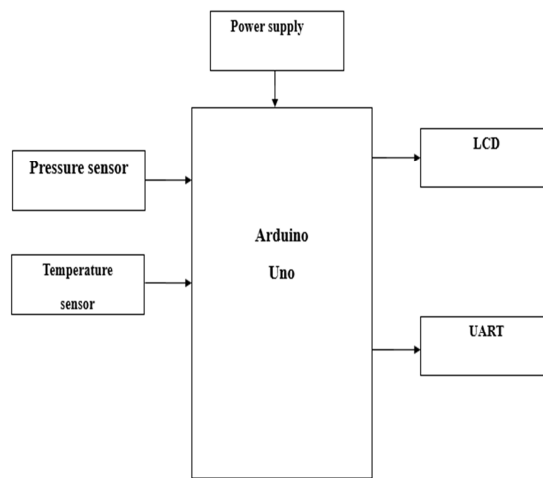
From a practical standpoint, a trade-off must be made between the desired level of product performance and the effort associated with accomplishing the calibration. The instrument will provide the best performance when the intermediate points provided in the manufacturer’s performance specifications are used for calibration; the specified process essentially eliminates, or “zeroes out”, the inherent instrument error at these points.

**NEED FOR CALIBRATION**

Calibration helps a power plant in maintaining or even improving safety, as well as in meeting national and international standards. However, calibration is also a matter of profitability. By using high-accuracy calibration equipment, the accuracy of vital measurements can be maintained on a required level and the plant can increase its annual power production capability.

**PROPOSED METHOD**

The objective of the project is to perform calibration in an automated manner (data entry) with the help of Arduino and its supporting software. These operations could be done in two manners remote and manual mode. If operated in manual mode it is necessary, that an operator is employed exclusively for this project at the lab with the help of HART communicating device which is actually used as the HMI for this process. Whereas here the operation is done with the help of Arduino board which is already preprogramed in it.



The calibration process is actually discussed for both manual and remote modes. The main objective of this project is to control and perform calibration and data entry without any human empowerment in the lab or in the site. Secondary thing is pen and paper based data entry will be eradicated and the calibration will be automated completely. The data that is received to the controller board (Laptops or PC's) is saved as Excel file sheet.

The Arduino is developed accordingly with the help of Arduino IDE software which will be acting as the front end of this project. The simulated result could be viewed with exact date, time and tag name which greatly reduces the chance of data loss and also data could be retrieved with an easy process. The main objective of this project is to achieve an automated calibration process and an automated data entry.

**HARDWARE DESIGN**

In order to achieve an automated calibration test bench some of the hardwares are required as explained below.

**LM35 SENSOR**

An LM 35 sensor is used a temperature calibrator or instrument.

**PRESSURE SENSOR**

A pressure sensor is actually used as the pressure instrument.

## RS 232 PROTOCOL

The RS 232 is a serial communication used for the data receive or transmit data from the calibrator to the LCD (User front end).

## INITIAL OPERATION

Initially the instrument that has to be calibrated (LM35 and Pressure sensor) is connected to the Arduino board and a power supply is given. Now the Arduino UNO senses the type of instrument and starts the procedure. The signal is from analog block is transmitted to LCD (laptops or PC's) and the Arduino sends the signal through RS 232 to the user end with the help of the software named as Arduino IDE this is already a preprogramed software which could also be altered according to the needs of the user.

If the sensors connected are detected the Arduino sends the information to the user in the form of a datasheet. The datasheet consists of date, time, tag name and the engineering value of the device that has been under calibration. The live feed of readings from the could also be viewed with the help of this datasheet.

## RESULTS AND DISCUSSION

The advantages of implementing this project are:

- Selection of instruments could be done in an automated manner
- The range and error trimming of the device or the instrument could be done from the operator screen
- The data entry which is done through paper and pen work is now computerised
- This project minimises the risk of loss of any confidential data
- This project is user friendly
- Calibration procedure is made easier with this software
- The complexity of the work is reduced because of the replacement of manual calibration to automated calibration with the help of Arduino and Arduino IDE software
- The accuracy in calibration of the system is increased.

## CONCLUSION AND FUTURE WORK

The existing system for calibration is in manual mode. With the proposed system, calibration and the data entry will be performed automatically using Arduino and Arduino IDE software. The advantages of the automated calibration system over manual methods are many. The speed of calibration is dramatically increased with automation of connect, read, adjust and record functions. Due to this kind of system installation calibration quality is improved, the calibrations are more consistent, and the testing of equipment is more comprehensive. Reports can be generated directly from measured data with the minimum of operator interface being necessary.

## ACKNOWLEDGEMENT

We would like to express our sincere thanks to Professor and Head of the Department **Dr. S. Sujatha, M.E., Ph.D.**, Department of Electronics and Instrumentation Engineering for the encouragement and opportunity to undertake this project.

We also take the privilege to thank our Project Guide (assistant professor) **Mr.C. Stalin Jose, M.E.**, Department of Electronics and Instrumentation Engineering for giving a dynamic guidance and encouragement at every step of our project work.

We wish to express our gratitude to **Mr. S. Sakthivelan DGM/C&I/TPS-I Expn/NLC India Ltd**, for the support.

Our heartfelt and sincere thanks to our external guide **Mrs. G. Sowmya, EE/C&I TPS I Expn/NLC India Ltd**, for her guidance and support to help our project come true.

**REFERENCES**

- [1] JCGM 200:2008 International vocabulary of metrology — Basic and general concepts and associated terms (VIM)
- [2] ISO 9001: "Quality management systems — Requirements" (2008), section 7.6.
- [3] ISO 17025: "General requirements for the competence of testing and calibration laboratories" (2005), section 5.
- [4] Faison, C. Douglas; Brickenkamp, Carroll S. (March 2004). "Calibration Laboratories: Technical Guide for Mechanical Measurements" (PDF). NIST Handbook 150-2G. NIST. Retrieved 14 June 2015.
- [5] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [6] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques' - Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [7] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [8] "Metrology, Pressure, Thermal & Electrotechnical Measurement and Calibration". Fluid Control Research Institute (FCRI), Ministry of Heavy Industries & Public Enterprises, Govt. of India. Archived from the original on 14 June 2015. Retrieved 14 June 2015.
- [9] Haider, Syed Imtiaz; Asif, Syed Erfan (16 February 2011). Quality Control Training Manual: Comprehensive Training Guide for API, Finished Pharmaceutical and Biotechnologies Laboratories. CRC Press. p. 49. ISBN 978-1-4398-4994-1.
- [10] Bare, Allen (2006). Simplified Calibration Interval Analysis (PDF). Aiken, SC: NCSL International Workshop and Symposium, under contract with the Office of Scientific and Technical Information, U.S. Department of Energy. pp. 1–2. Retrieved 28 November 2014.

## SECURED HUMAN IDENTIFICATION USING FINGER VEIN

*R. Aasir Allwin<sup>1</sup>, M. Joanna Felcy<sup>1</sup>, S. Jothijob<sup>1</sup>, and N. Bagyalakshmi<sup>2</sup>*

<sup>1</sup>UG Student, Department of EIE, Adhiyamaan College of Engineering, Hosur, India

<sup>2</sup>Faculty, Department of EIE, Adhiyamaan College of Engineering, Hosur, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The novel method to recognize the person by the use of finger vein. The steps for the acquired finger vein image normalization, image alignment, and segmentation to effectively minimize resulting intra-class variations in the finger images are also developed. It is combining finger vein. Here comparative evaluation of the proposed fusion approaches with the sum, average, product, weighted sum. The segmentation of the finger vein from the image takes place. The ROI region is extracted, after the extraction of vein pattern by the maximum curvature. From the segmented result the Features for vein image is extracted. The Gabor feature for the input image is used as filter. Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for shape representation and discrimination. It is a linear filter used for edge detection. Finally weighted matching is calculated for the identification.

**KEYWORDS:** human identification, finger vein.

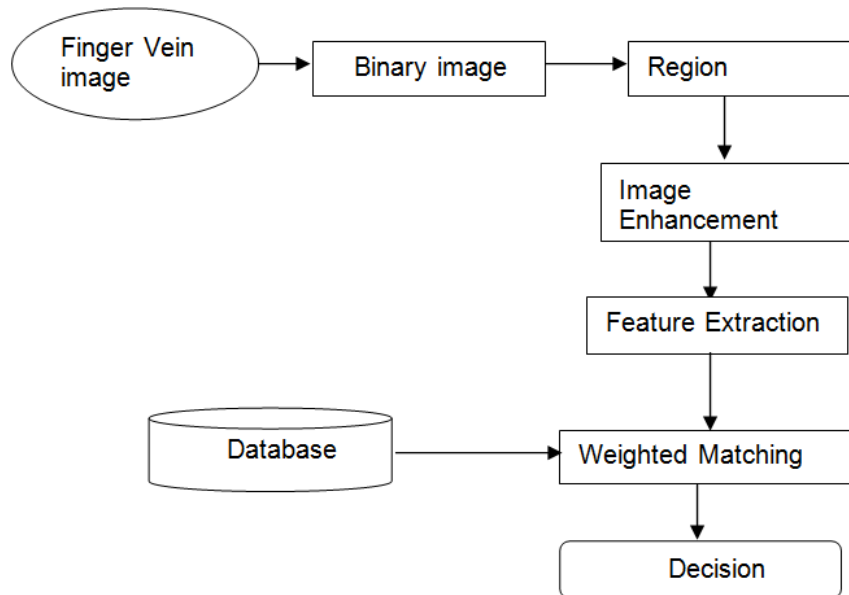
### INTRODUCTION

The identity of character is more important in security system. In biometrics scanning this method of detection is easy to use and more comfortable. The fingerprint, face reputation, voice popularity, Iris reputation are used for the safety reason to avoid pseudo person. Historically, the authentication mode which includes keys, password and magnetic card are not safe sufficient now a days, due to the fact they will be stolen easily or may forgotten [1]. The low quality finger vein images may cause the followings. There are some kinds of noise (e.g., sensor noise, finger noise, etc.) [9]. Vein pattern is the network of human blood vessels esoteric a person's skin. The vein pattern can also be used to authenticate the identity of an individual. In the global network society, individuals can easily access their information anytime and anywhere, people are also facing with the risk that they have a fear that others can also easily access the same information anytime and anywhere [2]. The terrific growth in the demand for more user-friendly and secured biometrics systems has motivated researchers to discover new biometrics features and behaviors [10]. Finger vein is broadly measured as an auspicious biometric example for customized ID, getting bunches of medical, banking and business applications. Finger vein pattern recognition includes four principle techniques: image capturing, preprocessing, feature extraction and matching. Specifically, image capturing vision of veins in a finger it shows vein pattern. Through Preprocessing images can get improvised. Feature extraction distinguishes the qualities of the vein design from each individuals which represents and coordinates the similarity between two finger vein images for recognition. The benefits of finger vein recognition, is of identifying the correct individual [3]. The vein characteristics will remain unchanged for years which are everlasting but the thumb impression occurs some changes in after years [4]. Here acquiring the image, preprocessing, segmentation, Representation and interpretation techniques are used for acquiring better results. Hand vein patterns are the vast network of blood vessels inside a person's skin. The vein patterns are unique from one individual to other and they are stable over a long period of time. It is invisible to human eye [8]. Here Gabor filter is used for edge detection and extraction of finger vein patterns takes place for the identification of human.

EXISTING SYSTEM

In Existing methods different kinds of algorithm are implemented for finger identification using Radon transform based statistical features and probabilistic neural network classifier. Here the vein are tracked from the repeated line tracking algorithm. If the resolution of image is low means, the performance of the system is low. The segmentation of finger image is not performed well in the existing system.

PROPOSED SYSTEM



The above flowchart gives the clear image of identifying human by using vein pattern. Firstly, acquiring the image can be done using either a CCD camera, or a scanner. Preprocessing is the step taken before the major image processing task. Some basic task is to perform for the resulting image and them to proceed. In this case it may involve enhancing the contrast, removing noise, or identifying regions likely to contain the postcode. Segmentation is actually get the postcode; in other words the extraction of image that part of it. Which contains just the postcode. Representation and description refer extracting the particular features which help us to identifying objects. To distinguish the different digits which constitute a postcode by curves, holes and corners. Then assigning labels to objects based on their descriptors (i.e) recognition and interpretation (from the previous stand assigning meanings to those labels. So we identify particular digits, and we interpret a string of four digits at the end of the address as the postcode. In line tracking algorithm, the resolution of image is low, means the performance of the system is low. The segmentation of finger image is performed well in the existing system Includes ROI Extraction. In this module here we use the adaptive threshold segmentation. The image get segmented based on threshold value [6]. First we have to select a gray-level  $T$ . Between those two dominant levels, which will serve as a threshold to distinguish the two classes (objects and background). The natural choice for a threshold is 'T'. A new binary image can then be produced, in which painted completely black, and the remaining pixels are white with the help of threshold. Let the original image be  $f(x, y)$ , then the threshold product will be attained by scanning the original image, pixel by pixel, and testing each pixel against the selected threshold: the pixel is classified as an object pixel otherwise  $f(x, y) > T$ , then the pixel is classified as being a background pixel,. This can be summarized in the following definition, where  $b(x, y)$  denotes the threshold binary image

$$b(x, y) = \begin{cases} 255, & \text{if } f(x, y) > T \\ 0, & \text{if } f(x, y) \leq T \end{cases}$$

In the general case, a threshold is produced for each pixel in the original image; this threshold is then used to test the pixel against, and produce the desired result (in our case, a binary image).According to this, the general definition of a threshold can be written in the following manner:

$$T = T[x, y, p(x, y), f(x, y)]$$

Where  $f(x, y)$  is the gray level of point  $(x, y)$  in the original image and  $p(x, y)$  is some local property of this point (we shall explain this shortly). When  $T$  depends only on the gray-level at that point, then it degenerates into a simple global threshold (like the in the previous section). Special attention needs to be given to the factor  $p(x, y)$ . This was described as a property of the point. Actually, this is one of the more important components in the calculation of the threshold for a certain point. In order to take into consideration the influence of noise or illumination, the calculation of this property is usually based on an environment of the point at hand. An example of a property may be the average gray-level in a predefined environment, the center of which is the point at hand. Vein is segmented by the use maximum curvature. Maximum curvature method locates the position that possess the maximum curvature from the image profile, and the profile are acquired in different direction; while all points are extracted they are connected and combined according to the rules. Curvature refers to any of a number of loosely related concepts in different areas of geometry. Intuitively, the amount of deviate from being flat, or straight in the case of a lineof any geometric object is known as curvature, but this is defined in different ways depending on the context. There is a key distinction between extrinsic curvature, which is defined for objects embedded in another space (usually a Euclidean space) in a way that relates to the radius of curvature of circles that touch the object, and intrinsiccurvature. Feature Extractionof the gabor filter for the input image. Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate representation and discrimination. It is a linear filter used for edge detection.

Windowed Fourier Transform

$$F^{Fen}(\omega, \tau) = \int_{-\infty}^{+\infty} f(t)g(t - \tau)e^{-i\omega t} dt$$

Gaussian function as windowing function

$$G_f(\omega, \tau) = \int_{-\infty}^{+\infty} f(t)g_\alpha(t - \tau)e^{-i\omega t} dt$$

Gabor Transformation :

Orientation  $\phi$ , Frequency  $f$ , Sigma (standard deviation of gaussian distribution)Selection of sigma involves a tradeoff. Larger values: more robust to noise but more likely to create spurious rings.Spurious rings will be produce with small values but less effective in removing noise[5].

**RESULT**

In this project, vein recognition is implemented with help of vein segmentation and feature extraction. These are used for identifying and matching with their individual pattern. This method can be used for mobile tracking, automated teller machine and it is for securing a tenable information.

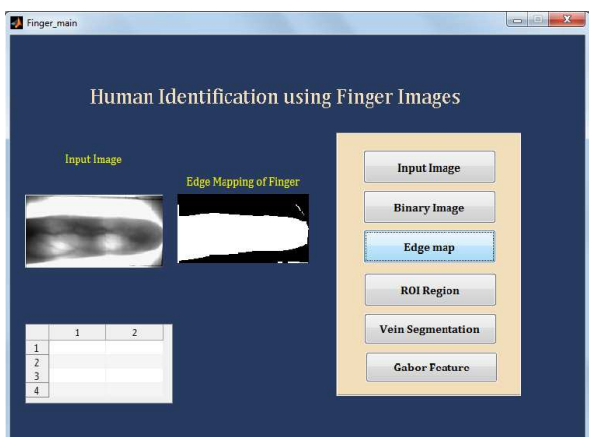


Fig 1(a)

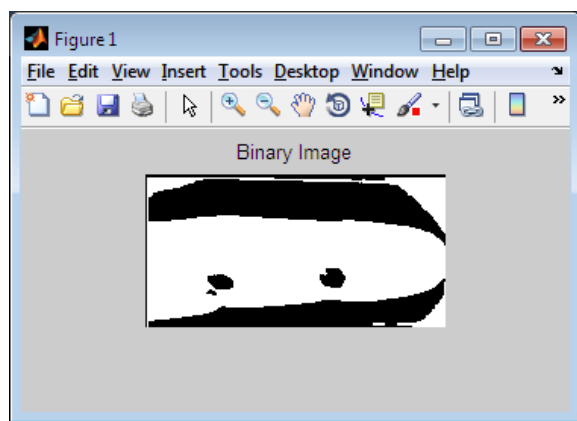


Fig 1(b)

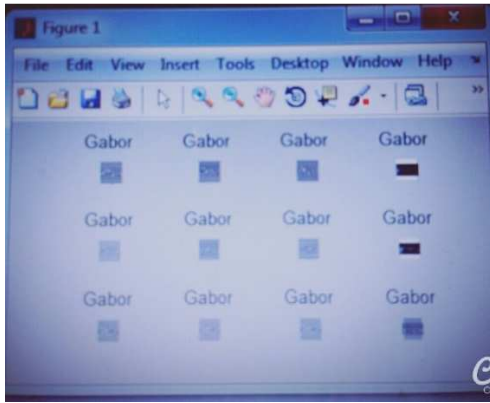


Fig 1(c)

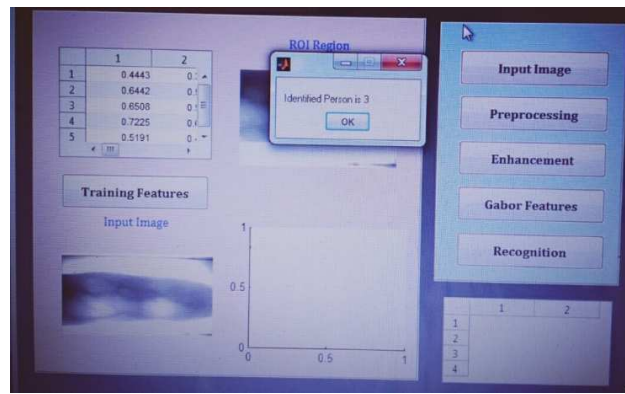


Fig 1(d)

Fig 1(a) gives the clear image getting edge mapping which is one of the extracting technique. Fig 1(b) represents the binary image. Fig 1(c) gives the aspects of Gabor features based on orientation and frequency. Fig 1(d) shows the identification of human using vein pattern, enhancement is to improve the quality of the image.

REFERENCES

- [1] Sneha N Desai, ShruthiG, "Finger Vein Biometrics Approach for Person Identification "Vol.5,no.4,2016.
- [2] Sowmya. A, Shiva kumar K.S. "Finger Vein Biometric Approach for Personal Identification Using IRT Feature and Gabor Filter Implementation" Vol.03, no.05, 2016.
- [3] Er. Nancy Mantrao, Er. Sukhpreet Kaur "An Efficient Minutiae Matching Method for Finger Vein Recognition", Vol5, no.6,2015.
- [4] Vasuki M", Finger Vein Recognition and Authentication System"(2014).
- [5] Sameer Sharma, Mr. ShashiBhushan, Ms. Jaspreet Kaur" Improved Human Identification using Finger Vein Images" Vol. 3,no.1, pg.262 – 271,2014.
- [6] D Praveen Reddy, Koteswara Rao "An Efficient Approach for Fingerprint Identification through Finger Images" Volume 1, Issue 8, PP 71-84, 2014.
- [7] Jose Anand, T. G. Arul Flora, Anu Susan Philip "finger vein based biometric system" Volume: 02 no: 12,2013.
- [8] Sunita Aeri and SukhvinderKaur,"Vein Patterns as Bio-Metric Identifier using Euclidean Distance", Vol.89, no.20, 2014.
- [9] C. Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [10] C. Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [11] C. Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

## Automatic Engine Ignition Based on Traffic Signal Using Micro-Controller

*M. Anbarasan<sup>1</sup>, A. Ajeeth Kumar<sup>2</sup>, P. Ranjith Kumar<sup>2</sup>, and A. Subashini<sup>2</sup>*

<sup>1</sup>Assistant Professor, Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Tamil Nadu, India

<sup>2</sup>Student, Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering, Tamil Nadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Pollution and fuel consumption in automobiles is becoming a matter of grave concern. It is essential to build an efficient and much more reliable system that would control this issue in traffic signals. The objective of this project is to introduce a system, which would detect the status of the traffic signal and control the engine ignition automatically thereby reducing the fuel consumption and reducing pollution. Radio frequency modules, interfaced with micro controller are used to transmit the signals from traffic light and detect them by the automobiles.

**KEYWORDS:** microcontroller; traffic signal; radio frequency modules.

### 1 INTRODUCTION

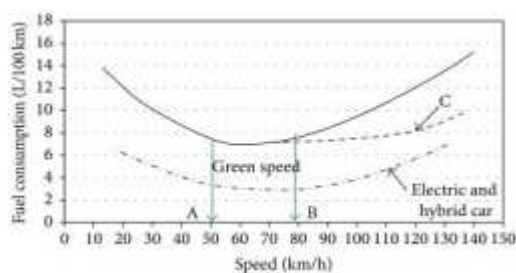
Contemporary growths in fuel expenses have a great impact on global economic changes. The drivers are worried about their monthly budget because of the fuel consumption. Excessive usage of petroleum increases the budget and also emits more pollutants [1]. In 2011, the Transportation Institute of Texas found that due to congestion, urban Americans travel an extra 5.5 billion hours and they purchase an additional 2.9 billion gallons of fuel for a congestion, costing \$121 billion. During these congestions 56 billion pounds of additional Carbon Monoxide (CO) and greenhouse gas are released into the atmosphere during urban congestions in that year alone. The world suffers heavily from environmental pollution nowadays [2, 3].

According to a study conducted by the Transport Corporation of India and IIM Calcutta, India loses almost Rs.60,000 crore a year due to traffic delays, including fuel wastage on high volume highways. Urbanization and rising incomes have been driving rapid motorization across almost all countries of the world. If no action is taken, these cars threaten literally to choke tomorrow's cities. The pollution level has reached alarming rates and the cities are like smog chambers. Pollution levels are found to be up to 40% higher while in traffic jams or at a red traffic light compared to free flowing conditions. When these cars keep accelerating or inching by slowly, they emit a great deal of emissions. These emissions take more time to disperse as well. The pollution ends up accumulating in the air at traffic lights. Long traffic jams may cause exposure to traffic fumes, and potentially increase various health risks, including cancer, say researchers.

According to a report by the World Health Organization (WHO), exposure to outdoor air pollution is among the top ten health risks faced by humans, especially in urban concentrations. Thus WHO has classified outdoor air pollution as being carcinogenic to humans. Previous studies have shown that drivers stuck at traffic lights were exposed up to 29 times more harmful pollution particles than those driving in free flowing traffic. A research on 'How much does traffic congestion increases fuel consumption' has obtained the remarkable result that traffic congestions have increased the fuel consumption by a factor of less than two. According to findings by Central Road Research Institute (CRRI), Delhi's eight most congested traffic signals are consuming at least 40,000 kiloliters of fuel daily while vehicles wait in peak rush hours. And even worse, it is adding to cities pollution with nearly 115 tonnes of carbon dioxide (CO<sub>2</sub>) being released daily. The amount of fuel burnt by idling of vehicles at traffic intersections amounts to 39,860 kg (petrol, diesel and CNG vehicles combined) and the quantity of carbon dioxide produced equals 1,15,609 kg that is 115 tonnes of the unhealthy black soot. And these figures are just from

eight traffic junctions of the city [4,5]. As a result, switching off the engine at traffic signal helps save money and also keeps the environment clean and safe. It may not be the complete solution to traffic congestions, but aims at reducing fuel consumption and air pollution. Many government and private agencies are now advertising about turning off the vehicle's ignitions to save fuel, which is the right thing to do. It is a general misconception that switching off the ignition and restarting it consumes more fuel than keeping the engine on idle while stuck in traffic or when waiting for the signal to turn green.

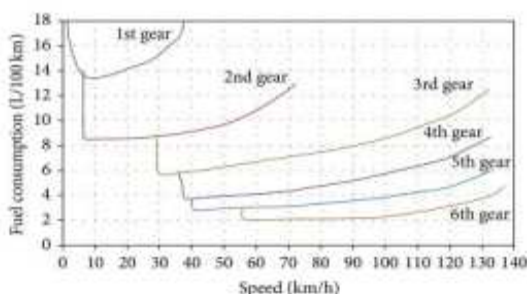
According to studies, "on an average we waste 0.098 liters of fuel every 10 minutes of idling. That may not sound much but it all adds up over time" [6]. Anything more than 10 to 15 seconds would save fuel, because car that is already warm does not need that much effort to restart, as it is at the proper operating temperature, and oil is distributed around the engine at a high lubricity. The efficient range of temperatures is maintained by the motor for more than few minutes, and takes a few hours to completely cool down, so there is definitely no need to keep the car running during short stops. So switching off the engine if we are idling over 10 seconds is the best idea [6]. And this system is devised for the automatic control of engine ignition.



**Fig 1. Relation between fuel consumption and average speed**

There are several factors that affect the fuel consumption on streets. From the mechanical properties of the vehicle, it has been proved that a vehicle running at 50–70 km/h for gasoline engines and at 50–80 km/h for petrol engines consumed fuel at lesser rates. Figure 1 illustrates the relationship between the vehicle speeds and the fuel consumption from which exhaust pollutant by the driving pattern can be assumed [8, 9]. By eliminating congestion and suggesting a path that is uninterrupted with the help of ITS technique the vehicle can maintain this green speed and then obtain the best fuel efficiency and pollution at minimum level [10]. If the vehicle drives above green speed or runs below the green speed it will consume more fuel [11]. The curve C in figure 1 shows that fuel consumption will be reduced if the aerodynamic drag is reduced at high speed [12]. The speed versus fuel consumption for the hybrid and electric vehicle is shown by dotted dash line.

Figure 2 shows the relation between fuel consumption and gear change of a manual driving car. The best way to maintain the engine in low speed and high torque mode is to select the highest speed ratio. Engine consumes more fuel in 1st gear than in 3rd gear and more fuel in 4th gear than in 5th gear. Lower the speed ratios higher is fuel guzzling, because they are associated with an engine that is not loaded sufficiently. The transmission vehicle operated manually goes to the highest speed ratio as soon as possible. When going up a slope, shifting to a lower gear should be avoided as much as possible to keep engine loaded. As the vehicle is about to stop, it can be shifted to a lower gear without braking, so as to recover energy over longer distances. For an automatic transmission, it is difficult to control speed ratios but can be done, by momentarily taking foot off the gas pedal when going up a slope to reach the upper speed ratio.



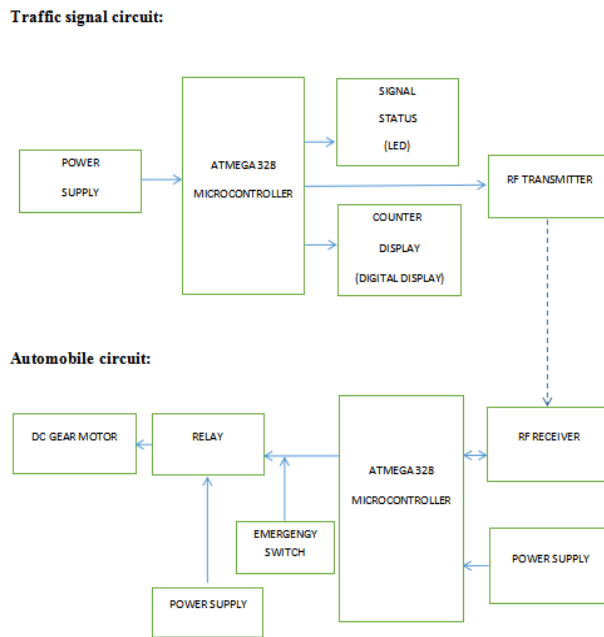
**Fig 2. Relation between fuel consumption and gear change of a manual driving car**

**2 PROPOSED SYSTEM**

The traffic signal circuit consists of ATMEGA 328, counter display and RF transmitter, which is powered by a 9V battery. The 9V battery supply is regulated to 5V by a voltage regulator (IC7805) and is distributed to the ATMEGA 328, counter display and RF transmitter. The ATMEGA 328 is programmed using Arduino software and the program is downloaded in the ATMEGA 328, which controls the signal status and the counter display value. The RF transmitter transmits the counter value continuously to the RF receiver in the automobile circuit.

The automobile circuit holds the ATMEGA 328, RF receiver, relay and a DC gear motor. The DC gear motor runs with the 9V power supply, hence the relay is used to provide a separate 9V supply, whereas other components does not require 9V power supply. Hence the 9V power supply from the battery is regulated using the voltage regulator (IC7805) and then sent to the components based on their requirements. The ATMEGA 328 is programmed to receive the traffic signal counter value and the conditions are also programmed in the ATMEGA 328. It is programmed by using Arduino software and loaded into the ATMEGA 328. The ATMEGA 328 holds the program code, which contains the RF, commands, necessary to control the DC gear motor. When the automobile is turned ON and is in idle state, it switches the receiver circuit to active state. In active state, the RF receiver interfaced with the ATMEGA 328 receives the counter value and checks the condition that is programmed in the ATMEGA 328. When the condition is satisfied, it provides a 5V input signal to the relay, which switches the DC gear motor ON. And when the condition is not satisfied it does not provide any input signal to the relay and the DC gear motor is in OFF state.

In case of an emergency, to turn ON the DC motor, a bypass switch is used. It triggers the relay, which would power the DC gear motor. In the real time application of this project the ATMEGA 328 at the receiver end should be interfaced with the Engine Control Unit (ECU) of the automobile, which will control the ignition of the automobile. The interfacing programming has to be done in the ECU board, in addition to the programming done in the ATMEGA 328.



**Fig 3. Block diagram of the system**

### 3 SYSTEM ARCHITECTURE

#### 3.1 MICROCONTROLLER (ATMEGA 328)



*Fig 4. Arduino UNO*

An Arduino UNO R3 board is used in this project. Arduino board is a micro-controller kit for building digital devices and interactive objects that can sense and control objects in the physical world. They are distributed as open-source hardware and software. It designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins. These pins may be used to interface to various expansion boards and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB), which are also used for loading programs from personal computers.

It consists of an Atmel 32bit AVR micro-controller (ATmega328). It has 14 digital I/O pins at the top (of which 6 can be used as PWM outputs), 6 analog input pins at the lower right, and the power connector at the lower left, a 16 MHz quartz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button. The board can operate on an external supply of 6-20 V. If supplied with less than 7V, however, the 5V pin may supply less than 5V and the board may become unstable. If used in more than 12V, the voltage regulator may overheat and damage the board. The recommended input voltage is 7-12 V. The DC current per I/O pin is 20mA. The DC current for 3.3V pin is 50mA. The flash memory is of 32kB, of which 0.5kB is used by boot loader. The SRAM is 2kB and EEPROM is 1kB. Generally the UNO board is powered via the USB connection or with an external power supply. The power source is selected automatically.

#### 3.2 RF TRANSMITTER AND RECEIVER

An RF module (radio frequency module) is a (usually) small electronic device used to transmit and or receive radio signals between two devices. The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF module, variations in the amplitude of carrier wave represents the digital data. This kind of modulation is known as Amplitude Shift Keying (ASK). Transmission through radio frequency is better than infrared (IR) because basically, signals through RF can travel through larger distances making it suitable for long range applications. This RF module comprises of a transmitter and a receiver. The transmitter and receiver pair (Tx/Rx) operates at a frequency of 434 MHz. An RF transmitter receives serial data and wirelessly transmits it through RF by an antenna connected in its 4<sup>th</sup> pin. The transmission happens at the rate of 1Kbps - 10Kbps. The transmitted data is received by an RF receiver operating at the frequency similar to that of the transmitter. The RF module is always used together with an encoder/decoder pair. The encoder is used for encoding parallel data for transmission feed while a decoder decodes reception. HT12E-HT12D, HT640-HT648, etc. are some commonly used modules.

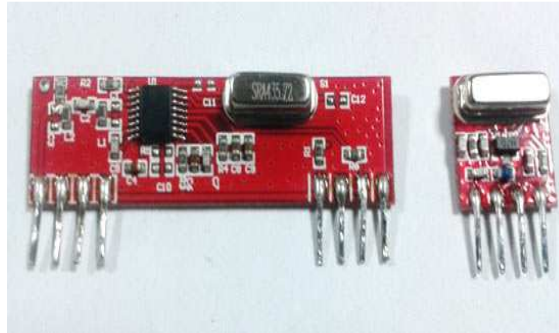


Fig 5. RF Transmitter and Receiver

### 3.3 RELAY

Relay is an electromagnetic device, that isolates two circuits electrically and connect them magnetically. Relay allows one circuit to switch another one while they are completely separate. It can interface an electronic circuit, at a low voltage, to an electrical circuit, which works at very high voltage. For example, a relay can switch a 230V AC mains circuit in a 5V DC battery circuit. Thus, a small electrical circuit is able to drive a fan or an electric bulb. In this project, a basic 5V relay is used. It is a high quality single pole- double throw (SPDT) switch, which is fully sealed. It can be used to switch high voltage and/or high current devices. The coil of this relay is rated up to 12V, with a minimum voltage of 5V at 250V AC or 30V DC. The rated current is up to 5A. When the relay is not activated, the common pin is in contact with the NC pin. Similarly, when it is activated, the common pin will break away from contact with the NC pin and make contact with the NO pin. Also, when the relay is deactivated from activated state, the common pin will conversely break away from contact with the NO pin and return back in contact with the NC pin.

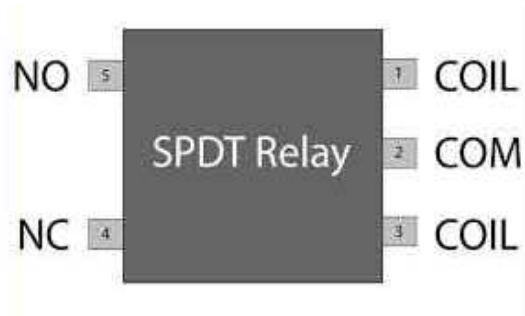


Fig 6. Pin diagram of relay

## 4 RESULT AND DISCUSSIONS

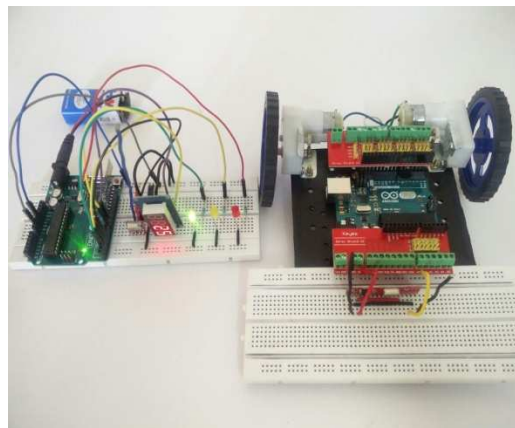


Fig 7. Hardware kit

Protecting car engines by idling less and frequent restarts are no longer hard on car's engine and battery. The added wear which amounts to no more than \$10 for an annual, is much less than the cost wasted for fuel, which is nearly \$70-650 for an annual, depending upon fuel prices, idling types, vehicle types, etc. Idling actually increases overall engine wear by causing the car to operate for longer than necessary [7]. From this, we can conclude that, in addition to saving fuel, money is also saved. The important thing is that air pollution by automobiles can be reduced considerably. This is possible by the centralized automatic traffic control signal. The same system can also be developed for manual traffic control in future. From this proposed system, we can control the fuel consumption by vehicles waiting in traffic signals. This is possible with the help of ECU, interfaced with microcontroller, which turn on or turn off the engine unit.

## 5 CONCLUSION

Thus this system will help reduce fuel consumption and emission of air pollutants like carbon dioxide, hydrocarbons, carbon-mono oxide, nitrous oxides and other pollutants from automobiles. It saves lot of money spent on fuel that is wasted in traffic signals. In addition, it will also help in regulated traffic. Turning on and off the engine every time a vehicle waits in traffic signal can be arduous for the driver. This project is the minor part of a major project. The main future work is to design it in an efficient manner. After the complete review of the scientific literature, it can be concluded that the design of this system is viable. This may give a marginal gain in fuel economy without any strain on the starter system.

## REFERENCES

- [1] T. Mahlia, S. Tohno, and T. Tezuka, "International experience on incentive program in support of fuel economy standards and labelling for motor vehicle: a comprehensive review," *Renewable and Sustainable Energy Reviews*, vol. 25, pp. 18–33, 2013.
- [2] T. Mahlia, S. Tohno, and T. Tezuka, "History and current status of the motor vehicle energy labeling and its implementation possibilities in Malaysia," *Renewable and Sustainable Energy Reviews*, vol. 16, no. 4, pp. 1828– 1844, 2012.
- [3] M. N. Uddin, W. M. A. W. Daud, and H. F. Abbas, "Potential hydrogen and non-condensable gases production from biomass pyrolysis: insights into the process variables," *Renewable and Sustainable Energy Reviews*, vol. 27, pp. 204–224, 2013.
- [4] <https://googleweblight.com/i?u=https://www.quora.com/Fuel-Efficiency-Should-you-turn-off-the-cars-engine-at-a-red-light-when-you-stop-for-very-shorttime&grqid=fECRAu8x&hl=en-IN&geid=1006>
- [5] <http://googleweblight.com/i?u=http://www.thejournal.ie/switch-off-engine-stuck-in-traffic-1121608Oct2013/&grqid=tbmsGN5F&hl=en-IN&geid=1006>
- [6] <https://googleweblight.com/i?u=https://www.zigwheels.com/guide/fuel-efficiency-guide/switching-off-youengine-at-trafficlights/11604/&grqid=eslMWdk7&hl=en-IN&geid=1006>
- [7] C. Nagarajan and M. Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING*, Vol.63 (6), pp.365-372, Dec.2012.
- [8] C. Nagarajan and M. Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- *Taylor & Francis, Electric Power Components and Systems*, Vol.39 (8), pp.780-793, May 2011.
- [9] C. Nagarajan and M. Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [10] <https://www.edf.org/climate/reports/idling>
- [11] S. Shamshirband, N. B. Anuar, M. L. M. Kiah, and A. Patel, "An appraisal and design of a multi-agent system based cooperative wireless intrusion detection computational intelligence technique," *Engineering Applications of Artificial Intelligence*, vol. 26, no. 9, pp. 2105–2127, 2013.
- [12] N. Haworth and M. Symmons, "Driving to reduce fuel consumption and improve road safety," *Monash University Accident Research Centre*, 2001, <http://acrs.org.au/les/arsrpe/RS010036.pdf>.
- [13] T. Lyons, J. Kenworthy, C. Moy, and F. dos Santos, "An international urban air pollution model for the transportation sector," *Transportation Research D: Transport and Environment*, vol. 8, no. 3, pp. 159–167, 2003.
- [14] A. AfWählberg, "Fuel efficient driving training-state of the art and quantification of effects," in *Proceedings of the International Conference Soric*, E141, Manama, Bahrain, 2002.

- [15] S. Fan, Q. Fu, J. Zhang, J. Ma, J. Zhao, and K.Lu, "Research on drag reduction of commercial vehicle based on aerodynamics," in Proceedings of the FISITA 2012 World Automotive Congress, vol. 195 of Lecture Notes in Electrical Engineering, pp. 801–809, Springer, Berlin.

## DAM AUTOMATION USING ARDUINO

*V. Rajendran<sup>1</sup>, J. Shilpa<sup>1</sup>, S. Veeravalavan<sup>1</sup>, and M. Anbarasan<sup>2</sup>*

<sup>1</sup>Student, Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering (ACE), Tamil Nadu, India

<sup>2</sup>Assistant professor, Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering (ACE), Tamil Nadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Dams have been used in many purposes since long time by mankind. Power has been generated through flow of water in dam and the water stored in dam for a whole year has been used for irrigation and drinking purposes. This paper is based on automating the dam functions based on controlling the various parameters such as level and flow with real time implementation of gate control using Arduino. And the dam functions are regularly monitored and reported to a remote computer or a mobile through RF module.

**KEYWORDS:** Arduino, Level sensor, Dam automation system.

### INTRODUCTION

In India approximately 3200 dam are present and it cover 1,70,000 sq.km for collecting water. Dam are manmade or artificial barriers usually constructed across to impound water. There is also 2067.68 km long and complex canal network through which about 10 lakes hectare land gets water for irrigation and drinking purpose. The farmers are dependent on seasonal ran and after that bore well water for their crops.

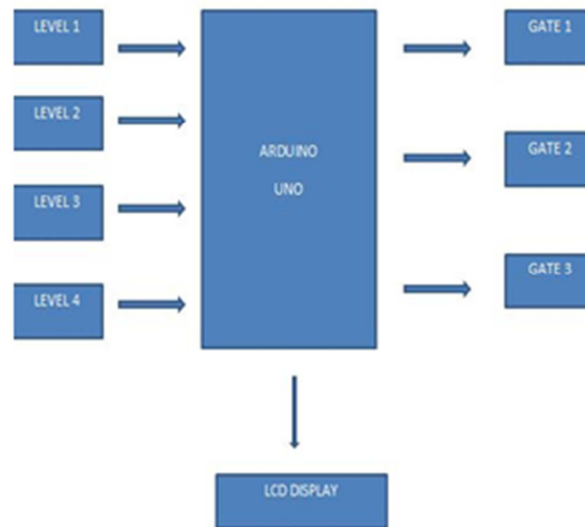
Recently, all the farmers use in flood irrigation system for plant their crops which needs more water. As we know water is gradually becoming one of the most precious natural resources

As the solution of above problem we are making this project to develop a Arduino based system which detects the water level in dam and thereby control the movement of gates automatically.

Automation or automatic control is the use of various control system for operating equipment such as machinery, process in factories, boilers and heat treating ovens, switching in telephone network, steering and stabilization of ship, aircraft and other application with minimal pr reduced human intervention some processes have been completely automated. The biggest benefit of automation is that it is saves labor however, it is also used to save energy and waterfalls and to improve quality, accuracy and precision.

### SYSTEM DEVELOPMENT

In our project we have developed the overall method on many ways. This is used to control the dam gates automatically and used to store the water in any condition of weather.

**SCHEMATIC DIAGRAM****IMPLEMENTATION OF PROPOSED SYSTEM**

In this section the prototype that we have developed in order to implement the proposed system has been explained. There are various components we used to implement this system.

By using components the entire system is controlled and implemented in accordance with the level of water present in the reservoir and it is sensed and send to the controller where the corresponding gates are opened.

**a. Arduino**

Arduino is open source hardware. The hardware references designs are distributed under a creative common Attribution Share-Alike 2.5 license and are available on the Arduino website. The source code for the IDE is released under GNU General Public License, Version 2.

Although the hardware and software designs are freely available under licenses, the develops have requested that the name Arduino be exclusive on use of the Arduino name emphasizes that the project is open to incorporating work by other into the official product Arduino.

Final | Arduino 1.6.8 Hourly Build 2016/02/02 09:41

File Edit Sketch Tools Help

```

Serial.println(val);
myservoy.write(val);
delay(50);
Serial.print("GENERATED VOLTAGE = ");
Serial.println(vin,2);
delay(500);
if (millis() - lastMillis > 2000)
{
  TMP_Therm_ADunits = analogRead(analogPinForTMP);
  RV_Wind_ADunits = analogRead(analogPinForRV);
  RV_Wind_Volts = (RV_Wind_ADunits * 0.0048828125);
  TempCtimes100 = (0.005 * ((float)TMP_Therm_ADunits * (float)TMP_Therm_ADunits)) - (16.862 * (float)TMP_Therm_ADunits) + 9075.4;
  temp= (TempCtimes100)/100;
  zeroWind_ADunits = -0.0006* ((float)TMP_Therm_ADunits * (float)TMP_Therm_ADunits) + 1.0727 * (float)TMP_Therm_ADunits + 47.172;
  zeroWind_volts = (zeroWind_ADunits * 0.0048828125) - zeroWindAdjustment;
  WindSpeed_MPH = pow(((RV_Wind_Volts - zeroWind_volts) /.2300) , 2.7265);
  Serial.print("NACELLE TEMP =");
  Serial.print(temp);
  Serial.print(" C");
  Serial.print(" WIND SPEED = ");
  Serial.print(WindSpeed_MPH);
  Serial.println(" mph");
  lastMillis = millis();
}
if(WindSpeed_MPH > 5)
{
  myservop.write(90);
}

```

### b. Sensing element

Sensing element in our project is the water level sensor which is attached in the reservoir. Whenever the water level increases the sensor will sense the water. Whenever the desired level achieved then the sensor will send the input to the Arduino which controls the action of gate as opening and closing the gate and sensors are used to send the level of water.

### c. Gate control

In gate control assembly there are three doors are used in our proposed system. One gate partially open when the water is preset in the low level and the water level increases then the gate 1 is fully opened and keep on increasing to the next level then gate 1 as well as gate 2 will be open. For very high condition only emergency gate called gate 3 will open along with another two gate. The opening and closing of gate is controlled by using gear motor, the motor shaft is connected with the gears belt which placed on gate assembly. The opening of gate also control by timer with required time application. When the gate is fully open during this stop action of gate will controlled by using manual bypass switch.

### d. Communication and display interface

RF module is used to send a communication of all process which involved in a Dam automation. It will send to a computer through RF transmitter from the sensor and gate and received in a computer where LCD display are used to display the entire process in the automation of dam and control if gates.

### e. Water Level Sensor

Wide spectrum of sensors is available in the market and commonly, they are classified based on the specific application of the sensor. Sensor used for measuring humidity is termed as humidity sensor, the one used for measurement of pressure is called pressure sensor, sensor used for measurement of displacement is called position sensor and so on though all of them

may be using the similar sensing principle. In a similar fashion, the sensor used for measurement of fluid levels is called a level sensor.

#### f. Gear Motor

"Gear motor" refers to a combination of a motor plus a reduction gear train. These are often conveniently packaged together in one unit. The gear reduction (gear train) reduces the speed of the motor, with a corresponding increase in torque. Gear ratios range from just a few (e.g. 3) to huge (e.g. 500). A small ratio can be accomplished with a single gear pair, while a large ratio requires a series of gear reduction steps and thus more gears. There are a lot of different kinds of gear reduction.

#### g. LCD

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology.

A **liquid-crystal display (LCD)** is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and indoor and outdoor signage. Small LCD screens are common in portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, including smart phones. LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks. LCD screens have replaced heavy, bulky cathode ray tube (CRT) displays in nearly all applications. LCD screens are available in a wider range of screen sizes than CRT and plasma displays, with LCD screens available in sizes ranging from tiny digital watches to huge, big-screen television set.



#### h. Motor shield

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name *Arduino* comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014



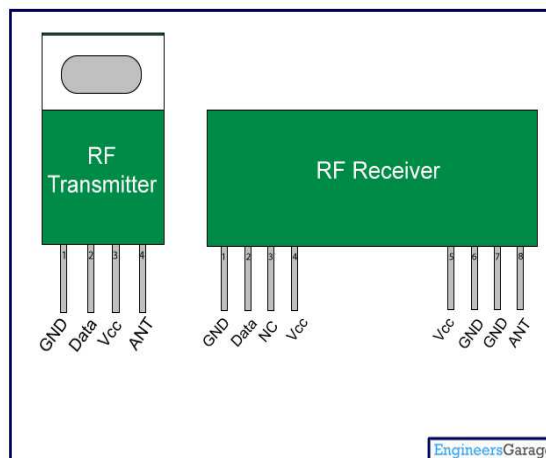
**i. RF MODULE**

An **RF module** (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter or receiver.

RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. Good electronic radio design is notoriously complex because of the sensitivity of radio circuits and the accuracy of components and layouts required to achieve operation on a specific frequency. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected. Finally, radio circuits are usually subject to limits on radiated emissions, and require Conformance testing and certification by a standardization organization such as ETSI or the U.S. Federal Communications Commission (FCC). For these reasons, design engineers will often design a circuit for an application which requires radio communication and then "drop in" a pre-made radio module rather than attempt a discrete design, saving time and money on development.

RF modules are most often used in medium and low volume products for consumer applications such as garage door openers, wireless alarm systems, industrial remote controls, smart sensor applications, and wireless home automation systems. They are sometimes used to replace older infra red communication designs as they have the advantage of not requiring line-of-sight operation.

Several carrier frequencies are commonly used in commercially available RF modules, including those in the industrial, scientific and medical (ISM) radio bands such as 433.92 MHz, 915 MHz, and 2400 MHz. These frequencies are used because of national and international regulations governing the used of radio for communication. Short Range Devices may also use frequencies available for unlicensed such as 315 MHz and 868 MHz.



## CONCLUSION

In India, Dam control is done manually and has not been automated till now. Human invention is involved in opening the gate, measuring the water level in the reservoir and controlled manually. The concept of our work is to automation all process in the dam and make it easier to operate. Also use the bypass to control manually.

In this paper, it represents an automatic controlling of a motor using Arduino. This system model of a dam automation system which is the completely automated can control the level of the dam gates using the backup of the water. Thus using Arduino the level of water in the dam is controlled effectively there by opening and closing the gates of the dam whenever the level increases. Therefore, the use of level sensor has opened doors for a level of automation dam systems and also monitoring the entire system about the gate opening and closing of the gate.

## REFERENCES

- [1] V. Rajeswari, Prof. Y. Rajeswari, Dr. L. Padma Suresh, "Real –Time Implementation of Hydroelectric Power Plant using PLC and SCADA" International Journal of Engineering Research and Applications.
- [2] Nikhil R.Dusawar (March 2015) presented the paper PLC based Dam Automation System, This paper based on controlling the process variable parameters such as level and limit with time implementation of gate controlling of DC motor using Programmable Logic Controller.
- [3] C. Nagarajan and M. Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [4] C. Nagarajan and M. Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [5] C. Nagarajan and M. Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [6] Matthew S. Maxwell (August 2012) presented the paper on real time based dam automation. Recent improvements to the system have now automated this part of the process to provide a greater degree of convenience and efficiency.
- [7] Venkatasubramaniam (April 2016) Presented the paper on advanced dam monitoring system. In this paper if dam remains as the very first source for storage of drinking water in reservoir for serving a metropolitan city.
- [8] Syed Muhammad Umar Thlha, Syed Sheraz Mohani, Syed Hassan Ahmed in their paper "Design for an Irrigation and Monitoring System of an Automated Dam" in Proc. Of IMECS 2012 March 14-16, 2012, Hong Kong.

## WIND MILL AUTOMATION USING ARDUINO AND SCADA SYSTEM

*R. Rahul<sup>1</sup>, S. Ragul Raj<sup>1</sup>, S. Vidhya<sup>1</sup>, and M. Anbarasan<sup>2</sup>*

<sup>1</sup>Student, Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering (ACE), Tamil Nadu, India

<sup>2</sup>Assistant Professor, Department of Electronics and Instrumentation Engineering, Adhiyamaan College of Engineering (ACE), Tamil Nadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The requirement to harness renewable energies like SOLAR, WIND, TIDEL in the recent decades are increasing, so these fields need lot of innovation to get maximum results. A lot of concern regarding the problems faced in harnessing them like maintenance and continuous monitoring of those systems. Here in this project we automate the Wind Turbine by using ARDUINO which provides a control over the wind turbine like orientation to the wind, propeller control and fail safe conditions. And also, to monitor number of wind turbines collectively in a particular area from a remote locality with the use of SCADA Systems.

**KEYWORDS:** arduino, wind sensor, motor shiel, potentiometer, voltage swnsor module.

### 1 INTRODUCTION

Since past two decades, there have been many energy related crises experienced due to depletion of fossil fuels e.g. coal and oil; and environmental concerns resulting from the fuel consumption. The most effective utilization of renewable energies, like wind and solar energy etc. are highly anticipated instead of the fossil fuels like petroleum and coal [4].

A windmill is a setup that converts the energy of wind into rotational energy by means of sails or blades. The majority of modern windmills take the form of wind turbines used to generate electricity.

Today's wind turbines are manufactured in a wide range of vertical and horizontal axis types. The smaller turbines are used for applications such as battery charging for auxiliary power for boats to power traffic warning signs. A wind turbine used for charging batteries may be referred to as a wind charger. Slightly larger turbines can be used for making small contributions to a domestic power supply while selling unused power back to the utility supplier via the electrical grid. Many large turbines, known as wind farms, are becoming an increasingly important source of renewable energy and are used by many factions as part of a strategy to reduce their dependency on fossil fuels.

In 1919, by the German physicist Albert Betz proposed Betz's law which indicates the maximum power that can be extracted from the wind, independent of the design of a wind turbine in open flow. Based on Betz's law, no turbine can capture more than  $16/27$  (59.3%) of the kinetic energy in wind. The factor  $16/27$  (0.593) is known as Betz's coefficient. Practical utility-scale wind turbines achieve at peak 75% to 80% of the Betz limit.

In order to achieve the maximum Betz limit, the windmill should be oriented towards the incoming wind and control the blades based on the wind speed. A nacelle is the center hub of a wind turbine, with blades attached to it, and it is a key component to be controlled to ensure that the wind turbine face the incoming wind to capture the energy. Ideally, the nacelle orientation and the wind course should be opposite to each other. In this era of huge energy demands and shortage of the existing conventional energy sources, wind energy is one of the most established and cost-effective renewable energy sources.

Wind power, as an alternative to fossil fuels, is plentiful, renewable, extensively distributed, no greenhouse gas emissions during operation and uses minimal land.

## 2 EXISTING

According to the research, a non-effective control system may not be able to adjust the nacelle to its proper position, which can be a soft failure; or, in the worst-case scenario like a shaft failure, the nacelle orientation is completely hooked at one direction since the turbine is shut down, which is a hard failure. In the SCADA (supervisory control and data acquisition) data set of wind turbines, there are lots of measurement variables, on ambient weather conditions, power, other electrical measures, and some mechanical measures. They have observed that the nacelle alignment exhibits a much more irregular or volatile pattern than the other variables, but the relationship between the wind course and nacelle alignment is still effective to indicate an abnormal health state [1]. A research was going on about a monitoring wind turbine wirelessly using Arduino. They have employed an Arduino based wireless system that measures and transmits the different electrical and mechanical parameters of the turbine. The parameters that were monitored are current, voltage, speed and vibration in the turbine. Moog Industries has made this setup of windmill orientation based on various parameters by using separate motion controllers. They have their own pitch system, yaw system with separate motion controllers [2].

Providing an automation solutions for the wind sector which is used to monitor and diagnose the wind farms. Provide automation solutions for wind farms (at farm and at remote levels) using Symphony Plus platform

- S+ Operation as SCADA solution for the remote-control center
- S+ Operations and PLC for SCADA and control system at the farm level Monitor relevant signals and diagnose the wind farms to minimize downtime of turbines and improve their efficiency

Providing a software solution to increase the value of renewables in order to turn renewables into a reliable generation basis. Provide control abilities and aggregation in (larger) virtual power plants to enable the integration of renewables into the power system planning and operations through flexible control and forecasting of power production Provide amplified control, predictive service and maintenance solutions to reduce the cost of renewable energy [3].

### POWER FROM WIND TURBINE

The power rises as cube of the wind velocity and can be calculated with respect to area in which the wind and wind velocity is available. When wind is in motion, the energy produced is kinetic energy. Hence the power from turbine is related to the kinetic energy produced.

$$\text{Kinetic Energy} = 1/2 MV^2.$$

The volume  $V'$  flowing in unit time through an area  $A$ , with wind speed  $V$  is denoted by  $AV$  and mass  $M$  is the product of Volume  $V'$  and density  $\rho$  so:  $M = \rho AV$

$$\text{putting the } M \text{ in equation of kinetic energy we get: Kinetic Energy} = 1/2 (\rho AV)V^2 = 1/2 (\rho AV^3)$$

$$\text{But Power is nothing but the kinetic energy generated by the turbine. Hence, Power} = 1/2 (\rho AV)V^2 = 1/2 (\rho AV^3)$$

$$\text{Where: Air Density } (\rho) = 1.225 \text{ kg/m}^3 \text{ Area } (A) = \text{Swept Area of turbine blades Velocity } (V) = \text{wind speed in m/s.}$$

### GENERATOR

The generator converts mechanical energy of the shaft into electrical energy output. While designing the axial flux generator observation can be noted that the operating capacity of generator depends on permanent magnet alternators. For these generators air gap is arranged in perpendicular direction to rotating axis and hence produces magnetic fluxes in parallel direction to rotating axis.

### HOW POWER IS GENERATED

Wind turbines serve as a means to transform the kinetic energy of wind into power. This process begins when wind contacts the turbine blades and transfers some of its kinetic energy to them, forcing them to rotate. Since the blades are connected to the main shaft through the rotor, the shaft rotates as well, creating mechanical energy. The main shaft is usually connected to a gear box which rotates a parallel shaft at about 30 times the rate of the main shaft. At high enough wind

speeds, this amplification creates sufficient rotational speeds for the generator electrical output. Generators generally used in turbines are off-the-shelf and use electromagnetic induction to produce an electrical current. In these generators permanent magnets are arranged surrounding a coil. The shaft connects to the magnet assembly, spinning it around the stationary coil of wire and creating a voltage in the wire. The voltage is what drives the electrical current out of the wire and into power lines to be distributed [5].

**ARDUINO (REV C) ATMEGA328P**

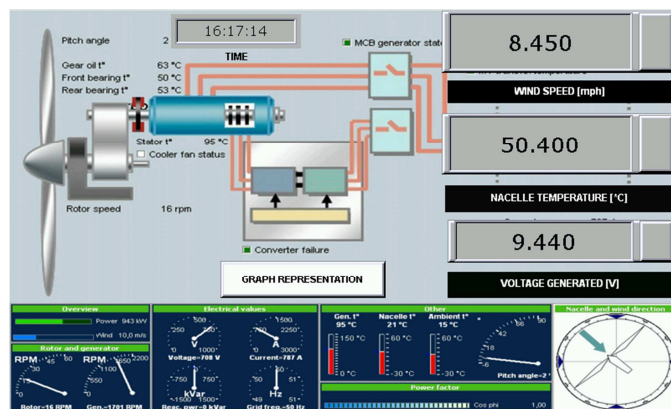
Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino/Genuino Uno comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.

**SERVOMOTORS**

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

**WIND SENSOR**

Wind sensor rev C is used here. The Wind Sensor is a thermal anemometer based on a traditional technique for measuring wind speed. The technique is called the “hot-wire” technique, and involves heating an element to a constant temperature and then measuring the electrical power that is required to maintain the heated element at temperature as the wind changes. The sensor can be switched off to save power, but at start-up needs to be allowed to warm up about 10 seconds to thermally stabilize for best accuracy. This time interval allows the sensing thermistor to heat up to operating temperature. The Wind Sensor includes a small trim pot that is used to calibrate the sensor for zero wind. Calibration is simple. Simply put a glass over the sensor to block any breeze and adjust the pot for the desired zero level. We calibrate the sensors roughly for .5V of output at zero wind with a six-volt supply, but you are free to calibrate as desired. A lower calibration point, say .2 V will result in a little more sensing capability at the high end. Using a higher voltage supply will require recalibration. Do not use supplies higher than about 10 volts. A regulated supply is highly recommended.



## VOLTAGE SENSOR MODULE

This module is based on resistance point's pressure principle, and it can make the input voltage of red terminal reduce 5 times of original voltage.

The max Arduino analog input voltage is 5 V, so the input voltage of this module should be not more than  $5\text{ V} \times 5 = 25$  (if for 3.3 V system, the input voltage should be not more than  $3.3\text{V} \times 5 = 16.5\text{V}$ ). Because the Arduino AVR chip have 10 bit AD, so this module simulation resolution is  $0.00489\text{ V} (5\text{ V} / 1023)$ , and the input voltage of this module should be more than  $0.00489\text{ V} \times 5 = 0.02445\text{ V}$ .

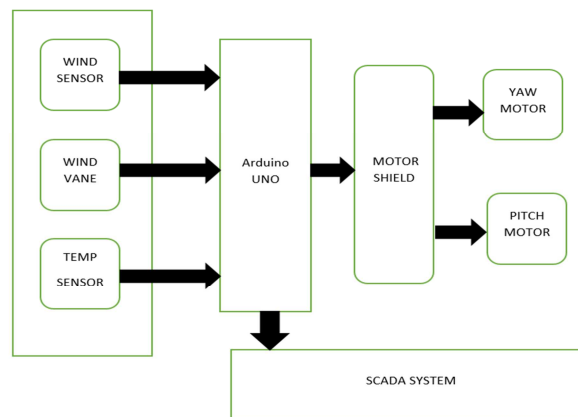
1. Voltage input range: DC 0-25 V
2. Voltage detection range: DC 0.02445 V-25 V
3. Voltage analog resolution: 0.00489 V
4. DC input interface: red terminal positive with VCC, negative with GND.

It will sense the voltage which was generated by the windmill and it shows the voltage generated.

## POTENTIOMETER

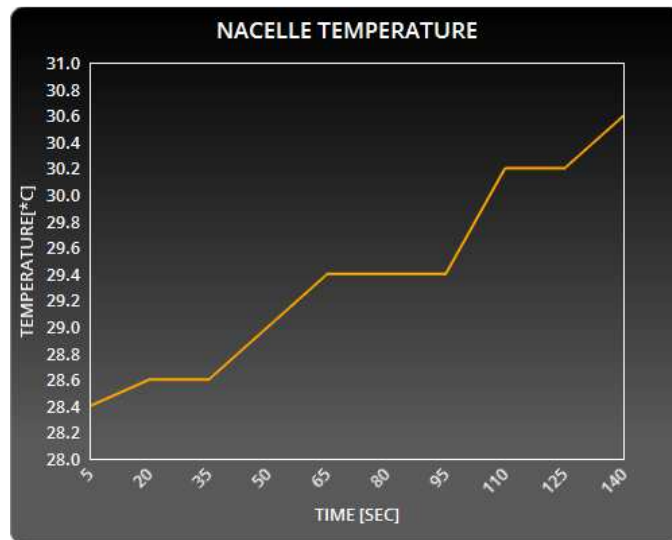
A potentiometer is an instrument for variable potential (voltage) in a circuit. Before the introduction of the moving coil and digital volt meters, potentiometers were used in measuring voltage. In this arrangement, a fraction of a known voltage from a resistive slide wire is compared with an unknown voltage by means of a galvanometer. The sliding contact or wiper of the potentiometer is adjusted and the galvanometer briefly connected between the sliding contact and the unknown voltage. The deflection of the galvanometer is observed and the sliding tap adjusted until the galvanometer no longer deflects from zero. At that point the galvanometer draws no current from the unknown source, and the magnitude of voltage can be calculated from the position of the sliding contact. This null balance measuring method is still important in electrical metrology and standards work and is also used in other areas of electronics.

## 3 PROPOSED SYSTEM



**Fig.1 Block Diagram Representation of the System**

Wind sensor is at the transmitter side to sense the speed of the wind and send the signal to the Motor shield through the Arduino UNO. Arduino UNO is at intermediate stage to control the process. Wind vane is to determine the wind direction, a wind vane spins and points in the direction from which the wind is coming and it generally has two parts or ends: one that is usually shaped like an arrow and turns into the wind and the other end is wider so that it catches the breeze. Temperature sensor senses the temperature of the nacelle and sends the signals to the Arduino UNO.



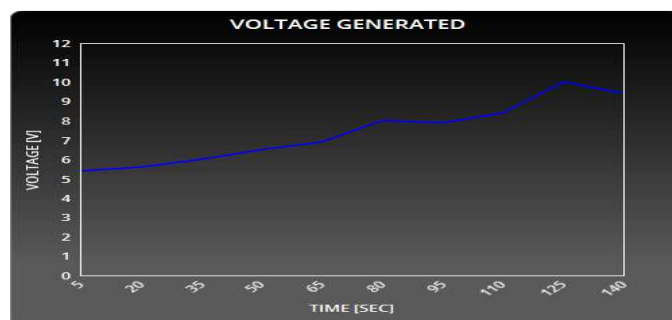
As the wind sensor senses the speed of the wind it gives signals, if the speed of the wind is more than 40 miles/hour the Arduino gives the input to the pitch motor such that the pitch control is activated and the blades rotate into 90 degrees to avoid the damage for blades. The pitch control always serves the essential purpose of setting wind turbine blades at the best angle to the wind to turn the rotor.

As the wind vane determines the direction of the wind with the help of a potentiometer, the signals of the potentiometer are sent to the Arduino UNO by which yaw motor orients the nacelle towards the wind direction to ensure that wind turbine always faces exactly into the incoming wind.

The signals from wind sensor, wind vane and the temperature sensor are sent to the Arduino UNO and from this it is sent to SCADA to monitor the turbines parameters to form a single platform. By using SCADA a lot of functions can be performed from a remote locality.

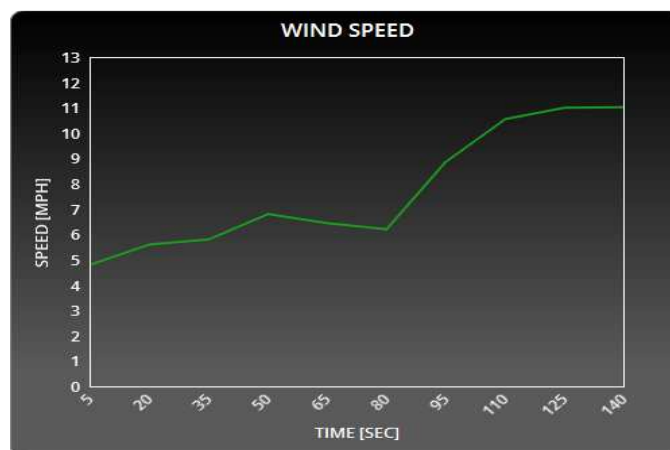
**4 RESULT AND DISCUSSION**

From the natural resources we can obtain an electricity through windmill. Automated windmill provides centralized system, controlled and monitoring that far from a distance which are in remote location, this is possible by the help of SCADA system. SCADA which informs the windmill details like speed of the windmill, nozzle temperature, voltage which is regulated by the windmill through this we can monitor the windmill from the centralized area.



**Fig 2 VOLTAGE SENSOR GRAPH**

From the fig.2 the Voltage values indicated in the SCADA system through the voltage sensor module which is been generated from the wind mill in a graphical manner.



**Fig 3 WIND SENSOR REV C GRAPH**

Fig.3 labels the wind speed, SCADA which indicates the speed of windmill in a graphical chart which is provided by the wind sensor REV C is used for the pitch control of the wind mill.

## 5 CONCLUSION

In recent decades automation has taken over each and every industry to obtain maximum output with minimal human interference. So, automating the windmill will provide various advantages. Most of the windmills used are partially automated with various controllers. Automating with monitoring becomes very convenient if it is centralized and controlled from a remote locality, implementing a centralized system collectively for numerous windmills or a wind farm will be economical and more informative.

Employing the automation system based on Arduino and SCADA system will harness more energy from the wind with proper orientation to the wind with good safety features. Centralized SCADA system for a whole wind farm will make all the windmill to be in a single controlled structure. Advancement in the windmill industries are most welcomed as there is more necessity to harness green energy in order to tackle global warming and depleting fossil fuels. It also provides effective change in the windmill industries at effective cost and in an efficient manner. Thus the work results in designing better automated and efficient windmills.

## ACKNOWLEDGMENT

The authors would like to thank the Boundless impression with Adhiyamaan College of Engineering. We prompt our sincere thanks to our respected guide. Our project becomes commendably, the reason behind this is cordiality with us. The department faculties who helped us in a straight line and implicitly gave their facts to us to triumph our project with warmth.

## REFERENCES

- [1] Yanjun Yan "Nacelle orientation based health indicator for wind turbines" Prognostics and Health Management (PHM), 2015 IEEE Conference on 22-25 June 2015
- [2] S.Prakash, S.P.Vijayaragavan "Wireless Wind Turbine Monitoring Using Arduino" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 7, July 2015.
- [3] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [4] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [5] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.

- [6] <https://library.e.abb.com/public/7efe4468fdce1043c1257e0300557226/Wind%20Automation%20-%20Customer%20Presentation.pdf>
- [7] O. Kanna, S. Hanba, S. Asato, and K. Yamashita, "A method of stabilization of a wind generator power using back stepping algorithm," IEEE Trans. on Energy, vol. 117, no. 2, pp. 15131519, Jan 1997.
- [8] Harshal Vaidya, Pooja Chandodkar, Bobby Khobragade, R.K. Kharat'Power Generation Using Maglev Windmill" International Journal of Research in Engineering and Technology, Electrical and Electronics Engineering.

## Segmentation for Video Sequence

*M. Ganeshwade Mandakini<sup>1</sup>, Daivashala R. Deshmukh<sup>2</sup>, and K. Vengatesan<sup>3</sup>*

<sup>1</sup>Assistant Professor, Department of Computer Science Engineering, Marathwada Institute of Technology, Aurangabad, India

<sup>2</sup>Assistant Professor, Department of Computer Science Engineering, Maharashtra Institute of Technology, Aurangabad, India

<sup>3</sup>Assistant Professor, Department of Computer Science Engineering, Marathwada Institute of Technology, Aurangabad, India

---

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The objective of this paper is generation of an algorithm that will separate moving foreground from a stationary background in a general video sequence. We use the different models to calculate the foreground motion in a robust estimation framework. Segmentation of objects in image sequence is very important in many aspects of multimedia applications. We describe a system for representing moving images from the multi-layered sequence. This work realizes a motion- based image isolation algorithms for isolating the moving image in a multi-layered moving image sequence. The system has been proposed here which can efficiently segment a moving foreground object from a given image sequence with still background. The modules of the system are developed using MATLAB and verified for its functionality. In our system different algorithms like LMSE, Block-matching algorithm, motion tracing and recursive algorithms are used to estimate foreground image segmentation for Multi-layered video sequence. Experimental results are given to show the efficiency of our methods.

**KEYWORDS:** Block-matching, frame-interpolator, image/video segmentation, motion estimator.

### 1 INTRODUCTION

Due to the rapid progress in microelectronics and computer technology together with the creation of networks operating with various channel capacities, the last decade has seen the emerging of new multimedia applications such as Internet multimedia, Video on Demand (VOD), interpersonal communications(videoconference, videophone), and digital library.

The content-based functionalities in MPEG-4 video characterize a revolution in representing digital video and will have a tremendous influence in the future of visual world. With content-based functionalities, video bit stream can be manipulated to achieve personalized video. In MPEG-4 video, bit stream is composed of Video Object Planes (VOP), which can be used to assemble a real world scene. Each VOP is coded independent of other objects by its texture, motion and shape. VOP form the basic elements of MPEG-4 video bit streams. VOP extraction is a key issue in efficiently applying the MPEG-4 coding scheme. Although MPEG-4 standard doesn't specify how to obtain VOP, it's apparent and recognizes that segmentation-based techniques are essential to, and therefore, will dominate VOP generation. This is because most of visual information, existing or being generated, is in the form of frames or images. To achieve content-based functionalities, these frames and images have to be decomposed into individual objects to be fed into MPEG-4 video encoder.

This problem is motivated primarily by the need for replacing or removing a moving object in a motion picture. As mentioned above, however, motion-based segmentation also finds a niche in the realms of video compression and computer vision. Selection of a motion estimator model represents the first step in the problem. Gradient-based methods such as optical flow have shown high performance but generally come with increased computational overhead than block-based matching. The disadvantage of block methods is an expected loss of sharpness at edge regions marking the boundary between foreground and background.

### 1.1 SEGMENTATION

The ideal goal of segmentation is to identify the semantically meaningful components of an image and grouping the pixels belonging to such components. While it is impossible to segment static objects in image at the present stage, it is more practical to segment moving objects from dynamic scene with the aid of motion information contained in it. Segmentation of moving objects in image sequence plays an important role in image sequence processing and analysis. Once the moving objects are detected or extracted out, they can serve for varieties of purposes.

The aim of image segmentation is to segment the video frame into background, foreground, objects, and sub objects with different characteristics so that the mesh can represent the motion of objects perfectly. During segmentation, luminance, color and motion are used. In fact, decomposing a video sequence into Visual Object (VO) is very difficult. An intrinsic problem of VO generation is that objects of interest are not homogeneous with respect to low-level features such as color, intensity, or motion. Thus, it is very hard to obtain meaningful partitions

### 1.2 MULTI-LAYERED IMAGE

A system is described for representing moving images with sets of overlapping layers. Each layer contains an intensity map that defines the additive values of each pixel, along with an alpha map that's servers as a mask indicating the transparency. The layers of ordered in depth and they occlude each other in according with the rules of compositing. Velocity maps define how the layers are to be warped over time. The layered representation is more flexible than standard image transforms and can capture many important properties of natural image sequences

The decomposition of a sequence into its layered image representation is presented and demonstrates the flexible of the layered decomposition with applications in image compression and video special effects. The general block diagram of the algorithm consists of motion estimation, motion segmentation, and temporal integration is also presented.

## 2 DESIGN IMPLEMENTATION

### SYSTEM DESIGN

This project work realizes a motion based image isolation algorithm for isolating the moving image in a multi layered moving image sequence. The system reads a moving data and read the frame sequence based on the value passed by the user. The obtained frame sequence is processed using motion estimator and tracer module for the isolation of moving parameters in the given moving image sequence

### 2.1 FRAME READER

This unit is the first interfacing unit for the interface of selected moving image to the implemented design. The module reads the complete moving image data and creates multiple frames based on the frame skip and the frame number passed. This module creates frames at a rate of frame skip passed to and select the frames depending upon the total frame numbers passed. These frames are the passed to the next noise estimator module for the calculation of noise present in the frame sequence.

### 2.2 NOISE ESTIMATOR

Before motion estimation is begun, an accurate estimate of the mean-squared error due to noise in pixel intensities must be obtained. With this information, incorrect non-zero motion vectors may be discarded before they are traced. The rejection of these vectors can have important consequences for the resulting visual quality. The noise estimation is computed in a straightforward fashion where the inter-pixel differences between the blocks of two successive frames are computed. On every process the obtained inter-pixel difference is considered to be least value and compared with the next difference value. If the difference is found to be less than the present difference the minimum error is taken as the present difference else the minimum error is retained the previous value. This operation is iterated for the whole block and for the whole image. The obtained minimum error values are the squared and the mean square error is calculated from it.

The least mean square error is given by;

$$\text{LMSE error} = [\text{mean}(\text{least error})^2] + 3 * \sigma (\text{least error})$$

This module reads the frame sequence from the frame reader and process on successive frames returning the least MSE (Mean square error) for each frame. The obtained value is then used for the elimination of noise effect in the given frames sequence.

#### **NOISE ESTIMATION MODULE**

In all following motion vector calculations, only minimum mean-squared errors that fall below this threshold value can be considered true non-zero motion vectors. This method relies on the assumption that a large number of zero-motion regions can be found before considering noise. The problem here is that if the images are very noisy or a particularly noisy pair of images is used for the threshold estimate, then the collection of data points for threshold estimation is small. Also, depending on the nature of the distribution of the mean-squared errors, a varying number of standard deviations above the mean results in a useful threshold value.

#### **2.3 MOTION ESTIMATOR**

A block-matching motion estimator is used to calculate motion vectors over each pair of frames in the sequence. Since high accuracy in the motion vectors is desired, the estimator performs a full-search over the window. The minimum mean-squared error Criterion gives the best block match. The choice of the block size will have a great impact on results. A smaller block size will tend to produce more false motion vectors despite any noise estimation, but will result in finer edge definition in the resulting segmented image. Larger block sizes have coarser edges but are less plagued by noise effects. Furthermore the number of computations necessary for motion tracing goes down as the block size increases since there are fewer motion vectors to analyze. For the images analyzed (144x176 pixels) a block size of 8x8 pixels is used for the implementation.

The module reads the frames sequences with the threshold value obtained from the noise estimator unit and implements the block matching algorithm as explained in section for the

#### **2.4 MOTION TRACER**

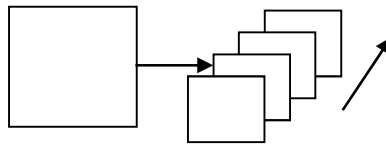
This block trace out the recursive pixels occurring in different frames rather than the successive frames. Its function is to distinguish regions that are moving in any frame or have moved at any time throughout the sequence of images. By analyzing the motion in this way, segmentation of regions that only move briefly is possible. For instance, in a complicated moving object such as a person, a hand or shoulder may only move slightly between a single pair of frames and will be stationary in all other frames. Isolation of such slow moving elements may not be possible under motion estimator block as it estimates the moving parameters between two successive frames only. The tracing unit realized, takes the frame sequence and trace out the whole frames for a pixel position in forward direction i.e. From the first to the last frame of the moving frame sequence is traced out for each pixel. If the difference is found gradually varying then such pixel values are also treated as moving. The unit implements the tracing algorithm for the determination of motion elements using forward tracing algorithm as explained in section

#### **2.5 FRAME INTERPOLATOR**

This unit reads the isolated motion vectors from motion tracer as well as motion estimator unit and rebuilds the frames depending on the motion vectors obtained. This module place the pixels back to the same position as in the original frames for the pixels isolated. Remaining pixel positions are been filled with zeros to neglect the non-moving elements. This unit after reconstructing the frames arrange it in sequence and play back as moving image. The obtained moving image is the final reconstructed isolated moving image for the given image. This isolated image can be taken and used for various other applications.

### **3 ALGORITHM FOR MULTILAYERED VIDEO**

The moving frames are generally represented as a sequence of multiple frames. These frames are static in nature when isolated. All these frames together create a moving image as shown in figure 3 On a closer observation it can be seen that most of the moving frames has got correlated pixels among successive frames transmission of these correlated pixels for low bit rate application is a very difficult task. To overcome this difficulty the moving image can be isolated from the stationary elements and can be isolately transmitted for more efficient low bit rate application.



**Fig 3 multi-frame representation of moving image**

Generally images have two layers named foreground and background. Under moving image there are three probability occurs

- 1) Both foreground and background moving
- 2) Foreground stationary and background moving
- 3) Background stationary and foreground moving

In most of the moving images we find the probability of third observation occurring i.e. the Background stationary and foreground moving. During transmission if this foreground can be isolated and transmitted it can improve the operational efficiency of the system. This project work implements an advanced moving image isolation system using block matching algorithm for foreground segmentation. The algorithms used are explained in the following sections.

#### **LEAST MEAN SQUARE ERROR (LMSE) ALGORITHM**

The Least Mean Square (LMS) algorithm is an adaptive algorithm, which uses a gradient-based method of steepest decent. LMS algorithm uses the estimates of the gradient vector from the available data. LMS incorporates an iterative procedure that makes successive corrections to the weight vector in the direction of the negative of the gradient vector, which eventually leads to the minimum mean square error. Compared to other algorithms LMS algorithm is relatively simple; it does not require correlation function calculation nor does it require matrix inversions.

#### **3.1 BLOCK MATCHING ALGORITHM**

The motion estimation and compensation technique has been widely used in video compression due to its capability of reducing the temporal redundancies between frames. Most of the algorithms developed for motion estimation so far are block-based techniques, called block-matching algorithm (BMA). In this technique, the current frame is divided into fixed size of blocks, & each block is compared with candidate blocks in reference frame within the search area. The widely used approach for the BMA is the full search BMA (FSBMA), which examines all candidate blocks within the search area in the reference frame to obtain a motion vector (MV). The MV is a displacement between the block in the current frame and the best matched block in reference frame in horizontal and vertical directions.

The motion estimation algorithm is performed with a variable size of search area depending on block types varying from 8x8 block to complete frame. The video sequences for low bit-rate video coding applications such as videophone and video-conferencing have some restrictive motion characteristics.

A block in a specific region in the previous frame can belong to the same region at that position in the current frame: a block in background region may lie in the background region in the current frame. The changing block shows the percentage of the difference from background to active region or vice versa. The other labels mean that the block types are the same in successive frames. In all video sequences, the percentage of background blocks in successive frames is very high.

The pattern of distribution is very similar without regard to video sequences. It is shown that the temporal correlation between successive frame is very high, that is, if a block in the previous frame belongs to background regions or active regions, the block which is located in the same position in the current frame may be classified as a background block or active moving block, respectively, with a strong probability.

The basic idea of block matching is depicted in the figure where the displacement for a pixel  $(n_1, n_2)$  in frame  $k$  (the present frame ) is determined by considering an  $N_1 \times N_2$  block centered about  $(n_1, n_2)$  and searching frame  $k+1$  (the search frame ) for the location of the best-matching block of the same size. The search is usually limited to an  $N_1+2M_1 \times N_2+2M_2$  region called the search window for computational reasons.

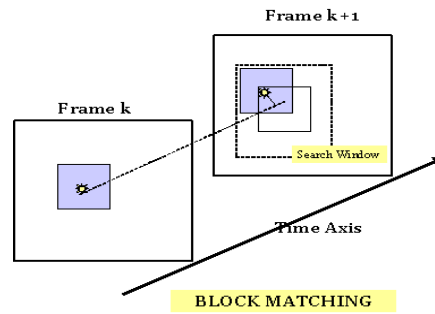


Figure 3.1 Block-matching

Block matching algorithms differ in

- The matching Criteria
- The search strategy
- The determination of block size

**MATCHING CRITERIA**

The matching of the blocks can be quantified according to various criteria including the maximum cross-correlation, the minimum mean square error (MSE), the minimum mean absolute difference (MAD) and maximum matching pel count (MPC)

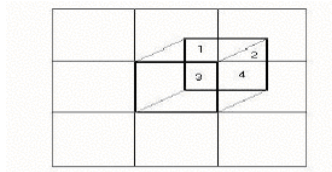


Figure 3.2 seed

$$\text{MSE: } \text{MSE}(d_1, d_2) = 1 / (N_1 N_2) \sum [s(n_1, n_2, k) - s(n_1 + d_1, n_2 + d_2, k + 1)]^2$$

The estimate of motion vector is taken to be the value of  $(d_1, d_2)$  which minimizes MSE.

$$[d_1, d_2]_T = \text{arg. min MSE}(d_1, d_2)$$

Normally not used, as it is difficult to realize the square operation in hardware

$$\text{MAD: } \text{MAD}(d_1, d_2) = 1 / (N_1 N_2) \sum [|s(n_1, n_2, k) - s(n_1 + d_1, n_2 + d_2, k + 1)|]$$

$$[d_1, d_2]_T = \text{arg. min MAD}(d_1, d_2)$$

Performance of MAD deteriorates as the search area becomes larger due to the presence of several local minima.

$$\text{MPC: } T(n_1, n_2; d_1, d_2) = 1,$$

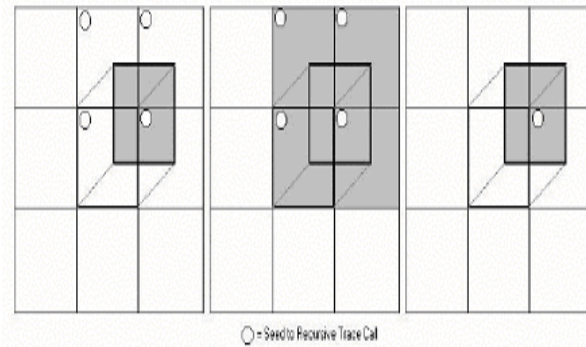
$$\text{if } |s(n_1, n_2, k) - s(n_1 + d_1, n_2 + d_2, k + 1)| \leq t; 0, \text{ Otherwise}$$

$$\text{MPC}(d_1, d_2) = \sum T(n_1, n_2; d_1, d_2)$$

$$[d_1, d_2]_T = \text{arg. max MPC}(d_1, d_2)$$

The selection of an appropriate block is essential for any block-based motion estimation algorithm. There are conflicting requirements on the size of the search blocks. If the blocks are too small, a match may be established between blocks containing similar gray level patterns, which are unrelated in the sense of motion. On the other hand, if the blocks are too large, then actual motion vectors may vary within a block, violating the assumption of a single motion vector per block. Hierarchical block matching discusses these conflicting requirements. The block size for the proposed design is calculated by performing continuous testing, taking different combination of frame sizes with different frame skips.

Tracing motion vectors lends itself naturally to a recursive solution. Each block with non-zero motion vectors in each frame represents a “seed” call to the tracing function. As shown in figure 3.2 above, a moving block will, in general, translate into a region corresponding to four blocks. The tracing algorithm begins with a seed call. This seed block will move into as many as four other blocks, and each of these blocks is recursively called by the tracing function. The purpose of the tracing function is simply to identify the appropriate moving pixels based on the motion vectors and block regions, then to seed further calls to it. Motion tracing has a straightforward solution only in a one direction temporally. In other words, tracing must be done in both the forwards and reverse temporal directions and best segmentation results.



**Figure 3.3 Tracing algorithm**

Figure 3.3 shows three varieties of the tracing algorithm. The first case represents the fully general approach. For any moving block only the pixels corresponding to that moving block are associated with motion, but all four regions impinged by the block are seeded to the successive tracing call. This is the most accurate approach but also the most computationally burdensome. The second approach is to seed all four blocks as well, but to treat all pixels within the four seeded blocks as having moved rather than just the actual moving pixels it. This approximation greatly simplifies the tracing algorithm, and also increases the algorithm efficiency dramatically, since a block that is seeded to the tracing function need not be ever seeded again

A final approach is to mark all moving pixels as in the general case, but to only seed the block corresponding to maximum overlap. If there are equal overlaps, then multiple blocks are seeded. Although this variation only approximates the tracing problem, it can be much faster since each trace call usually only seeds one recursive call rather than four. In the most general case, the tracing algorithm runs slow. For improved speed, motion vectors are computed not between each frame but between every  $n$  frames and tracing is done on this smaller set of motion vectors. This explains the use of the optional interpolation estimator at the end of the block diagram. This interpolation can improve temporal resolution that may be lost by skipping every  $n$ .

MATLAB feature a family of application specific solutions called toolboxes. Toolboxes are comprehensive collection of MATLAB functions (M-file) that extends the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, image processing, control system, neural networks, fuzzy logic and many others. This high performance numerical computation package with built in function for graphics and animation. It can perform symbolic algebra like mathematical, Maple and Matrix X.

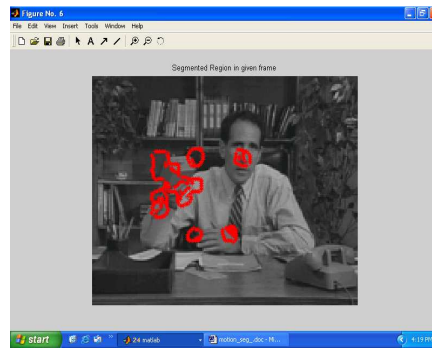
This allows solving many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non-interactive language such as C or FORTRAN. Environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

## EXPERIMENTAL RESULTS

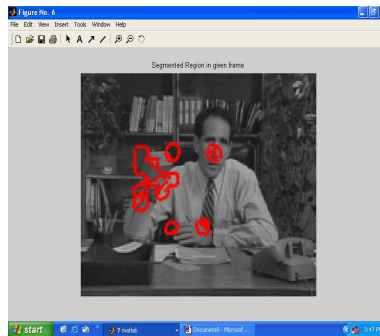
### INPUT CONSIDERATION

Test input image frame sequence (Salesman. qcif) Fig given below shows that, input image frame sequence from salesman. qcif file. File has been loaded into current directory work library for simulation. Various image sequences are considered for regress testing of the implemented design. The image sequences are classified depending up on the frame sequence the moving sequence of the image. Images are furthered chooses depending upon the level intensities. Design is been tested for both gray level images as well as color image sequence

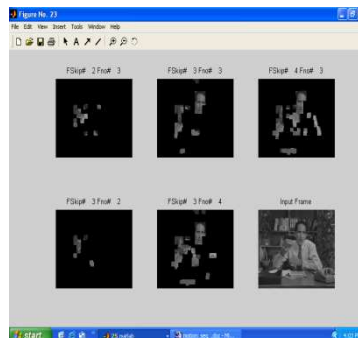
**PERCENTAGE OF SEGMENTATION AT SKIP 2 & FRAMES 3=9.13%**



**PERCENTAGE OF SEGM<sup>N</sup> AT SKIP 3 FRAMES 3=(12.27%)**



**FIVE OBSERVATION PARAMETERS**



A system has been proposed here which can efficiently segment for segmentation always remains a challenge as decrease in the frame skip value a result in high clarity of segmented image but increase the operation time, thus resulting in a slower system. On the other hand increase in frame skip and keeping constant frame size results in segmentation with less clarity. Though the speed of operation increases, because of higher value of frame skips, the two neighboring frame will be farther which when computed between the two consecutive frames gives very high difference value. Observing the other way where the frame skip is kept constant with the increase in frame size results in segmentation clarity.

**4 CONCLUSION**

The algorithm is decomposition in a way that will hopefully render future upgrades and modifications relatively simple. A particular weakness of the current approach is block artifacts near the foreground image edges. A different motion estimation algorithm such as optical flow may go a long way towards reducing these Undesirable effects. In addition, optical flow methods may show greater resistance to unwanted noisy motion vectors that debilitate the current approach. Noise-reducing filters may be an alternative method towards reducing noise-generated vectors, as opposed to the current threshold mean-squared error approach.

The current tracing algorithm, particularly the full four-block fill approximation, has shown good results towards the goal of segmentation. Again, with improved motion estimation techniques, the tracing algorithms may show improved results.

### REFERENCES

- [1] David B. Brown. "Motion-Based Foreground Segmentation." digital video processing, EE392J Stanford University March 13, 2000.
- [2] P. R. Giaccone and G.A. Jones. "Segmentation of Global Motion using Temporal Probabilistic Classification." Proceeding of British Machine Vision Conference, pages 619-628, University of Southampton, 1998.
- [3] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [4] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [5] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [6] Wang and Adelson. "Spatio- Temporal Segmentation of Video Data." Proceedings the SPIE: Image and Video .Processing II, vol. 2182, San Jose, CA, February 1994
- [7] Wang and Adelson. "Representing Moving Images with Layers." IEEE Transactionson images Processing, vol. 3, no. 5,
- [8] September 1994, revised May 1994
- [9] Getting started with MATLAB By – Rudra Pratap , Oxford University Press 2003 . 6. Digital Image Processing . Using MATLAB – R. C. Gonzalez, third edition.
- [10] MATLAB Programming for Engineers BY – Stephen J. chapman, Thomson learning Asia Pvt .Ltd, Singapore 2005, third edition.
- [11] Vengatesan K., and S. Selvarajan: Improved T-Cluster based scheme for combination gene scale expression data. International Conference on Radar, Communication and Computing (ICRCC), pp. 131-136. IEEE (2012).

## By Using SIFT Algorithm: Privacy Policy Inference of User-Uploaded Images on Content Sharing Sites

*Shraddha Babasaheb Kote<sup>1</sup>, M. Ganeshwade Mandakini<sup>2</sup>, and K. Vengatesan<sup>3</sup>*

<sup>1</sup>ME (CSE), MIT college, Aurangabad, India

<sup>2</sup>Assistant Professor, Department of Computer Science Engineering, Marathwada Institute of Technology, Aurangabad, India

<sup>3</sup>Assistant Professor, Department of Computer Science Engineering, Marathwada Institute of Technology, Aurangabad, India

---

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Social Network is an emerging E-service for content sharing sites (CSS). It is emerging service which provides a reliable communication, through this communication a new attack ground for data hackers; they can easily misuses the data through these media. Some users over CSS affects users privacy on their personal contents, where some users keep on sending unwanted comments and messages by taking advantage of the users' inherent trust in their relationship network. By this privacy of the user data may be loss for this issue this paper handles the most prevalent issues and threats targeting different CSS recently. This proposes a privacy policy prediction and access restrictions along with blocking scheme for social sites using data mining techniques. To perform this, the system utilizes APP (Access Policy Prediction) and Access control mechanism by applying BIC algorithm (Bayesian Information Criterion).

**KEYWORDS:** Adaptive Privacy Policy Prediction (A3P), A3P- Core, A3P- Social, Polar Fourier Transform (PFT).

### 1 INTRODUCTION

Social media is the two way communication in Web 2.0 and it means to communicate, share, and interact with an individual or with a large audience. Social networking websites are the most famous websites on the Internet and millions of people use them every day to engage and connect with other people. Twitter, Facebook, LinkedIn and Google Plus seems to be the most popular Social networking websites on the Internet. Today, for every single piece of content shared on sites like Facebook—every wall post, photo, status update, and video—the up loader must decide which of his friends, group members, and other Facebook users should be able to access the content. As a result, the issue of privacy on sites like Facebook has received significant attention in both the research community [1] and the mainstream media [2]. Our goal is to improve the set of privacy controls and defaults, but we are limited by the fact that there has been no in-depth study of users' privacy settings on sites like Facebook. While significant privacy violations and mismatched user expectations are likely to exist, the extent to which such privacy violations occur has yet to be quantified. Images are now one of the key enablers of users' connectivity. Sharing takes place both among previously established groups of known people or social circles (e.g. Google+, Flickr or Picasa), and also increasingly with people outside the users social circles, for purposes of social discovery to help them identify new peers and learn about peers interests and social surroundings. With the increasing volume of images users share through social sites, maintaining privacy has become a major problem, as demonstrated by a recent wave of publicized incidents where users inadvertently shared personal information. In light of these incidents, the need of tools to help users control access to their shared content is apparent. An image retrieval system is a computer system for browsing, searching and retrieving images from a large database of digital images. Most traditional and common methods of image retrieval utilize some method of adding metadata such as captioning, keywords or descriptions to the image retrieval can be performed over the annotation words. Manual image annotation is time consuming, laborious and expensive to address this, there has been a large amount of research done on automatic image annotation. Additionally, the increase social web

applications and the semantic web have inspired the development of several web-based image annotation tools. Automatic image annotation [6] is the process by which a computer system automatically assigns metadata in the form of captioning or keywords to a digital image. This application of computer vision techniques is used in image retrieval systems to organize and locate images of interest from a database. This method can be regarded as a type of multi-image classification with a very large number of classes large as the vocabulary size. Typically, image analysis in the form of extracted feature vectors and training annotation words are used by machine learning techniques to attempt to automatically apply annotations to new images

## **2 LITERATURE SURVEY**

Privacy Suites [1] is proposed by Jonathan Anderson which allows users to easily choose —suites" of privacy settings. Using privacy programming a privacy suite can be created by an expert. Privacy Suites could also be created directly through existing configuration UIs or exporting them to the abstract format. To the members of the social sites the privacy suite is distributed through existing distribution channels. Transparency is the main goal, which is essential for convincing influential users that it is safe to use. The disadvantage of a rich programming language is less understandability for end users. To verify a Privacy Suite sufficiently high-level language and good coding practice, motivated users are able. Privacy-Aware Image Classification and Search [2] is a technique to automatically detect private images, and to enable privacy-oriented image search introduced by Sergej Zerr. To provide security policies technique combines textual meta data images with variety of visual features. It uses various classification models trained on a large scale dataset with privacy assignments obtained through a social annotation game. In this the selected image features (edges, faces, color histograms) which can help discriminate between natural and man-made objects/scenes (the EDCV feature) that can indicate the presence or absence of particular objects (SIFT). A tag based access control of data [3] is developed by Peter F. Klemperer. It is a system that creates access-control policies from photo management tags. Every photo is incorporated with an access grid for mapping the photo with the participant's friends. A suitable preference can be selected by participants and access the information. Based on the user needs photo tags can be categorized as organizational or communicative. There are several important limitations .First, our results are limited by the participants recruited and the photos provided by them. Machine generated access-control rules are the second limitation. Algorithm used here has no access to the context and meaning of tags and no insight into the policy the participant intended when tagging for access control. Hence, some rules appeared strange to the participants who makes them to tag explicitly like private and —public

A decentralized authentication protocol [4], is a access control system proposed by Ching-man Au Yeung based on a descriptive tags and linked data of social networks in the Semantic websites. Here users can specify access control rules based on open linked data provided by other parties and it allows users to create expressive policies for their photos stored in one or more photo sharing. Adaptive Privacy Policy Prediction (A3P) [5] system is introduced by Anna Cinzia Squicciarini. Personalized policies can be automatically generated by this system. It makes use of the uploaded images by users and a hierarchical image classification is done. Images content and metadata is handled by the A3P system .It consists of two components: A3P Core and A3P Social. The image will be first sent to the A3P-core, when the user uploads the image. The A3P-core classifies the image and determines whether there is a need to invoke the A3P-social. When meta data information is unavailable it is difficult to generate accurate privacy policy. This is the disadvantage of this system. Privacy violation as well as inaccurate classification will be the after effect of manual creation of meta data log information.

## **3 PROBLEM STATEMENT**

Consider social context such as one's friend list. While interesting, they may not be sufficient to address challenges brought by image files for which privacy may vary substantially not just because of social context but also due to the actual image content .As far as images, authors in have presented an expressive language for images uploaded in social sites. This work is complementary to ours as we do not deal with policy expressiveness, but rely on common forms policy specification for our predictive algorithm. In addition, there is a large body of work on image content analysis, for classification and interpretation, retrieval, and photo ranking, also in the context of online photo sharing sites. Of these works, probably the closest to ours. explores privacy-aware image classification using a mixed set of features, both content and meta-data. This is however a binary classification (private versus public), so the classification task is very different than ours. Also, the authors do not deal with the issue of cold-start problem.

## 4 EXISTING SYSTEM

Most content sharing websites allow users to enter their privacy preferences. Unfortunately, recent studies have shown that users struggle to set up and maintain such privacy settings. One of the main reasons provided is that given the amount of shared information this process can be tedious and error-prone. Therefore, many have acknowledged the need of policy recommendation systems which can assist users to easily and properly configure privacy settings. However, existing proposals for automating privacy settings appear to be inadequate to address the unique privacy needs of images, due to the amount of information implicitly carried within images, and their relationship with the online environment wherein they are exposed.

## 5 PROPOSED SCHEME

In proposed System an Adaptive Privacy Policy Prediction (A3P) system that helps users automate the privacy policy settings for their uploaded images. The A3P system provides a comprehensive framework to infer privacy preferences based on the information available for a given user. We also effectively tackled the issue of cold-start, leveraging social context information. Our experimental study proves that our A3P is a practical tool that offers significant improvements over current approaches to privacy.

### ADVANTAGES

Maintain both efficiency and high prediction accuracy of a system.

## 6 SYSTEM MODEL A3P-CORE

There are two major components in A3P-core: (i) Image classification and (ii) Adaptive policy prediction. For each user, his/her images are first classified based on content and metadata. Then, privacy policies of each category of images are analyzed for the policy prediction. Adopting a two-stage approach is more suitable for policy recommendation than applying the common one-stage data mining approaches to mine both image features and policies together. Image classification: Groups of images that may be associated with similar privacy preferences; we propose a hierarchical image classification which classifies images first based on their contents and then refine each category into subcategories based on their metadata. Images that do not have metadata will be grouped only by content. Such a hierarchical classification gives a higher priority to image content and minimizes the influence of missing tags. Note that it is possible that some images are included in multiple categories as long as they contain the typical content features or metadata of those categories.

Adaptive policy prediction: The policy prediction algorithm provides a predicted policy of a newly uploaded image to the user for his/her reference. More importantly, the predicted policy will reflect the possible changes of a user's privacy concerns. The prediction process consists of three main phases: (i) policy normalization; (ii) policy mining; and (iii) policy prediction.

- 1) Policy normalization: The policy normalization is a simple decomposition process to convert a user policy into a set of atomic rules in which the data (D) component is a single-element set.
- 2) Policy mining: hierarchical mining first look for popular subjects defined by the user, then look for popular actions in the policies containing the popular subjects, and finally for popular conditions in the policies containing both popular subjects and conditions.
- 3) Policy prediction: The policy mining phase may generate several candidate policies while the goal of our system is to return the most promising one to the user. Thus, we present an approach to choose the best candidate policy that follows the user's privacy tendency. To model the user's privacy tendency, we define a notion of strictness level. The strictness level is a quantitative metric that describes how "strict" a policy is.

### A3P-SOCIAL:

The A3P-social employs a multi-criteria inference mechanism that generates representative policies by leveraging key information related to the user's social context and his general attitude toward privacy. As mentioned earlier, A3Psocial will invoked by the A3P-core in two scenarios. One is when the user is a newbie of a site, and does not have enough images stored for the A3P-core to infer meaningful and customized policies.

Social Context Modeling: The social context modeling algorithm consists of two major steps. The first step is to identify and formalize potentially important factors that may be informative of one's privacy settings. The second step is to group users based on the identified factors.

1) Screenshots :input

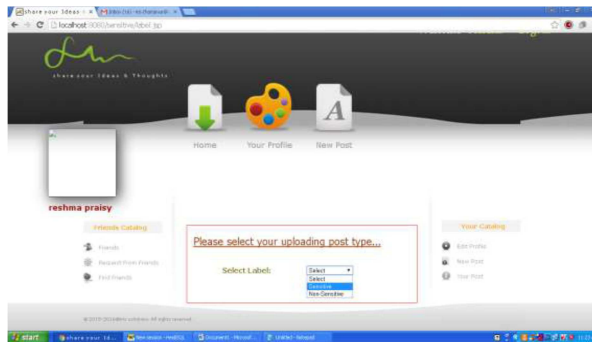


Fig. 1. system model

7 CONCLUSION AND FUTURE WORK

We have proposed an Adaptive Privacy Policy Prediction (A3P) system that helps users automate the privacy policy settings for their uploaded images. The A3P system provides a comprehensive framework to infer privacy preferences based on the information available for a given user. We also effectively tackled the issue of cold-start, leveraging social context information.

Our experimental study proves that our A3P is a practical tool that offers significant improvements over current approaches to privacy. Social network is an upgrading media for information sharing through internet. It provides a content sharing like text, image, audio, video, etc... With this emerging E-service for content sharing in social sites privacy is an important issue. It is an emerging service which provides a reliable communication, through this a new attack ground from an un-authored person can easily misuses the data through these media. For this issue our proposed systems use the BIC algorithm to classify the attackers and the users with the help of the Access Policy Prediction and Access control mechanism. These provide a privacy policy prediction and access restrictions along with blocking scheme for social sites and improve the privacy level for the user in social media.

REFERENCES

- [1] R. Datta, D. Joshi, J. Li, and J. Wang, "Image retrieval: Ideas, influences, and trends of the new age" IEEE Transaction on Cloud Computing, Vol. 2, NO. 4, OCTOBER-DECEMBER 2014.
- [2] P.R. Hill, C.N. Canagarajah and D.R. Bull, "Rotationally Invariant Texture Based Features" IEEE Computer Society 1089-7801/15/\$31.00 c 2015 IEEE.
- [3] Kaitai Liang, Joseph K. Liu, Rongxing Lu, Duncan S. Wong, "Privacy Concerns for Photo Sharing in Online Social Networks" IEEE Computer Society 1089- 7801/15/\$31.00 c 2015 IEEE.
- [4] P. Klemperer, Y. Liang, M. Mazurek, M. Sleeper, "Tag, you can see it!: Using tags for access control in photo sharing" IEEE Transaction on Engineering Management, Vol. 62, NO. 3, AUGUST 2015.
- [5] D. Liu, X.-S. Hua, M. Wang, and H.-J. Zhang, "Retagging social images based on visual and semantic consistency" IEEE Transaction on Image Processing, VOL. 24, NO. 11, NOVEMBER 2014.
- [6] G. Loy and A. Zelinsky, "Fast radial symmetry for detecting points of interest" IEEE Transaction on Pattern Analysis and Machine Intelligence, Vol. 25, NO.8, AUGUST 2014.
- [7] K.Vengatesan, S.Selvarajan,"The performance Analysis of Microarray Data using Occurrence Clustering" International Journal of Mathematical Science and Engineering, Issue-2, Volume-3, December 2014,pp 69-75.
- [8] Vengatesan K., and S. Selvarajan: Improved T-Cluster based scheme for combination gene scale expression data. International Conference on Radar, Communication and Computing (ICRCC), pp. 131-136. IEEE (2012).
- [9] Kalaivanan M., and K. Vengatesan.: Recommendation system based on statistical analysis of ranking from user. International Conference on Information Communication and Embedded Systems (ICICES), pp. 479-484, IEEE, (2013).

## Cipher Text Attribute Based Encrypted Data Sharing With Escrow in Cloud Computing

*N. Jayapriya, V. Maheswari, M. Moovarasi, and G. Shanthi*

Department of Computer science and engineering,  
SKP Engineering College, Thiruvannamalai, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Attribute-based encryption (ABE) is a very promising scheme suitable for access control in cloud storage system. It proposes a hierarchical attribute based access control scheme with constant size cipher text. This scheme is efficient because the length of cipher text and the number of bilinear pairing evaluations through a constant are fixed. By using this, prevent KA and CSP from knowing each other's master secret key so that none of them can create the whole secret keys of users individually thus, the fully trusted KA can be semi-trusted. This scheme is implement in cloud for ensuring privacy and uphold security through upload and download file.

**KEYWORDS:** KA – key authority, Attribute-based encryption, remove escrow, Weighted power.

### 1 INTRODUCTION

Confuse compute has become a study hot-spot due touts disguised long-list advantages (e.g. ease, high scalability). One of the most promising cloud computing applications is on-line data sharing, such as photo sharing in On-line Social Networks among more than one billion users and on-line health record system. A data owner (DO) is usually willing to store large amounts of data in cloud for saving the cost on local data management. Without any data security device, cloud service provider (CSP), but, can fully gain access to all data of the user. This brings a likely security danger to the user, since CSP may compromise the data for commercial benefits. Accordingly, how to securely and efficiently share user data is one of the toughest challenges in the picture of blur compute .Cipher text-policy attribute-based encryption (CP-ABE), has turned to be an important encryption technology to tackle the challenge of secure data sharing. In a CP-ABE, user's secret key is described by an attribute set, and cipher text is associated with an access structure. DO is allowed to define access structure over the universe of attributes. A user can decrypt a given cipher text only if his/her attribute set matches the access structure over the cipher text. Employing a CP-ABE system directly into a cloud application that may yield some release problems. Firstly, all users' secret keys need to be issued by a fully trust key power (KA). This bring a safety risk that is known as key escrow problem. By knowing the secret key of a system user, the KA can decrypt all the user's cipher texts, which stands in total against to the will of the user. Secondly, the clarity of attribute set is another concern Thus, the storage cost and encryption cost for a cipher text can be relieved. We use the following example to further illustrate our approach. Suppose there is a formal structure in university, in which teachers are classified into lessons helper, lecturer, associated university lecturer and full institution of higher education lecturer.

In this case, they can be denoted by one attribute which has just dissimilar weights. Therefore, the storage visual protuberance of the parallel cipher text and the computational cost used in encryption can be reduced In addition; our method can be used to express larger attribute breathing space than increasingly under the same number of attribute. pro case, if both the attribute space and one-sided set include  $n$  elements, the proposed scheme can describe  $n^2$  different possibilities. In contrast, the existing CPABE schemes only show  $2n$  possibilities. Employing a CP-ABE system directly into a cloud application that may yield some open problems. Firstly, all users' secret keys need to be issued by a fully trusted key authority (KA).

## 2 RELATED WORK

In 2005, Sinai and Waters introduced fuzzy identity based encryption (IBE), which is the seminal work of attribute based encryption (ABE). After that, two variants of ABE were proposed: key-policy ABE (KP-ABE) and CP-ABE depending on if a given policy is associated with either a cipher text and a key. Later, many CP-ABE schemes with specific features have been presented in the literature. For example, presented a novel access control scheme in cloud computing with efficient attribute and user revocation. The computational overhead is significantly eliminated from  $O(2N)$  to  $O(N)$  in user key generation by improving CPABE scheme, where  $N$  is the number of attributes. The size of cipher text is approximately reduced to half of original size. However, the security proof of the scheme is not fully given. Most of the existing CP-ABE schemes require a full trusted authority with its own master secret key as input to generate and issue the secret keys of users. Thus, the key escrow issue is inherent, such that the authority has the “power” to decrypt all the cipher texts of system users. Chase *et al.* presented a distributed KP-ABE scheme to solve the key escrow difficulty in a multi-authority scheme. In this approach, all authorities, which are not colluded with each other, are participating in the key generation protocol in a spread way, such that they cannot team their data and link multiple attribute sets belonging to the same user. Because there is no centralized authority with master secret in order, all element authorities should speak with others in the scheme to form a user’s secret key.

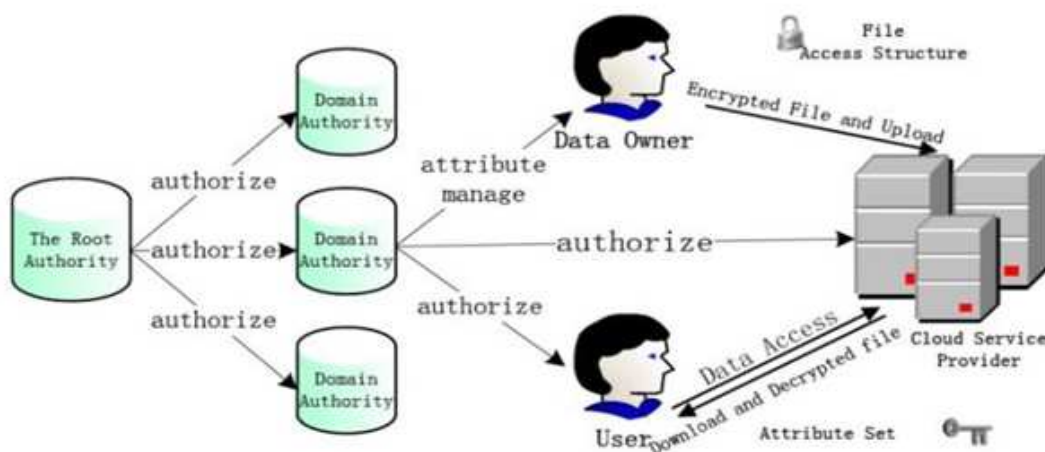
## 3 PROBLEM DEFINITION

A data owner (DO) is usually willing to store large amounts of data in cloud for saving the cost on local data management. Without any data safety machine, cloud service provider (CSP), however, can fully gain access to all data of the user. This brings a likely safety risk to the user, since CSP may compromise the data for commercial benefits. Firstly all users’ secret keys need to be issued by a fully trusted key authority (KA). This bring a security danger that is known as key escrow problem. By knowing the secret key of a system user, the KA can decrypt all the user’s cipher texts, which stands in total against to the will of the user.

## 4 PROPOSED SYSTEM

We propose an attribute-based data sharing scheme for cloud computing applications, which is denoted as cipher text-policy weighted ABE scheme with removing escrow (CP-WABE-RE). We propose an improved key issuing protocol to resolve the key escrow problem of ABE in cloud computing. The protocol can prevent KA and CSP from knowing each other’s master secret key so that none of them can create the whole secret keys of users individually thus, the fully trusted KA can be semi-trusted. Data confidentiality and privacy can be ensured.

## 5 SYSTEM DESIGN



## 6 PERFORMANCE ANALYSIS

We investigate and evaluate the fine organization of the proposed scheme with the schemes in Theoretical and experimental aspects.

A. Theoretical Analysis

- 1) *Key Escrow and Weighted Attribute*: Table I shows the problem of key escrow, feature of weighted attribute and application in cloud computing for each scheme. The key escrow in CP-WABE-RE scheme can be removed by using an improved key issuing protocol for cloud computing. uses escrow-free key issuing protocol to solve the issue. On the contrary, both don't solve the problem of key escrow. In addition, the weighted attribute in CP-WABERE scheme can not only support arbitrary-state attribute instead of the traditional binary state In Table I, we can find that only CP-WABE-RE scheme can simultaneously support all the three functions. solves the problem of key escrow so it can satisfy environment of cloud system as ours. cannot remove key escrow. Thus the both schemes cannot be directly applied in cloud computing.
- 2) *Efficiency*: In Table II and Table III, we compare efficiency of the above four schemes on storage overhead and computation cost in theory, where the used symbols are defined in Table IV. To simplify the comparisons, access structure, data reencryption dynamic membership management that is, user joining, leaving, and attribute updating) of are not included in the following analysis. In addition, the cost of transmission isn't involved when implementing the interactive protocols in both [15] and our proposed scheme.

B. Experimental Analysis

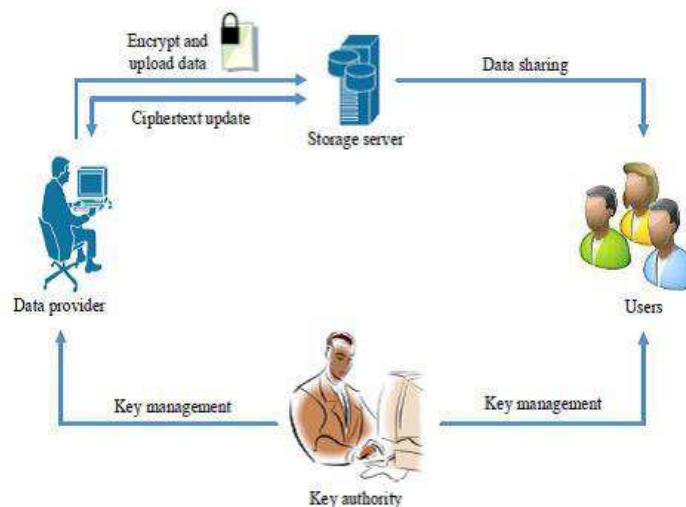
Now, to validate theoretical analysis proposed in previous subsection, we execute CP-WABE-RE scheme by using the cape toolkit and the Java Pairing-Based Cryptography library (JPBC). *Simulation Analysis of Weighted Attribute*: Next, we measure and analyze the storage overhead and computation cost for encrypting (by a DO) data, where the number of attributes in access policy is  $N = \{10, 20, 30, 40, 50\}$ .

- Key Generation: Private key =  $x \cdot 2R \cdot G$ ;
- Public key is  $y=g$  power of  $x$ .
- Signature :  $0 < k < p - 1$  and  $\gcd(k; p - 1) = 1$ .
- Compute  $r = g^k \pmod p$ .
- Compute  $s = (H(m) - xr)k^{-1} \pmod{p - 1}$ .
- Signature =  $(r; s)$
- Veri\_cation :  $gH(m) = yrrs \pmod p$ .

7 MODULE DESCRIPTION

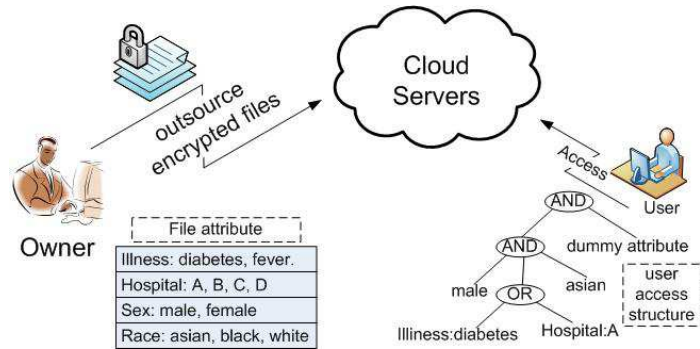
A. Key Authority (KA):

It is a semi-trusted entity in confuse system. i.e., KA is honest-but-curious, which can honestly perform the assigned tasks and return correct results. However, it will collect as many sensitive contents as possible. In confuse system, the unit is responsible for the users' employment. Meanwhile, it not only generates most part of system parameter, but also creates most part of secret key for each user.



B. Cloud Service Provider (CSP):

It is the manager of cloud servers and also a semi-trusted entity which provides many services such as data storage, computation and transmission. To solve the key escrow problem it generates both parts of system parameter and secret key for each user.



C. Data Owners (DO):

They are owners of files to be store in cloud method. They are in blame of defining contact structure and execute data encryption operation. They also upload the cipher text to CSP.

F

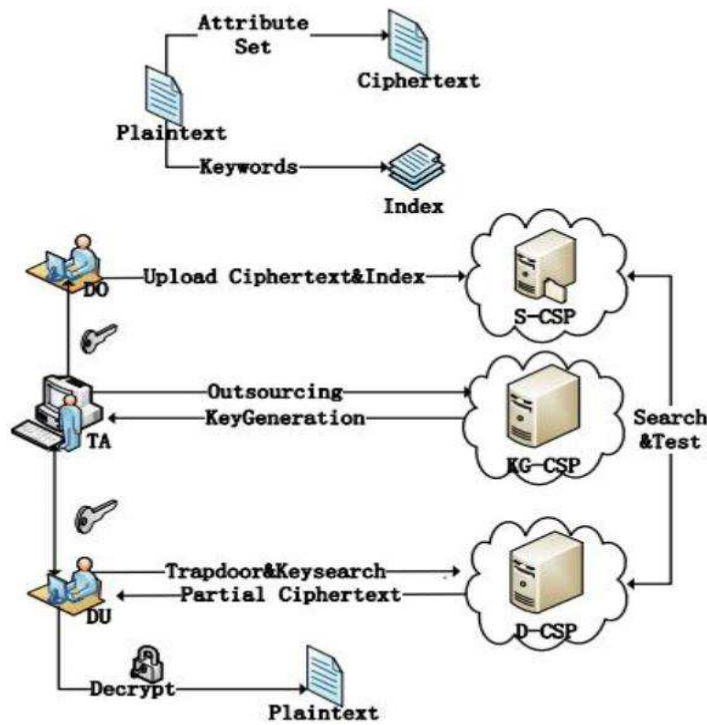
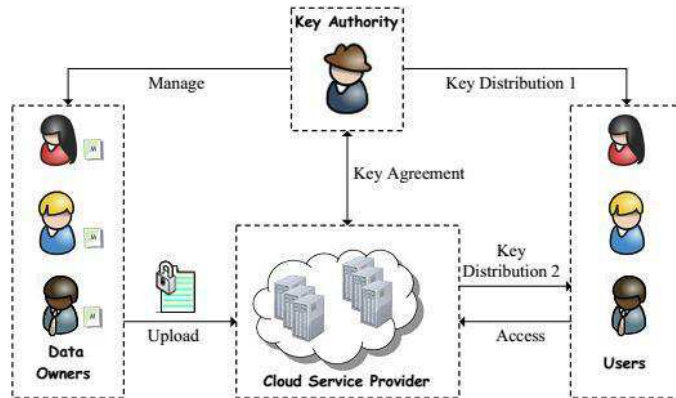


Fig. 1. System architecture

D. Users:

They want to access cipher text stored in cloud system. They download the cipher text and execute the corresponding decryption operation.



### 8 ALGORITHMS/TECHNIQUES USED

Setup ( $\lambda$ )  $\rightarrow$  PP

1. Randomly choose  $y \in Z_p$  to be the master secret key, MSK.
2. Output PP = (G, GT, g,  $g^y$ , H) where G and GT are main p-ordered group, g is a generator for G, and  $H : ID_{space} \rightarrow G$  is some hash function.

Encrypt(M, ID)  $\rightarrow$  CT

(Note that  $M, CT \in Z_p$ .)

1. Randomly choose  $s \in Z_p$ .
2. Compute  $e(H(ID), g^y)^s = e(H(ID), g)^{ys}$ .
3. Output  $CT = (g^s, M \cdot e(H(ID), g)^{ys})$ .

KeyGen(ID, MSK)  $\rightarrow$  SK

1. Output  $SK_{ID} = H(ID)^y$ , noting that y is the MSK.

Decrypt (CT,  $SK_{ID}$ )  $\rightarrow$  M

1. Compute  $e(SK_{ID}, C_1) = e(H(ID)^y, g^s)$

Which is the blind thing for the meaning  $M$  in  $C_2$ .

2. Output  $M = C_2 / e(SK_{ID}, C_1)$ .

Note the relative among D-H three-party key agreement and B-F:

Party X  $\sim$  Hash function  $g^x \sim H(ID)$

Party Y  $\sim$  MSK authority  $g^y \sim g^y$

Party Z  $\sim$  Encrypter  $g^z \sim g^s$ .

### 9 CONCLUSION AND FUTURE WORK

In this paper, we redesigned an attribute-based data allocation plan in cloud compute. The improved key issue protocol was open to resolve the key escrow problem. It enhances data confidentiality and privacy in cloud system against the managers of KA and CSP as well as malicious system outsider, where KA with CSP are semi-trusted. In adding, the one-sided attribute was proposed to improve the expression of attribute, which can not only describe arbitrare state attributes, but also reduce the complexity of access policy, so that the storage space rate of cipher text and time cost in encryption can be saved. Finally, we vacant the act and security analysis for the proposed scheme, in which the results show high effectiveness and security of our plan.

## REFERENCES

- [1] J. Baek, Q. H. Vu, J. K. Liu, X. Huang, and Y. Xiang. A secure cloud computing based framework for big data information management of IEEE Transactions on Cloud Smart grid. IEEE Transaction on cloud computing 2015.
- [2] H.Deng,Q. Wu,B.Qin,J.Han,J.K.LIU,j.Xu,andJ.Zhou.Security concerns in popular cloud storage services.IEEE Pervasive Computing,12(4):50-57,2013
- [3] A. Balu and K. Kuppusamy. An expressive and provably secure Cipher text-policy attribute-based encryption Information Science2014.
- [4] J. Bethencourt, A. Sahai, and B. Waters. Cipher text-policy attribute-based encryption.IEEE Symposium on Security and Privacy,pages 321-334,2007.
- [5] D. Boneh, B. Lynn, and H. Shacham. Short signatures from the weil *the 4th Conference on Theory of Cryptography* , 17(4):297–319, 2007.
- [6] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [7] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [8] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [9] M.Chese.Multi-authority attribute based encryption the 4<sup>th</sup> Conference on Theory of Cryptography, pages 515-514,2007.
- [10] L.Cheung and C.Newport.Provably secure cipher text policy ABE.Proceeding of the 14thACM conference on computer and communications security ,pages 456-465,2007.
- [11] S.SCHOW.Removing escrow from identity-based encryption,proceedingof the 12<sup>th</sup> International Conference on Practice and Theory in Public Key Crptography,pages 256,276,2009.
- [12] V. Goyal, O. Pandey, A. Sahai, and B. Waters. Attribute-based encryption for Fine-grained access control of encrypted data proceeding od the 13<sup>th</sup> ACM conference on computer communication pages 89\_98,2006.

## POETRY VISUALIZATION

*P. Renuka Devi, T.M. Thaarane, R. Ramya, and S. Shruthi*

Paavai Engineering College, Namakkal, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Poetry is a form of literature that uses artistic and rhythmic qualities of language to evoke meanings in addition to, or in place of, the simple apparent meaning. Poetry uses forms and conventions to suggest differential interpretation to words, or to suggest emotive responses. In this paper, we propose a method to extract features like nature, theme and visualize a poem as a flower. The extracted features from a poem are used to generate a flower for visual representation. We propose a mapping between the features of a poem to the type and color of a flower. We have tested the proposed method over four hundred poems from Purananuru. Also we are visualizing those poems using Word Cloud Visualization to show weighted words in the poems visually.

**KEYWORDS:** Poetry, language, poem, visualization.

### INTRODUCTION

Tamil is one of the longest-surviving classical languages in the world. <sup>[1]</sup> Tamil language having rich and large number of literary works. These include a corpus of 2,381 poems collectively known as Sangam literature. The Purananuru is one of the eight books in the secular anthology of Sangam literature. The secular anthology is entirely unique in Indian literature, which nearly all religious texts during this era. The Purananuru contains 400 poems of varying lengths and more than 150 poets wrote the poems. <sup>[2]</sup>

Visualization is a popular technique used to represent complex data as simple readable visual representations. Starting from visualizing simple 2 dimensional data into line graphs, we have complex multi-dimensional data visualization techniques in data warehousing applications. <sup>[3]</sup>

In this paper, we propose visualization of Purananuru poems by mapping the statistical features of poem to type and color of a flower. Primary objective of this paper is to illustrate the poem and its relation to other poem by showing flower.

Natural language processing is a field of computer science, artificial intelligence, and computational linguistics concerned with the interactions between computers and human languages and, in particular, concerned with programming computers to fruitfully process large natural language corpora.

### BACKGROUND

To visualize text readability using a few readability metrics<sup>[4]</sup>. The technique provides means for readers to see which sections of text are hard to read with complicated words. Investigating various data visualization techniques such as Tag cloud, musical Sparkline's, Wattenberg's Shape of Song for visualizing song lyric<sup>[5]</sup>. To extract Tamil song lyric features such as rhymes, similes, metaphors, pleasantness, freshness, genre, mood etc. and visualize a lyric as a flower by mapping the statistical features of the lyric to the features of the parts of a flower<sup>[6]</sup>.

In this paper, we propose visualization of poem using twelve types of theme and seven types of nature. Both nature and theme used to find the related poems and its unique flower representation.

**THEME OF THE PURANANURU POEM**

A poem is usually a small piece of a work compared to new articles. The following are the twelve features that are used to identify songs and introduce to use for the visualization in the next section. From the subject matter of the poems they accompany each can be said to represent the following themes:

1. *vetchi* - the provocation of war through attack and cattle raids
2. *karanthai* - defending against cattle raids
3. *vanchi* - invasion of the enemy's territory
4. *kanchi* - transience and change, the fragility of human life, against the backdrop of war
5. *uzhingi*- attacking the fort
6. *nochchi* - defence of the fort or territory
7. *thumpai* - the frenzy of battle
8. *vaakai* - victory
9. *paadaan* - praise of a king's heroism or generosity, asking for gifts
10. *pothuviyal* - general heroism (mostly philosophical musings and elegies for heroes).
11. *kaikkilai* - unrequited love
12. *perunthinai* - unsuitable love

**NATURE OF THE PURANANURU POEM**

It is not known exactly how many authors wrote the poems in Purananuru. There are 147 different names found from the colophons. However, some of these could denote the same author. For example, Mangudi Kizhaar and Mangudi Maruthanaar could denote the same person. Some of the authors of the poems, such as Kapilar and Nakkirar, have also written poems that are part of other anthologies.

As its name suggests, Purananuru poems deal with the puram (external or objective) concepts of life such as war, politics, wealth, as well as aspects of every-day living. Some of the poems are in the form of elegies in tribute to a fallen hero. These poems exhibit outpourings of affection and emotions. Purananuru principally revolves around three themes - the king and his powers over the environment, power of women's purity, namely karpu (chastity), and the system of caste, which is not too different from the current system prevalent among Tamil society.

There are also a few poems in Purananuru, which are classified as attruppatais. Attruppatai poems read like travelogues in which poets who were returning with gifts, received from a king, encourage other poets to do the same by describing the glory of the king and his country. This gives an opportunity to the poet, among other topics, to describe in great detail the natural beauty, fertility, and resources of the territory that has to be traversed to reach the palace of the patron.

There are 400 poems in Purananuru including the prayer poem. Poems 267 and 268 are lost and some of the poems exist only in fragment. Of the poets who wrote these poems, there are men and women, kings and paupers. The oldest book of annotations found so far has annotations and commentary on the first 266 poems. The commentator Nachinarkiniyaar, of the eleventh – twelfth century Tamil Nadu, has written a complete commentary on all the poems<sup>[10]</sup>.

Nature of poems are classified as below,

- Praise of the God
- Praise of the king
- By poets for their patrons
- Ethical and moral poems
- The death of the kings
- The ephemeral nature of life
- War poems
- Their generosity
- Drummer poems

**TAG CLOUDS**

A tag cloud (word cloud, or weighted list in visual design) is a visual representation of text data, typically used to depict keyword metadata (tags) on websites, or to visualize free form text. Tags are usually single words, and the importance of

each tag is shown with font size or color [7]. This format is useful for quickly perceiving the most prominent terms and for locating a term alphabetically to determine its relative prominence.

**PERCEPTION OF TAG CLOUDS:**

The following summary is based on an overview of research results given by Lohmann et al.: [8]

- Tag size:** Large tags attract more user attention than small tags (effect influenced by further properties, e.g., number of characters, position, neighboring tags).
- Scanning:** Users scan rather than read tag clouds.
- Centering:** Tags in the middle of the cloud attract more user attention than tags near the borders (effect influenced by layout).
- Position:** The upper left quadrant receives more user attention than the others (Western reading habits).
- Exploration:** Tag clouds provide suboptimal support when searching for specific tags (if these do not have a very large font size).



Figure: Typical Tag cloud diagram

In principle, the font size of a tag in a tag cloud is determined by its frequency. For smaller frequencies one can specify font sizes directly, from one to whatever the maximum font size. For larger values, a scaling should be made. In a linear normalization, the weight  $t_i$  of a descriptor is mapped to a size scale of 1 through  $f$ , where  $t_{min}$  and  $t_{max}$  are specifying the range of available weights.

$$s_i = \left\lceil \frac{f_{max} \cdot (t_i - t_{min})}{t_{max} - t_{min}} \right\rceil \text{ for } t_i > t_{min}; \text{ else } s_i = 1$$

- $s_i$ : display fontsize
- $f_{max}$ : max. fontsize
- $t_i$ : count
- $t_{min}$ : min. count
- $t_{max}$ : max. count

We are using synonym words computed from each poem to determine tag cloud to show poem visually.

IMPLEMENTATION OF VISUALIZATION AND MAPPING

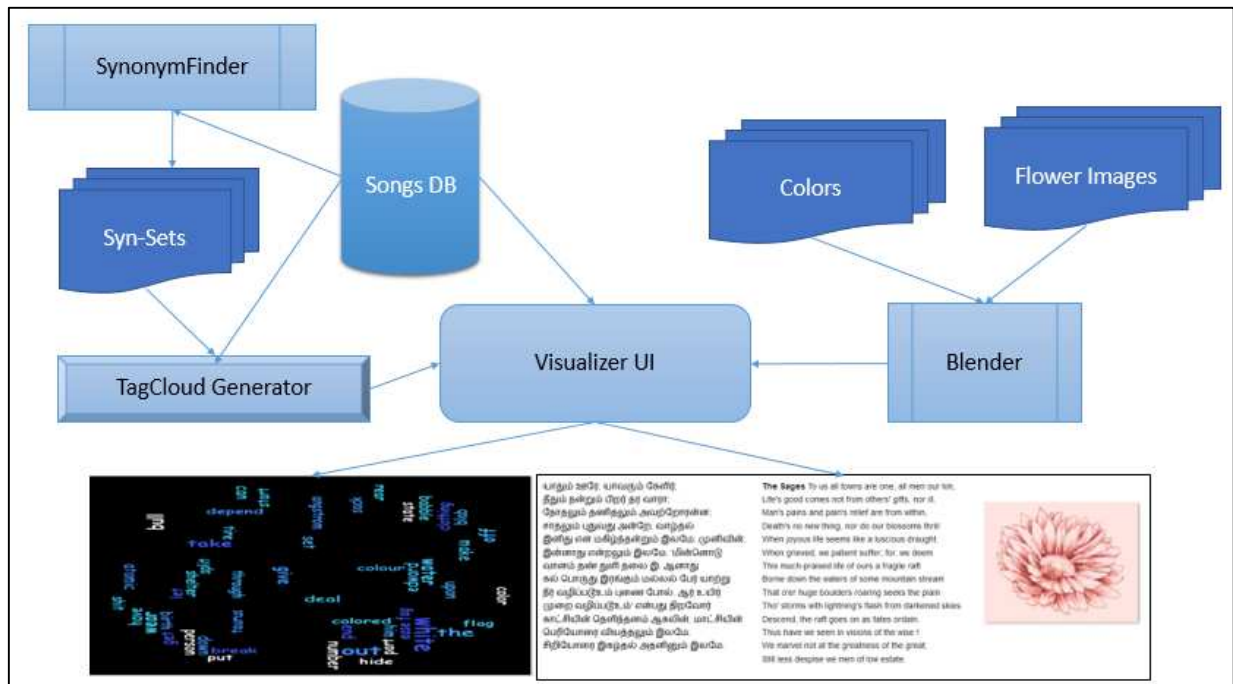


Figure 1: Flow Diagram

The Synonym sets for each poem will be used to map the Nature and Theme of a poem using its words frequency. We are using WordNet to find synonym sets.

We have different types of flower images to represent different types of Theme. This is illustrated in Figure 1.

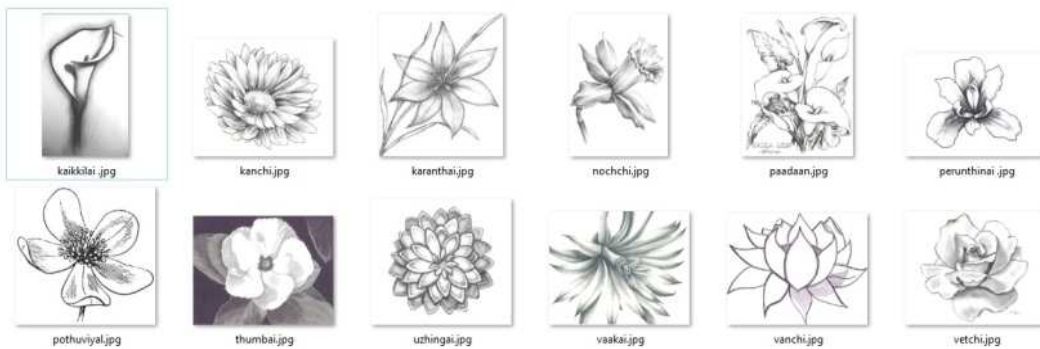


Figure 2: Types of Flower based on Theme

There are nine different natures in Purananuru songs. The nature is visualized using nine different colors as below,

ID	Nature	Color
1	Praise Of The God	GRAY
2	Praise Of The King	GREEN
3	By Poets For Their Patrons	ORANGE
4	Ethical And Moral Poems	PINK
5	Their Generosity	YELLOW
6	Death Of The Kings	RED
7	War Poems	MEGENTA
8	The Ephemeral Nature Of Life	CYAN
9	Drummer Poems	BLUE

The illustration of Colors depicted in Figure 3.



Figure 3: Colors of Flower based on Nature

### BLENDING ALGORITHM

“Colour blending mixes two colours together to produce a third colour.the first color is called source color.which is new color being added. Second color is called the destination color which the color that already exists”.

We are blending the Color with Flower image using below method,

$$\text{blend}(P_{xy}, \text{Color}, r, ir) = [[P_{xy} * ir] + [\text{Color} * r]] \text{ for } \begin{cases} x \geq 1, x \leq n \\ y \geq 1, y \leq m \end{cases}$$

- “n” = Width of Flower Image which is determined using Theme of the Poem
- “m” = Height of Flower Image which is determined using Theme of the Poem
- “Pxy” = ARGB components of Pixel(x,y) of Flower Image which is determined using Theme of the Poem
- “Color” = ARGB components of Color which is determined using Nature of the Poem
- “r” = blending ratio %
- “ir” = value of (1-r) ie inverse of ratio %

We have used kumo Package<sup>[9]</sup> to determine tag cloud for each poem. Implementation of tag cloud also include text parsing and filtering out unhelpful tags such as common words, numbers, and punctuation.

The entire flow of implementation is depicted in Figure 1. The Synonym Finder will fetch the poem from database and for every word in the poem it will find synonym set and consolidate without duplicates. The Tag cloud generator will use the generated synonym sets to generate Tag Cloud for each Poem. The Blender will blend the Flower Image which corresponds to Theme Type and Color which corresponds to Nature Type. The Visualizer will show each Poem with following details,

- Tamil version of the Poem
- English version of the Poem
- Nature and Theme
- Blended Flower Image
- Tag Cloud

### RESULTS

The visualization presented in this paper was implemented for all 400 Purananuru poems. They were analyzed and visualized using Poem theme and Nature.

யாதும் ஊரே, யாவரும் கேளிர்;  
 தீதும் நன்றும் பிறர் தர வாரா;  
 நோதலும் தணிதலும் அவற்றோரன்ன;  
 சாதலும் புதுவது அன்றே; வாழ்தல்  
 இனிது என மகிழ்ந்தன்றும் இலமே; முனிவின்,  
 இன்னாது என்றலும் இலமே; 'மின்னொடு  
 வானம் தண் துளி தலை இ. ஆனாது  
 கல் பொருது இரங்கும் மல்லல் பேர் யாற்று  
 நீர் வழிப்படுஉம் புணை போல், ஆர் உயிர்  
 முறை வழிப்படுஉம்' என்பது திறவோர்  
 காட்சியின் தெளிந்தனம் ஆகலின், மாட்சியின்  
 பெரியோரை வியத்தலும் இலமே;  
 சிறியோரை இகழ்தல் அதனினும் இலமே.

**The Sages** To us all towns are one, all men our kin,  
 Life's good comes not from others' gifts, nor ill,  
 Man's pains and pain's relief are from within,  
 Death's no new thing, nor do our blossoms thrill  
 When joyous life seems like a luscious draught.  
 When grieved, we patient suffer; for, we deem  
 This much-praised life of ours a fragile raft  
 Borne down the waters of some mountain stream  
 That o'er huge boulders roaring seeks the plain  
 Tho' storms with lightning's flash from darkened skies.  
 Descend, the raft goes on as fates ordain.  
 Thus have we seen in visions of the wise !  
 We marvel not at the greatness of the great;  
 Still less despise we men of low estate.



Figure 4: Sample Result, Poem# 196

வால் வலந்தர மறுப்பட்டன செவ்வானத்து வணப்புப்  
 போன்றன தாள் களங்கொளக் கழல் பறைந்தன கொல்  
 ஏற்றின் மருப்புப் போன்றன தோல் தலைத்து அம்பின் துளை  
 தோன்றுவ நிலைக்கு ஓராஅ இலக்கம் போன்றன மாவே எறி  
 பத்தான் இடங் காட்டக் கழல் பொருத செவ்வாயன் எடுத்து  
 வல்லிய புலி போன்றன களிதே கதவ எறியாச் சிவந்து  
 உராஅய் நுதி மழுங்கிய வெண் கோட்டான் உயிர் உண்ணும்  
 கூற்றுப் போன்றன நீயே அவங்கு உளைப் பரீஇ இவளிப்  
 பொலந்தேர் மிசைப் பொலிவு தோன்றி மாக்கடல் நிவந்து  
 எழுதரும் செஞ்சாயிற்றுக் கவினை மாதோ அணையை  
 ஆகன் மாநே தாயில் துவாக் குழவி போல ஓவாது கூஉம் நின்  
 உடற்றியோர் நாடே.

The swords that have brought victory are  
 stained like the beautiful red sky, war  
 anklets on feet are worn down in the  
 battlefield looking like horns of killer  
 bulls, shields are riddled with bullet  
 holes as though they are mobile training  
 targets, mouths of horses are red with  
 blood, chafed by the bridles that direct  
 them, and looking like the necks of prey  
 gripped by tigers, and elephants assaulting  
 gates in rage have blunted the tips of  
 their white tusks and appear like Death  
 that eats lives. You in your golden chariot  
 drawn by fast horses with waving plumes are  
 splendid like the red sun that rises up  
 high into the sky from the huge ocean.  
 Because of you being who you are, the  
 countries of your enemies wail without end,  
 like hungry, motherless infants!

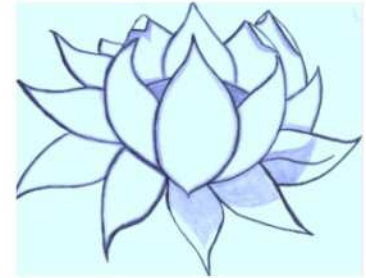


Figure 5: Sample Result, Poem# 4

## CONCLUSION

In this paper, we proposed a visualization technique that extracts twelve features from a songs and map it to the visual features of a flower. We implemented the visualization in a lyric portal, paadal. With this technique, users will be able to find their favourite type of poem just by seeing at the flower in the search results, rather than reading textual descriptions.

## REFERENCES

- [1] Stein, B. (1977). "Circulation and the Historical Geography of Tamil Country". The Journal of Asian Studies. 37: 7. doi:10.2307/2053325. JSTOR 2053325.
- [2] Swami Parmeshwaranand (2001). *Encyclopaedic Dictionary of Purāṇas*. Sarup & Sons. p. 1151. ISBN 81-7625-226-3, ISBN 978-81-7625-226-3.
- [3] Jock D. Mackinlay (1999). *Readings in information visualization: using vision to think*. With Stuart K. Card and Ben Shneiderman (eds.), Morgan Kaufmann Publishers Inc, p686.
- [4] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [5] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [6] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [7] Karmakar.S. *Visualizing text readability*. Advanced Information Management and Service (IMS) 6th International Conference, 2010.

- [8] Jieun Oh. *Text Visualization of Song Lyrics*. cs448b, Center for Computer Research in Music and Acoustics, Stanford, 2009.
- [9] Madhan Karky. *Lyric Visualization*. INFIT 2013 V7-16, 2013.
- [10] Martin Halvey and Mark T. Keane, *An Assessment of Tag Presentation Techniques*, poster presentation at WWW 2007, 2007
- [11] Lohmann, S., Ziegler, J., Tetzlaff, L. *Comparison of Tag Cloud Layouts: Task-Related Performance and Visual Exploration*, T. Gross et al. (Eds.): INTERACT 2009, Part I, LNCS 5726, pp. 392–404, 2009.
- [12] Kumo - Java Word Cloud, <https://github.com/kennycason/kumo>
- [13] Purananuru, <https://en.wikipedia.org/wiki/Purananuru>

## Data Optimization and Secure Data Transfer by Dynamic Sensing and Routing in Rechargeable Sensor Networks

G. RAJALAKSHMI, A.P. SHOPE CHIDIYA, A. VINITHA, S. ARCHANA, and S. PARVATHI

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING,  
SKP ENGINEERING COLLEGE, THIRUVANNAMALAI-606611, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The project is to carefully allocate the timely harvested renewable energy of the sensor for Data Sensing and Data Transmission so that the sensors remains active during the whole process by dynamically adjusting its sensing rate and transmission based on the available energy. Rechargeable sensor network offers a wide range of applications in areas such as traffic monitoring, medical care, inhospitable terrain, robotic exploration, and agriculture surveillance. In RSN, thousands of physically embedded sensor sensors are distributed in possibly harsh terrain and in most applications, it is impossible to replenish energy via replacing batteries. So automatically recharge the batteries from solar devices. In order to cooperatively monitor physical or environmental conditions, the main task of sensor sensors is to collect and transmit data. It is well known that transmitting data consumes much more energy than collecting data. The advent of efficient recharge communications and advancement in electronics has enabled the development of low-power, low-cost, and multi functionality sensor sensors that are characterized by miniaturization and integration

**KEYWORDS:** Data sensing, dynamic topology, energy allocation, energy harvesting, rechargeable sensor networks, routing.

### 1 INTRODUCTION

Data gathering optimization was previously addressed in battery-powered WSNs .A popular approach is to jointly optimize data sensing and data transmission globally by using cross-layer optimization. As the energy budget of each sensor is given initially, the problem can be formulated as a deterministic optimization problem. However, energy arrival at each sensor is intrinsically stochastic in RSNs. To optimize data gathering, sensors have to dynamically determine their sensing and transmission strategies in order to fully utilize the harvested energy according to the instant profile of energy arrival. These unique features make data gathering in RSNs a radically new and challenging problem, which is far from data gathering in battery-powered WSNs. In this paper, we seek to optimize data gathering in RSNs by jointly considering data sensing and data transmission. Existing works either assumed a static network topology or considered data sensing and data transmission independently. For example, Liu *et al.* proposed a distributed algorithm to jointly compute a routing structure and a high lexicographic rate as assignment, provided that the available logical links are predetermined . In practice, according to the amount of available energy, each sensor can adaptively adjust its transmit energy consumption within a certain range during network operation to improve the efficiency of data gathering by selecting optimal sensing rate and routing. Therefore, the dynamic feature of network topology should be taken into account to improve the efficiency of data gathering. In addition, since sensors should communicate with each other to compute the optimal data sensing and data transmission upon different energy allocation, 1 changing the energy allocation frequently may bring extra energy cost for communication and computation. Thus, the extra energy cost, as well as the computational complexity, should be taken into consideration. We introduce the related work in Section II and describe the network model and problem formulation in Section III. Then, a balanced energy allocation scheme (BEAS) for each sensor to manage its energy use efficiently is proposed and a distributed sensing rate and routing control (DSR2C) algorithm to find the optimal sensing rate and routing is designed. By taking into account time-varying characteristic of network topology, our goal is to maximize the data gathering by jointly optimizing the optimal energy allocation, data sensing and data transmission. Thus our work is different from existing works

and has the potential to significantly improve the network performance. In addition, we proposed an improved energy allocation scheme to reduce the extra energy cost and a topology control scheme to reduce computational complexity for the sensors to obtain the optimal data sensing and data transmission.

## 2 EXISTING SYSTEM

In existing system to improve the energy efficiency for transmitting data, most of the existing optimal data sensing and routing strategies attempt to find the minimum energy path between a source and a sink to achieve optimal energy consumption. To designing an to compute the optimal data sensing and routing policy change the energy allocation will bring huge communication for information exchange there is main issues, in case of sensor networks, is Stairwell, since it involves not only finding the minimum energy path from a single sensor to destination, but also balancing the distribution of Expected energy of the whole network. Furthermore, the unreliable wireless links and network partition may cause packet loss and multiple retransmissions in a preselected good path. Retransmitting packet over the preselected good path inevitably induces significant energy cost.

## 3 PROPOSED SYSTEM

In this paper, we propose a Balanced Energy Allocation Scheme (BEAS) for managing the energy use so that all sensors can effectively utilize the harvested energy and Distributed Sensing Rate and Routing Control (DSR2C) algorithm for choosing the best energy path to transmit the data without much energy loss. In these algorithms we introduce that the sensor dynamically adjust its sensing rate depending upon the energy. Each sensor consists of a solar cell or device, a rechargeable battery and a wireless module. We introduce the forwarder list based on the distance to energy efficient sensor (EEN) and residual energy of each sensor. Here we sends the data to sink using one dimensional network, so it cannot divert to other sensors, it will go straightly to sink. Another process of rout finding is depends on its coverage. In this process effectively transfer the value data to the sink. Data transmit first data sensing level based depends upon energy level will low and it depends the works coverage will be reconstruct then will be transmit data. One method will be send the data based on neighbor communications and another method to transmit the data depends on the convergence rate in a large scale sensor network it mean large distance to send the message.

## 4 MODULES

As discussed earlier, there are four methods to implement the data gathering optimaization. The modules are as follows:

1. Network Formation,
2. Distance based Route Finding,
3. Energy based Route Finding,
4. Data Transfer.

Each sensor will be sensing the temperature and humidity and consumes energy continuously for every 10 seconds. Each sensor's energy will be distributed between Sensing Rate and Transmission based on the algorithm. Using multicast socket, all sensors are used to detect the neighbor sensors. Once after finding neighbor sensors a queue is maintained for each neighboring sensor called as real queue. Once the sensor sends the data to the sink, energy will be reduced and it dynamically adjusts its sensing rate.

In this distance based route finding process, every sensor has a distance and a coverage area. Using multicast socket, all sensors are used to detect the neighbor sensors. Once after finding neighbor sensors a queue is maintained for each neighboring sensor to the Sink called as available path. A sensor can have any number of available paths. That can be used to make a route.

In this energy based route finding process, every sensor has an individual energy level. The energy level will differ from one sensor to another sensor. The highest energy level sensor is chosen as data forwarder. The higher energy sensors are forming the route for source to sink. In the data transmission process sensors energy can be reduced depends upon the data length. Energy level will be reduced automatically recharge from solar cell for each sensor.

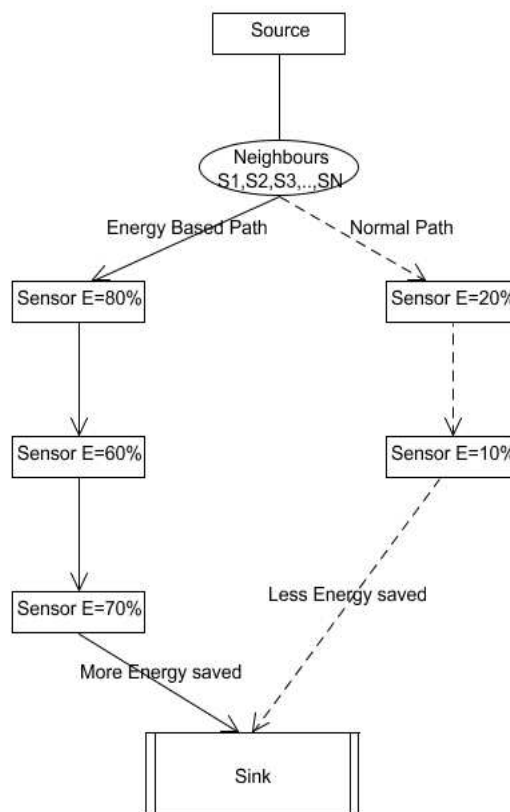
The transmission route depends on energy of each node. All the sensors are dedicated to send the sensed information to the Sink continuously. The sensor which sensed the data chooses one of the neighbors in the range which has maximum

energy and sends the information to that node. That sensor which got the information follows the same procedure to send to the next node in the neighbors. This way the information from each sensor reaches the sink. This method will save the energy of each sensor by dynamically choosing the path based on the energy.

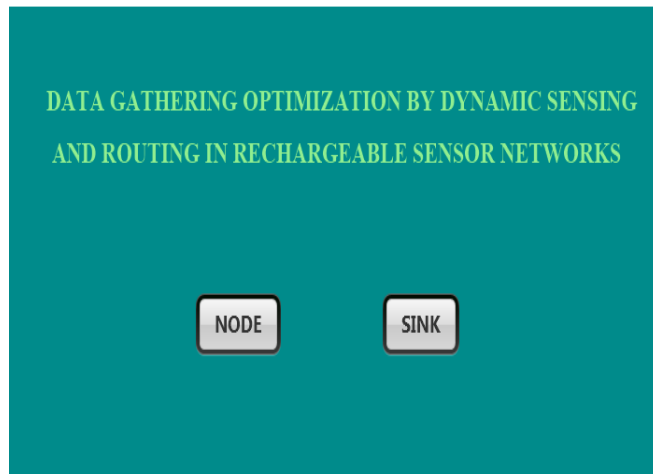
5 SYSTEM REQUIREMENTS

Serial No	Experimental Setup	
	Support Needed	Specification
1	Hard Disk	250GB and above
2	RAM	2GB and above
3	Processor	Core2Duoand above
5	Software Tools	JDK 1.6, java FX 1.3
6	Backend	Java
7	OS	Windows 7 or more.

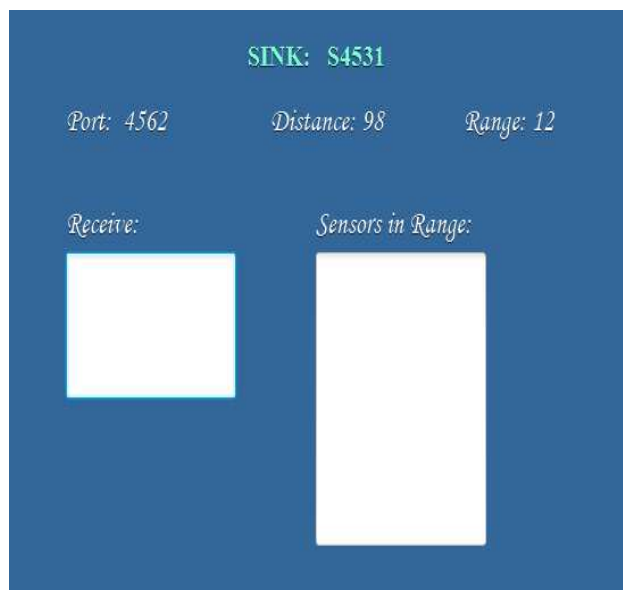
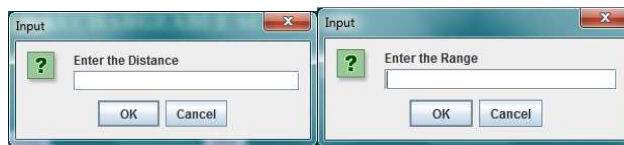
6 ARCHITECTURE DIAGRAM



7 EXPERIMENTAL RESULTS



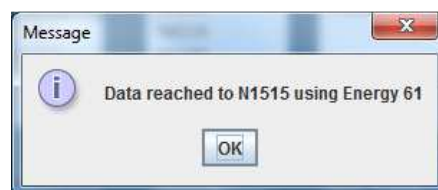
As discussed, The data gathering optimization page will diaplay with Node and Sink options.



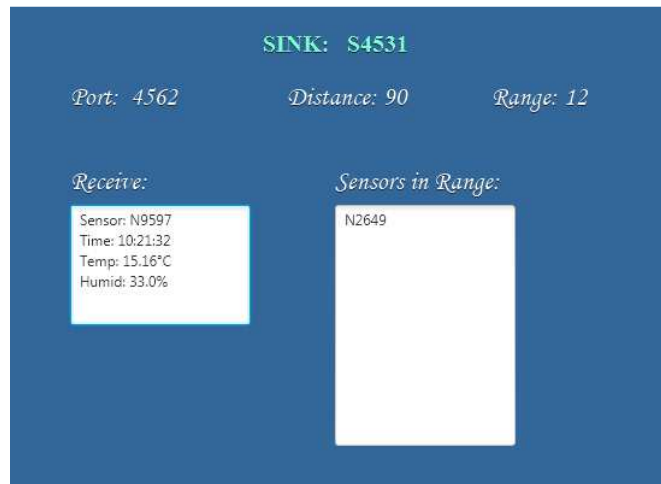
After clicking Sink option we have to give input as distance and range value, sink page will be created.



If we click node option, node page will be display with the neighbouring nodes and data sensing



If Energy is low it will automatically recharge every five seconds, After recharge the energy sensing and transmitted level will change. And the best path will be chosen by high energy level



Finally the Sink will receiving all sensing datas

## 8 CONCLUSION

Thus we design two algorithm BEAS and DSR2C for effectively utilizing the available energy and choose the path to sink that best suits to save the energy. To sense the data rates and flow rates using decomposition while taking the dynamic of network topology. It depends on energy to use manage it distribute the data, energy consumption and maximizing network lifetime in one dimensional network.

By introducing flow variables to simplify the relationship between sensing rates and flow rates, we developed a distributed sensing rate and routing control (DSR2C) algorithm to obtain the optimal sensing rate and routing by employing theory of dual decomposition while taking the dynamic feature of network topology into account. An improved BEAS was proposed by taking extra energy cost into consideration to manage the energy allocation and a topology control scheme

## REFERENCES

- [1] S. He, J. Chen, F. Jiang, D. Yau, G. Xing, and Y. Sun, "Energy provisioning in wireless rechargeable sensor networks," *IEEE Trans. Mobile Comput.*, vol. 12, no. 10, pp. 1931–1942, 2013.
- [2] Y. Zhang *et al.*, "Distributed sampling rate control for rechargeable sensor nodes with limited battery capacity," *IEEE Trans. Wireless Commun.*, vol. 12, no. 6, pp. 3096–3106, 2013.
- [3] Z. Wang, J. Liao, Q. Cao, H. Qi, and Z. Wang, "Achieving k-barrier coverage in hybrid directional sensor networks," *IEEE Trans. Mobile Comput.*, vol. 13, no. 7, pp. 1443–1455, 2014.
- [4] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [5] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [6] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [7] Y. Liu, A. Liu, and Z. Chen, "Analysis and improvement of send-and- wait automatic repeat-request protocols for wireless sensor networks," *Wireless Personal Commun.*, pp. 1–37, 2014
- [8] B. Gaudette, V. Hanumaiah, S. Vrudhula, and M. Krunz, "Optimal range assignment in solar powered active wireless sensor networks," in *Proc. IEEE INFOCOM*, 2012, pp. 2354–2362.
- [9] D. K. Noh and K. Kang, "Balanced energy allocation scheme for a solar-powered sensor System and its effects on network-wide perfor- mance," *J. Comput. Syst. Sci.*, vol. 77, no. 5, pp. 917–932, 2011.

## Sentimental and Latent Analysis of Twitter based Product Reviews

*R. Sathishkumar, T.M. Rino Simon, D. Abishake, M. Ajith Kumar, and Max Sherwin*

Department of Computer Science Engineering,  
Panimalar Engineering College, Chennai,  
Tamilnadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Social Media Sites has evolved into an authoritative communication and information sharing tool used by billions of people around the Worldwide to post what is happening now in World. Social media platform permit post the different opinion many of the users. One of the Social media Twitter has turn out to be an important medium for peer interaction. The Existing system used the Sentiment analysis for the Product reviews and Different Classification algorithms for analysis the data in Social media. The Sentiment analysis has gained much notice in recent years for Product reviews in the Market. In this paper, proposed system is Latent analysis and Re tweet based Product reviews generally latent Attributes are Sex, age, regional basis, and political from Twitter user language .Latent attributes mainly helpful for advertising, personalization, and recommendation another Proposed Methodoly Re tweet based Product reviews. Re tweet reviews and Along with No of followers Count, tweet length, Hashtag Mention and Tweet Count are helpful to reviews the Product. The center of attention on expected retweet count of a tweet of an image linked. Data used in this study are online product reviews collected from Twitter.

**KEYWORDS:** Sentimental analysis, Latent attributes, Classification Algorithms, Retweet count, Hashtags.

### 1 INTRODUCTION

Sentiment analysis or opinion mining is an approach, thinking, or decision prompted by feeling. Sentiment analysis is additionally known as opinion mining,[1] understands the people's sentiments towards bound entities. Internet may be an ingenious place with relevance feeling information. From a user's aspect, individuals are able to post their own opinion and content through social media, like twitter, face book and blogs, or on-line social networking sites. From a researcher's perspective, several social media sites unharness their application programming interfaces prompting information assortment and analysis by researchers and developers.

Twitter presently has three totally different versions of arthropod genus offered specifically the rest API, the Search API, and also the Streaming API. With the remainder API, developers square measure able to gather standing information and user information; the Search API permits developers to question specific Twitter content, whereas the Streaming API is in a position to gather Twitter content in period of time. Moreover, developers will combine that API s to make their own applications [1]. Hence, sentiment analysis appears having a powerful fundament with the support of large on-line information. However, those sorts of on-line information have many flaws that probably hinder the method of sentiment analysis.

The primary flaw is that since individuals will freely post their own content, the standard of their opinions can't be warranted. For instance, rather than sharing topic-related opinions, on-line spammers post spam on forums. [1]Some spam are hollow in any respect, whereas others have unsuitable opinions conjointly referred to as pretend opinions The second flaw is that ground truth of such on-line information isn't continually offered. A ground truth is a lot of sort of a tag of an explicit opinion, indicating whether or not the opinion is positive, negative, or neutral.

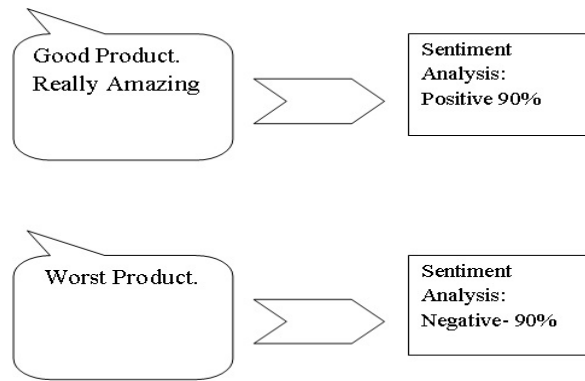


Figure 1 .Sentiment Analysis

Here, Haven on Demand has extracted a positive sentiment about the Good Products but a negative sentiment about Worst. In this case, it uses weights. Hate is obviously stronger than like and so it is weighted at 91%, while like has a weight of 72%.The Stanford Sentiment one hundred forty Tweet Corpus is one in all the datasets that has ground truth and is additionally public offered. The corpus contains one.6 million machine-tagged Twitter messages. Every message is labeled supported the emoticons discovered within the message. The Opinion Mining API is text to return the

Sentiment as negative, neutral and Positive. It contains a vocabulary of positive and negative words of different manner, and explains the patterns that describe how to combine these words to form positive and negative phrases. Sentiment analysis to valuable for the Product Analysis. The Sentimental Analysis helpful to review the Product.

```

    {
      "positive": [
        {
          "sentiment": "Good",
          "topic": "Products",
          "score": 90,
          "original_text": "Good Product",
          "original_length": 16,
          "normalized_text": "Good Product",
          "normalized_length": 16
        }
      ],
      "Negative": [],
      "Aggregate": {
        "Sentiment": "positive",
        "Score": 90
      }
    }
  }
  {
    "positive": [
      {
        "sentiment": "really like",
        "topic": "Products",
        "score": 0.8510865864332573,
        "original_text": "really like",
        "original_length": 11,
        "normalized_text": "really like",
        "normalized_length": 11
      }
    ],
    "positive": [
      {
        "sentiment": "Products",
        "topic": "Best",
        "score": 92.55,
        "original_text": "best product",
        "original_length": 11,
        "normalized_text": "Best Product",
        "normalized_length": 11
      }
    ]
  }

```

Figure 2. Sentimental analysis Query

API Parameters:

Table 1. API Parameters

Name	Type	Description
File	Array<binary>	File having the document to process. Multi POST
Reference	Array<String>	OnDemand reference obtained from either the Expand Container or Store Object API. passed to the API
Text	Array<String>	The text contains the Process
url	Array<String>	HTTP URL from which the document can be retrieved.

## 2 EXISTING SYSTEM

### a) Trending topic based classification:

Twitter is associate degree hugely widespread Social networking web site, Users will Post social info like breaking news, personal opinion regarding celebrities, and trending topics. Twitter account holder will post short messages referred to as tweets, short messages restricted by one hundred forty characters long and viewed by user's followers. Anyone World Health Organization chooses to possess other's tweets denote on one's timeline is named an acquaintance. Twitter has been used as a medium for period info dissemination and it's been utilized in numerous whole campaigns, elections, and as a print media. [6] The recognition of its use has been dramatically increasing. As of June 2011, regarding two hundred million tweets are being generated daily. once a brand new topic becomes widespread on Twitter, it's listed as a trending topic, which can take the shape of short phrases (e.g., #IPHONE7) or hashtags (e.g., #Best Product). What the Trend2 provides a frequently updated list of trending topics from Twitter. it's terribly fascinating to understand what topics are trending and what folks in different elements of the globe have an interest in. However, a really high share of trending topics are hashtags, a reputation of a personal, or words in different languages and it's typically tough to know what the trending topics are regarding. It's thus vital to classify these topics into general classes for easier understanding of topics and higher info retrieval. Classes: style, books, business, charity & deals, fashion, food & drink, health, holidays & dates, humor, music, politics, religion, science, sports, technology, TV & movies, other news, and other. Our goal is to assist users finding out info on Twitter to appear at solely smaller set of trending topics by classifying topics into general categories To classify trending topics into these predefined categories,[6] we have a tendency to propose 2 approaches: the well-known Bag-of-Words text classification, and victimization social network info.

### b) Text based classification:

Text categorization is to make systems that are able to mechanically classify documents into classes. to make text classification systems, the bag of words illustration is that the most frequently used feature area. Its quality comes from its wide use within the field of knowledge retrieval and from the simplicity of its implementation. Yet, as within the bag of words illustration every dimension corresponds to the quantity of occurrences of the words in a very document, the task of classifying text documents into classes is tough as a result of the dimensions of the feature area is incredibly high. In typical issues, it unremarkably exceeds tens of thousands of words. Another side that hampers this task is that the undeniable fact that the quantity of coaching documents is many orders of magnitude smaller than the dimensions of the feature area .With the quick development of the net Technology, the analysis on text categorization has acquire a brand new stage, All kinds of strategies have consecutively got developed, including machine learning technique, has changing into the leading modality of text categorization, for instance Naïve theorem Classification, KNN , Support Vector Machine , Neural Network and Boosting then on. Some of these algorithms has already been realized and utilized in sensible systems, and created smart effects. Although Naive Thomas Bayes and therefore the k nearest neighbor's classifier are multi-class classifiers, the SVM are by default binary classifiers. Then, to handle multi-class issues, SVM sometimes depends on a 1 versus all strategy wherever as several binary classifiers as there are categories are trained. For example, within the case of a classification downside with n-classes, n one versus the remainder binary classifiers are trained. Therefore, once running experiments on advanced classification tasks involving over two-classes[15].

Literally scrutiny n SVM classifiers (for n classes) to single multi-class naive Thomas Bayes or k nearest neighbor's classifier. Additionally, to look at and compare the behaviors of the classifiers once experimental conditions are varied, these

conditions should be controlled exactly. Indeed, the properties of the coaching set will influence mostly the training talents of the classifiers, whereas in multi-class issues, it will be tough to know the actual influence of every category on the classifier's behaviors. Of the classifiers, whereas in multi-class issues, it will be tough to know the actual influence of every category on the classifier's behaviors. Therefore, in our state of affairs, we have a tendency to specialize in issues with solely two-classes. First, it allows United States of America to discard the influence of the multiclass aggregating rule within the case of SVM and therefore, to compare SVM a lot of fairly with naive Thomas Bayes and therefore the risk to regulate a lot of fastidiously the properties of the coaching set. In this regarded, so as to grant to each categories identical likelihood to be learned also, we have a tendency to solely studied things wherever the quantity of coaching instances is that the same in every category. Last, as binary issues are smaller.

*c) Machine learning based classification:*

Machine learning acts as a building block of various different fields of technology like computing, data processing, knowledge science, info retrieval and pattern recognition. Machine learning explores the analysis and development of algorithms that learn from the prevailing knowledge and draw inferences victimization that it can create predictions on the longer term knowledge properly. Instead of writing easy static codes, a model is developed victimization the datasets called coaching datasets. The event of the coaching datasets permits the computers to adopt information driven approach.

Datasets ends up in a lot of correct predictions. The first operate of machine learning rests on classification. Classification is that the method of Categorizing the info or a brand new observation into a category from a bunch of categories. The category is finished victimization the pattern determined within the coaching datasets whose class membership is already noted. Associate degree example would be distribution a given email into "spam" or "non-spam" categories or distribution a designation to a given patient as delineate by determined characteristics of the patient (gender, force per unit area, presence or absence of sure symptoms, etc.). Is one among the most important applications of Machine learning here, we have a tendency to be attending to explore 2 of the classification algorithms, Naïve Thomas Bayes and Support Vector Machines. So as to check algorithms we've got taken two issues. Within the initial example we have a tendency to be taking a theoretical state of affairs wherever our self driving automotive needs to decide whether or not to travel quickly or slow. So as to try and do that, we've got taken 2 factors that have an effect on the speed of the care- roughness and grade. The quick and slow are the categories and therefore the roughness and grade are the options. Victimization the coaching datasets the algorithms can predict whether or not the automotive can go quick or slow relying upon the worth of the grade and roughness. The Naïve Thomas Bayes can adopt a probabilistic approach whereas the SVM uses a non probabilistic approach.

*d) Entity based classification:*

Twitter could be a widespread micro-blogging service on the online, wherever folks will enter short messages that then come into view to other users of the service. The topics of those messages varies, there are lots of messages wherever the users specific their opinions regarding some firms or their product. These messages are an upscale supply of knowledge for firms for sentiment analysis or opinion mining[9] There's but an excellent obstacle for analyzing the messages directly: because the company names are typically ambiguous .

One desire initial to spot, that messages are associated with the corporate. During this paper we have a tendency to address this question. we have a tendency to gift numerous techniques for classifying tweet messages containing a given keyword, whether or not they are associated with a specific company thereupon name or not. That create use of company profiles that we have a tendency to create semi-automatically from external internet sources. Our advanced techniques take ambiguity estimations into consideration and conjointly mechanically extend the corporate profiles from the twitter stream itself [9] We have a tendency to demonstrate the effectiveness of our strategies through an in depth set of experiments. Moreover, we have a tendency to extensively analyze the sources of errors within the classification. The analysis not solely brings additional improvement, however conjointly allows using the human input a lot of expeditiously.

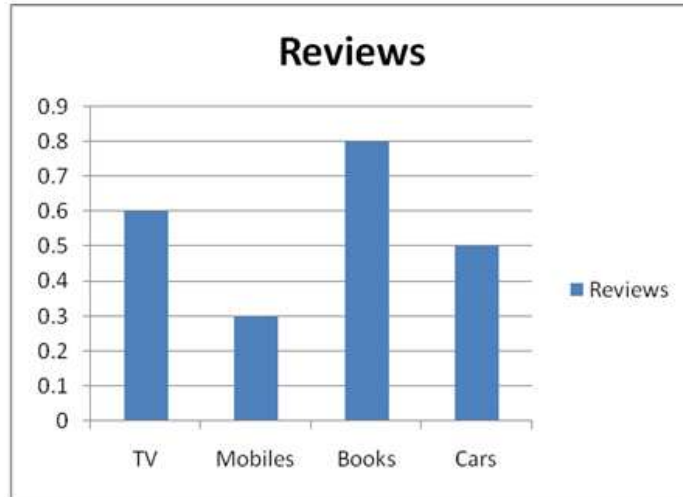
### 3 PROPOSED SYSTEM

*Sentimental Analysis for Product Review:*

1. Data Collection
2. Sentimental sentence Identification
3. Negotiation phase or Sentence Phase.

*Data Collection:*

Data used in these experiments is a collection of product reviews from Social Media sites like Twitter. From March, 2017, we collected, in total, millions of product reviews in which the products belong to the major categories: Mobiles, beauties, books, cars, appliances Etc. each review is rated in charts.



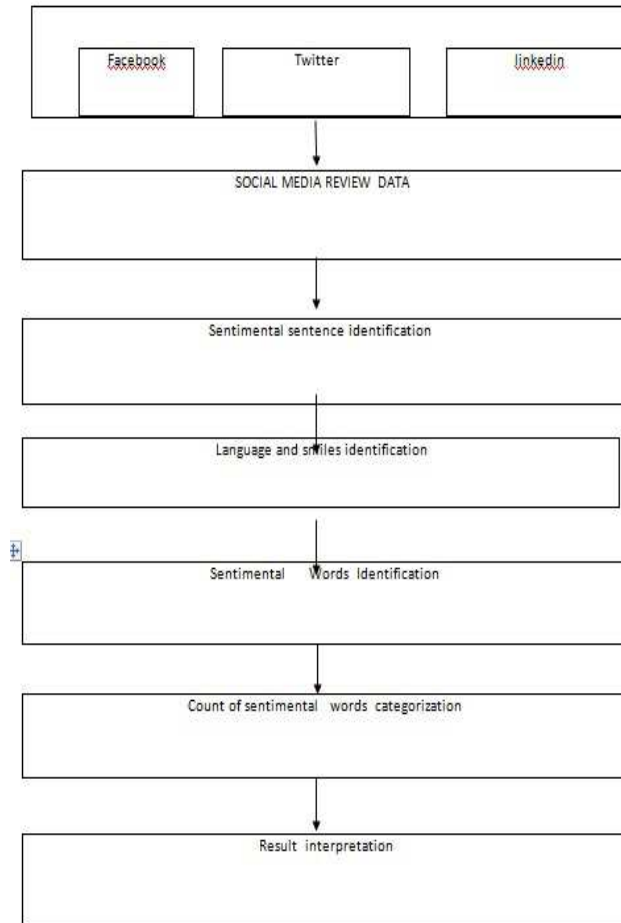
**Fig 3. Data collection Reviews**

*Sentence phase identification:*

The objective content is removed for sentiment analysis and all the subjective content was extracted for future analysis. The subjective content consists of all sentiment sentences. A sentiment verdict is the one that contains, at least, one positive or negative statement. The entire positive and negative were firstly separated English words. Every English word of a sentence has its role that explains how the word is used.[7] The syntactic roles are also known as the parts of speech. There are 8 parts of speech in English: verb, noun, pronoun, adjective, adverb, the preposition, Conjunction and the interjection.

*Negotiation Phase:*

- 1: **for** every hash tag Sentences **do**
- 2: **for**  $i/i + 1$  as hash tag pair **do**
- 3: **if**  $i + 1$  is a Negative Prefix **then**
- 4: **if** there is an adjective tag or a verb tag in next pair **then**
- 5: Negotiation of adjective Phrases  $\leftarrow (i, i + 2)$
- 6: Negotiation of verb Phrases  $\leftarrow (i, i + 2)$
- 7: **else**
- 8: **if** there is an adjective tag or a verb tag in the pair after next **then**
- 9: Negotiation of adjective Phrases  $\leftarrow (i, i + 2, i + 4)$
- 10: Negotiation of verb Phrases  $\leftarrow (i, i + 2, i + 4)$
- 11: **end if**
- 12: **end if**
- 13: **end if**
- 14: **end for**
- 15: **end for**
- 16: **return** Negotiation of adjective Phrases and Negotiation of verb Phrases.



**Fig 4. Flow diagram for Sentimental analysis**

**B) Latent Attributes:**

Latent attributes are gender, age, and regional origin and political orientation. Latent attributes based Product review is Our Methodology. [3] Age is a real valued attribute, given the universal lack of ground truth for user age, we used the Twitter4J Java API.Users into two major demographic pools, and we take users below 30 and users above 30. [5]This binary categorization is nevertheless useful for user modeling and understanding. Gender helps to finds the User is male or female.

**Table 2.Used Tweets**

Attributes	#No of Users per Class	No of Tweets
Gender	500	6855000
AGE	1000	865545554
Political	200	5555485
Religion	100	4221155

**Hash tag based Product review:**

Hash tags are mostly keywords that are used to tag the tweets so users and Followers easily categorized and found by users and Current Hot news. For example Hash-tags are mentioned the hot news example #wesavejallikattu. [4] Given these use cases of hash tags, one would expect that interesting tweets are more likely to contain hash tags, the plot of below figure shows that tweets containing 1 to 2 hash tags are more expected to be retweeted than tweets without hash tags.

Table 3. Tweet Hash tags

CHARATERISTIC	Value
Total Tweets	6,240,996
Cleared tweets	6,232,587
No hashtag tweets	5,187,804
At least one hashtag	1,042,592
One hashtag/tweet	724,653
Two hashtag/tweet	132,965
More than two hashtag	69,900
Total Hashtags in tweets	24

Table 4. Popular Hash tags last Month

No	Hashtag
1	#IPHONE7
2	#SamsungA8
3	#BESTPRODUCTASUS
4	#smartindia
5	#bbc
6	#teamfollowback
7	#news
8	#Northkorea
9	#love
10	#Neduvasal

#### 4 CONCLUSION

In this study, We Investigated Survey on Sentimental and Social Media based Product review. We use user databases of retweets for link prediction in the popular social media like Twitter. The sentimental Analysis or Opinion Mining is helps to study the People attitudes, Sentiments or human emotions certain entities, we take online based product review help of Social Medias like twitter. We hope that our survey is broad view and Discussions about sentimental analysis. While our research has established promising results on recommend modified hash tags, the scope of the research can be extended in several other directions in the future. We discuss the most prominent.

#### ACKNOWLEDGEMENT

This paper is based on research conducted by emerging technology of Information Retrieval .I am grateful for a number of friends and colleagues in encourages me to start a work, I thanks to Panimalar Engineering college for academic support. Finally I would like to thanks for all kept me going process.

#### REFERENCES

- [1] Sentiment analysis using product review data Xing Fang and Justin Zhan Otsuka *et al. Compu Social Networks (2016)* 3:3DOI 10.1186/s40649-016-0028-9
- [2] Retweets as a Predictor of Relationships among Users on Social Media Sho Tsugawa<sup>1\*</sup>, Kosuke Kit 2016
- [3] T. Bocklet, A. Maier, and E. N oth. Age determination of children in preschool and primary school age with gmm-based supervectors and support vector machines/regression. In TSD '08: Proceedings of the 11th international conference on Text, Speech and Dialogue, pages 253{260, Berlin, Heidelberg, .Springer-Verlag.
- [4] Tommasel, A.; and Godoy, D.; 2015. A novel metric for assessing user influence based on user behaviour. In: SocInf, pp. 15–21.
- [5] Ludu, P.S. 2015. Inferring Latent Attributes of an Indian Twitter User using Celebrities and Class Influencers, In Proceedings of the 1st ACM Workshop on Social Media World Sensors (SIdEWays'15). ACM, NewYork, NY,USA, 9-15.2016

- [6] Jean-Val'ere Cossu, Vincent Labatut, Nicolas Dugu'e. A Review of Features for the Discrimination of Twitter Users: Application to the Prediction of Offline Influence.2015
- [7] Schreiner T. New compete study: primary mobile users on twitter. 2011. <https://www.blog.twitter.com/2013/new-compete-study-primary-mobile-users-on-twitter>.
- [8] Heggstuen J. One in every 5 people in the world own a smartphone, one in every 17 own a tablet. 2013.
- [9] Entity-based Classification of Twitter Messages Surender Reddy Yerva\_ International Journal of Computer Science and Applications c Technomathematics Research Foundation Vol. 9 No. 2, pp. 88 - 115, 2012
- [10] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [11] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [12] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [13] MACHINE LEARNING COMPARISON OF CLASSIFICATION ALGORITHMS International Journal of Advanced Engineering and Global Technology / Vol-03, Issue-11, December 2015\
- [14] Y. S. Yegin Genc et.al, "Discovering context: Classifying tweets through a semantic transform based on wikipedia," in *Proceedings of HCI International*, 2011.
- [15] S. Kinsella, A. Passant,et.al "Topic classification in social media using metadata from hyperlinked objects," in *Proceedings of the 33rd European conference on Advances in information retrieval*, 2011, pp. 201–206.
- [16] J. Sankaranarayanan, H. Samet, et.al, "Twitterstand: news in tweets," in *Proceedings of the 17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*,2009, pp. 42–51.
- [18] M. N. Hila Becker et.al "Beyond trending topics:Real-world event identification on twitter," in *Proceedings of AAAI*, 2011.
- [19] Go, R. Bhayani, et.al, "Twitter sentiment classification using distant supervision," 2009.
- [20] Pang, L. Lee, et.al "Thumbs up?: sentiment classification using machine learning techniques," in *Proceedings of the ACL-02 conference on Empirical methods in natural language processing-Volume 10*. Association for Computational Linguistics, 2002, pp. 79–86. Weka 3: Data Mining Software in Java, <http://www.cs.waikato.ac.nz/ml/weka/>.

## Retrieve system of an intelligent ambulance using designate traffic shifting

*M. RAJAKUMARI, K. ROHINEE, K. SRI SANGEETHAA, V. SUGANYA, and S. VIMALA*

Department of Electronics and Communication Engineering,  
K. Ramakrishnan College Of Engineering, Tamil nadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Traffic congestion and tidal flow management are two major problems in modern urban areas which leads to road accident and loss of life. Automatic Ambulance Rescue System (AARS) is introduced to avoid the loss of life. The main idea behind this scheme is ambulance can reach smoothly to hospital in time, by mechanically controlling traffic lights in path. The sensor senses the spot and the nearest ambulance reaches the accident spot. The traffic lights in the path of the ambulance are controlled. The ambulance is guided to hospital by server through shortest route. The vehicle unit installed in vehicle senses the accident and sends the location of the accident to the main server in the ambulance section. The main server finds the ambulance, nearest to the accident spot and also shortest path between ambulance, accident spot and nearest hospital.

**KEYWORDS:** MicroElectroMechanical Systems (MEMS), Automatic Ambulance Rescue System (AARS), Vehicle Section, Ambulance Section, Signal Section, Global System for Mobile Communications (GSM), Global Positioning System (GPS), Microcontroller.

### INTRODUCTION

India is the second most populous Country in the World and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints. Also, Indian traffic is nonlane based and chaotic. It needs a traffic control solutions, which are different from the developed Countries. Intelligent management of traffic flows can reduce the negative impact of congestion. In recent years, wireless networks are widely used in the road transport as they provide more cost effective options. Technologies like ZigBee, RFID and GSM can be used in traffic control to provide cost effective solutions. RFID is a wireless technology that uses radio frequency electromagnetic energy to carry information between the RFID tag and RFID reader.

### TRAFFIC CONGESTION

Traffic congestion is a condition on transport networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queueing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, this results in some congestion.

As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam or traffic snarl-up. Traffic congestion can lead to drivers becoming frustrated and engaging in road rage. ZigBee technology is a wireless standard designed to operate low-power wireless sensor networks, and it can aid emergency vehicles in dealing with traffic congestion.

**THE PROLIFERATION OF VEHICLES**

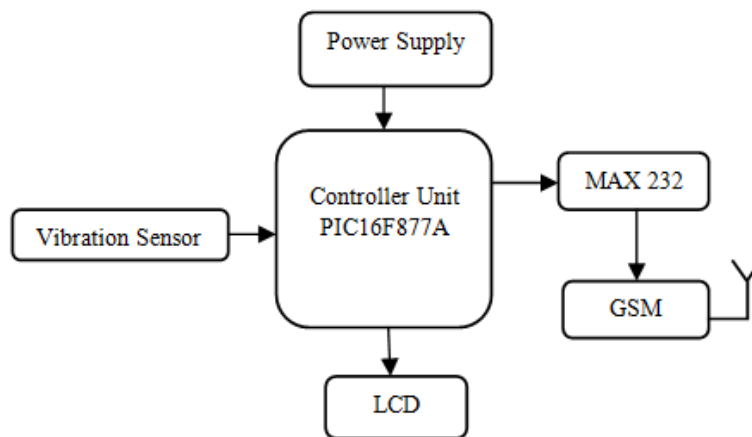
Urbanization is a global phenomenon, and its effect is more pronounced in developing countries like India. In these countries, there is a drastic improvement in industrialization. Due to an increase in industrialization, the usage of vehicles has developed countries but with the number of fatalities somewhat less due to modern infrastructure. In developing nations, due to a lack of infrastructure, motor vehicle fatalities are comparatively higher. Globally, road accidents claim lives of 1.24 million people per year with as high as 50 million people injured. The statistics show that countries have various numbers of fatalities and accidents. In India, statistics show that fatalities and accidents have been increasing. "Bus priority control system based on wireless sensor network (WSN) and Zigbee" (Wu et al., 2006) provides an overview of how buses are routed along roadways with all of the necessary information to control traffic congestion.

**VEHICLE SECTION**

In Vehicle Section, all the equipments are connected to microcontroller. The Piezoelectric sensor is used as vibration sensor to measure flex, touch, vibration and shock. Piezoelectric sensor is a device that uses piezoelectric effect to measure changes in acceleration, pressure, temperature, strain or force by converting them to an electric charge. Sensor based on piezoelectric effect can operate from transverse, longitudinal, shear forces and are insensitive to electric field and electromagnetic radiation. This piezoelectric sensor measures dynamic pressure which includes blast, ballistics and engine combustion under varying condition. An electronic amplifier is an electronic device that increases power of a signal and converts alternating current into direct current.

Here, we have used Microcontroller ARM7 for this vehicle section. ARM7 is a group of older 32-bit ARM processor. ARM is a family of instruction set architecture for computer processor based on a reduced instruction set computing. The sensor installed in the vehicle unit senses the accident and GPS tracks the location of the accident. Through GSM, it sends the location of the accident to the ambulance section [13]. The buzzer produces sound when accident occurs. The central unit finds the ambulance, nearest to the accident spot and also the shortest path between the location of the accident, ambulance and the nearest hospital. The ambulance crosses all the traffic junctions by automatically controlling the traffic Signals and Reaches The Nearest Hospital. Here, Wireless Technologies Are Used To Transfer Information.

**AMBULANCE SECTION**

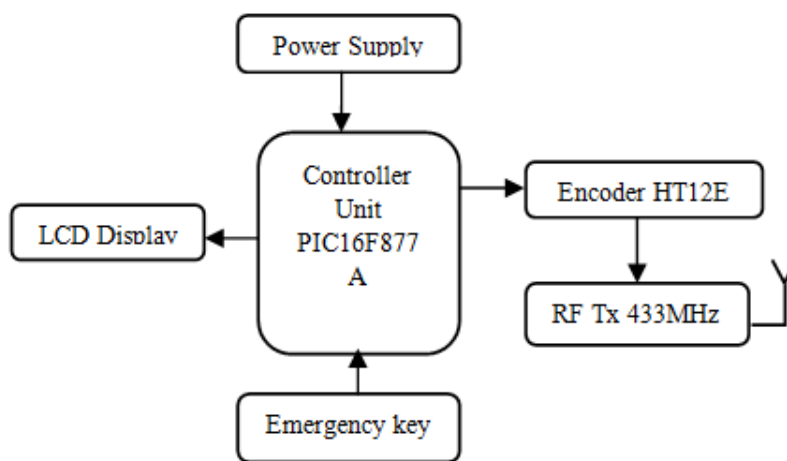


In ambulance section we used PIC microcontroller. The serial number of the IC is 16F877A. This section consists of crystal oscillator, power circuit and serial communication. 9v input supply is given and the operating voltage is 5v. The crystal oscillator is used to work according to the frequency change. In a PIC microcontroller, there are 40 pins and 5 ports; port a to port e. PIC is a family of modified architecture microcontrollers. An encoder is a device, transducer circuit, algorithm, Software program, or person, which converts data from one format or code to another, for the purpose of speed, standardization, security and compression. RF communication uses the transmitter or receiver.

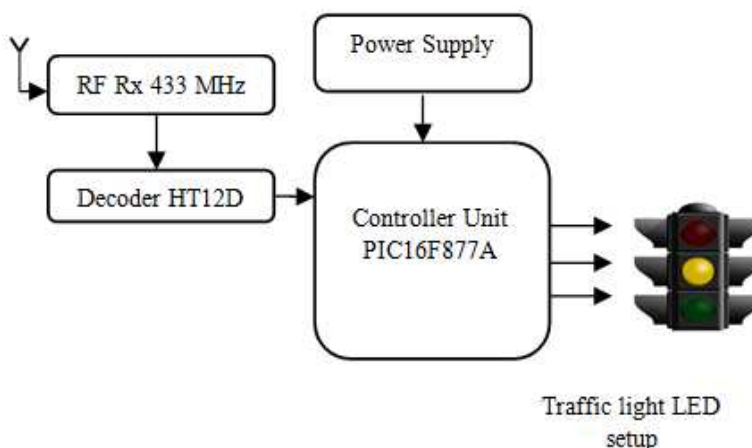
**TRANSMITTER NODE**

**SIGNAL NODE**

In Signal Section, the functions of the microcontroller section are same as in the ambulance section. Here, we used reader device, decoder unit and signal indicator. The reader device receives the data which the RF transmitter sends from the ambulance section. Any device may act as a reader that can display text on a screen. A decoder is a device that performs the reverse operation of an encoder. To recover the original information, it undoes the encoding. The received signal strength indicator (RSSI) measures the power present in a radio signal which is received. RSSI is a radio receiver technology metric, which is normally invisible to the user of the device which consists of receiver, but is directly known to users of wireless networking. The output of RSSI is a DC analog level. The ambulance unit is the transmitter and each signal is the receiver.



In this way, this system helps the ambulance to reach the emergency site and then to hospital without time delay so that intensive care can be given to the patient in the golden hour and many lives can be saved.



**CONCLUSION**

In this paper, we have described a design for automatically controlling the traffic signals so that location of the accident. Through GSM (Global System for Mobile Communications), it sends the location of the accident to the ambulance section. The central unit finds the ambulance, nearest to the accident spot and also the shortest path between the location of the accident, ambulance and the nearest ambulance would be able to cross all the traffic junctions and reach hospital without time delay.

The sensor installed in the vehicle senses the accident and global positioning system (GPS) tracks the hospital. Here, wireless technologies are used to transfer information.

## REFERENCES

- [1] Xiaolin Lu, Develop Web GIS Based Intelligent Transportation Application Systems with Web Service Technology, Proceedings of International Conference on ITS Telecommunications, 2006.
- [2] Kristofer D. Kusano and Hampton C. Gabler, Member, IEEE, "Safety Benefits of Forward Collision Warning, Brake Assist, and Autonomous Braking Systems in Rear-End Collisions", 2011.
- [3] Wang Wei, Fan Hanbo, Traffic Accident Automatic Detection and Remote Alarm Device.
- [4] G. Derekenaris, J. Garofalakis, C. Makris, J. Prentzas, S. Sioutas, A. Tsakalidis, "An Information System for the Effective Management of Ambulances", 2000.
- [5] Zhaosheng Yang. Study on the schemes of traffic signal timing for Priority Vehicles Based on Navigation System, 2000.
- [6] Maria Teresa Aviles, Roberto Becchini, "Mission support for emergency operators", 2007.
- [7] Samir El-Masri, Basema Saddik, "Mobile Emergency System and integration", 2011.
- [8] Sara Nazari, M. Reza Meybodi, M. Ali Salehigh, Sara taghipour, "An Advanced Algorithm for Finding Shortest Path in Car Navigation System", Proceedings of 1st International Conference on Intelligent Network and Intelligent Systems, pages: 671-674, 2008.
- [9] Katsunori Tawara, Naoto Mukai, Traffic Signal Control by using Traffic Congestion Prediction based on Pheromone Model, Proceedings of 22<sup>nd</sup> International Conference on Tools with Artificial Intelligence, 2010.
- [10] Dian-liang XIAO, Yu-jia TIAN, "Reliability of Emergency Rescue System on Highway", 2009.
- [11] XU Guang-hui, Deng Jun, Huang Yong-bo, "The Research and Design of the Control System of the Omnidirectional Self-balancing Intelligent Ambulance", 2011.
- [12] Noraimi Azlin Mohd Nordin, Norhidayah Kadir, Zati Aqmar Zaharudin and Nor Amalina Nordin, "An Application of the A\* Algorithm on the Ambulance Routing", 2011.
- [13] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [14] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [15] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [16] S.Jagadeeshwaran, N.Dinesh, "Automatic Ambulance Rescue System. K.Athavan, G.Balasubramanian", 2012.
- [17] Wei Yan Ma Zhigang, Qiu sihai, "System of Medical Emergency Ambulance for Community based on Zigbee", 2010.
- [18] Cheng Siong Lim, Member, IEEE, Rosbi Mamat, Member, IEEE, and Thomas Bräunl, Senior Member, IEEE, "Impact of Ambulance Dispatch Policies on Performance of Emergency Medical Services", 2011.

## EFFICIENT METHOD FOR IMAGE CLASSIFICATION USING ACO

*D. Vinod Kumar<sup>1</sup> and P. Selvakumar<sup>2</sup>*

<sup>1</sup>Dept. of Electronics Engineering, PET Group of Institutions, India

<sup>2</sup>Assistant Professor and Head, Department of ECE, PET Group of Institutions, India

---

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Classification of objects in an image finds its application in many real-time systems such as video surveillance systems etc. The basic operation is to detect the object present in the image frame. The processes involved are i) Extracting the object features and ii) Feeding the features into a classifier. External factors such as illumination, brightness etc., have profound effect on the process of classification. These conditions can lead to misdetection of objects. Similarly, the selection of features for classification affects the classification efficiency. Hence optimized feature detection, efficient feature extraction and a supportive classifier selection is mandatory for accurate classification. An absolute combination of suitable optimization solution, feature for classification and a matching classifier is presented in this work.

**KEYWORDS:** ACO, Pheromone, heuristics, Bayesian classification.

### INTRODUCTION

In one aspect, Image Classification subsequently intends to object detection, involving the identification of the objects present in the image. The object in the image is determined by its characteristics such as shape, texture, colour, position gradient etc. Efficient extraction of features from these characteristics is essential in order to avoid misconception of objects. Additionally, classifier selection also must be done in such a manner that it matches the optimized criteria.

The stages of classification presented in this work are:

Optimized Feature Detection

Feature Extraction

Object Classification

An image obtained by any source is subjected to several degradation. The features of the objects in such degraded images cannot be directly determined. It may lead to faulty detection. External factors responsible for the image degradation during their acquisition include illumination variances, fluctuations in brightness and contrast levels, abrupt noises, source defects etc. In order to overcome these acquisition defects, image restoration can be done. But performing restoration followed by feature detection formulates a highly computational process. Hence Optimization can be done prior to feature detection. This produces acceptable solutions for a wide variety of images with varying attributes.

Ant Colony Optimization is the technique used to detect features from images affected by varying external factors[1]. There are few key parameters that decide the throughput of the ACO algorithm. By carefully balancing those parameters, considerable optimization can be effected. ACO is used mainly because of its enhanced efficiency compared to other optimization techniques[2]. It is a probabilistic method and has higher predictive accuracy.

The feature selected for classification is the shape of the object. Shape provides a perfect feature class for classification and also vulnerable to small errors. Even meager changes in this feature can lead to misdetection of objects. Hence

optimization becomes essential. This simple shape feature is obtained by detecting the edges of the object under consideration. Edge detection is performed by ACO thus producing an optimized output[3].

Bayesian Classifier is used to classify the object based on the edge features. Similar to all classifiers Bayesian Classifier also uses two stages Training phase and Testing phase[4]. Bayesian Classifier works on the principle of conditional probability, given the training sequence it predicts the test sequence. The classifier is initially trained with the features extracted. The training dataset must be large enough to classify all the objects based on the determined feature, shape. During the testing phase the Classifier determines the prior probability based on the training set and this prior probability helps the classifier to segregate the test data to a particular class of defined object.

In the proposed work algorithms for Ant Colony Optimization, Feature extraction and Bayesian Classification are dealt in congruent manner. Finally the result for each stage along with the final classified output is shown.

## ANT COLONY OPTIMIZATION

Edge is an important feature in an image and carries important information about the objects present in the image. Edge detection aims to localize the boundaries of objects in an image and significantly reduces the amount of data to be processed. Ant colony optimization (ACO) is a nature inspired optimization algorithm that is motivated by natural foraging behavior of ants. It is a heuristic method that imitates the behavior of real ants to solve discrete optimization problems[2]. The real ants communicate by means of a chemical substance called pheromone which they deposit on the ground in order to mark some preferred path that should be followed by other ants of the colony.

### ANT COLONY OPTIMIZATION FOR EDGE DETECTION

Ant colony optimization (ACO) is a population-based metaheuristic that mimics the foraging behavior of ants to find approximate solutions to difficult optimization problems. The proposed method establishes a pheromone matrix that represents the edge information at each pixel based on the routes formed by the ants dispatched on the image. The movement of the ants is guided by the local variation in the image's intensity values.

In ACO algorithm for edge detection, ants move through a search space, the graph which consists of nodes and edges. The pixels in the digital image can be considered as the nodes of a graph[5]. The movement of ants from a pixel to another pixel is probabilistically dictated by the transition probabilities. The transition probability reflects the likelihood that an ant will move from a given pixel to another. The transition probability depends upon the heuristic information and pheromone information. All pixels of the image are initialized with small value of pheromone. The heuristics information in most of the ACO based methods for edge detection is determined by local statistics at the pixel position. When an ant visits a pixel, it will deposit certain amount of pheromone. The more ants visit a pixel, the more pheromone deposition will be there on that pixel. In the end, edges can be detected by analyzing the pheromone distribution in the image. The whole procedure of the ACO is summarized as follows [5].

#### ACO Algorithm

1. Initialize the positions of all ants as well as pheromone matrix (same size as image).
2. For the construction step, move the ant K for L steps according to the probability transition matrix.
3. Update the pheromone matrix.
4. Make the binary decision to decide if there is an edge or not based on final pheromone matrix.

## FEATURE EXTRACTION ALGORITHM

In this chapter, we introduced a robust feature extraction concept that returns the object edge information that can be further used for classification. The resultant shape is obtained as a distance vector, calculated between the centroid of the object and its outer edge.

This section deals with the procedure to generate the features associated with the objects in the image that is to be classified.

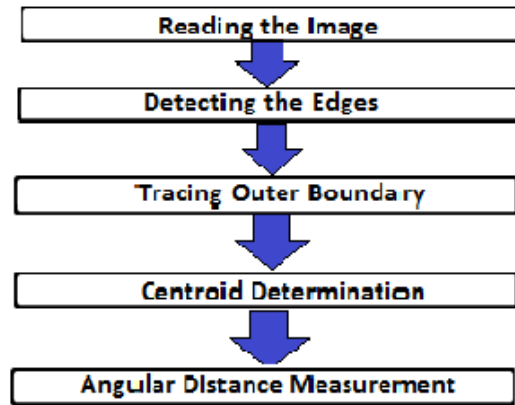


Fig.1. Feature Extraction Flow Diagram

The initial step is to take an image in which an object has to be identified. Different sets of images are taken involving variety of shapes. The colour image that is taken is converted into a grey-scale image as only the shape of that image is required. The input set we have taken includes car, human face, motor bike and bag.

After converting to gray scale format high frequency components present in the image are identified using the ACO edge detection, methods.

After obtaining the edges of the object, its outer boundary is traced out through scanning process. Scanning is done in horizontal, vertical and angular directions to increase the continuity of the boundary pixels. In the process of scanning the entire image is scanned from its outer boundary and the first occurrence of the edge or high intensity value is noted. In case of only horizontal and vertical scanning certain hidden portions in the image may be overridden leading to discontinuities in the traced outer boundary, hence we go also for angular scanning. Different scanning processes are given in Figure 3.3

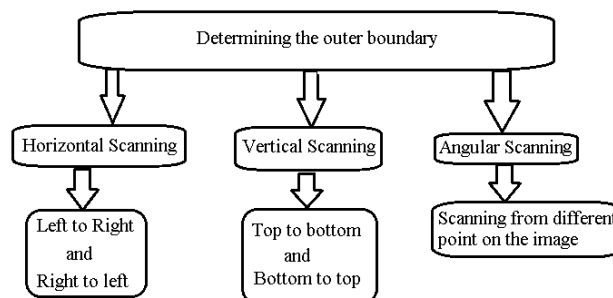


Fig.2. Flow of the Scanning Process

The angular scanning is performed from various points such as image corners and boundary mid points. The traced outer boundary gives the exact outline of the object under consideration.

After determining the outline, the centroid for object is identified. Centroid position is calculated only for the given object and not for the entire image. It is calculated by first calculating the mean row of the object. The mean row is obtained by averaging the row where the first occurrence of the high intensity pixel is obtained in top to bottom vertical scanning and the row where the first occurrence of the high intensity pixel is obtained in bottom to top vertical scanning. After determining the mean row the mean centroid pixel is determined by averaging the column pixel in the mean row where the first occurrence of the high intensity value is obtained in left to right scanning and the column pixel in the mean row where the first occurrence of the high intensity value is obtained in right to left scanning.

After determining the centroid coordinates, distance feature is extracted. It is obtained in an angular fashion, creating a distance vector for the corresponding angular measurement with respect to the centroid. This angle estimation is made with help of the two-point form of the line equation as in equation (1)

$$(y-y1) = m(x-x1) \quad \dots (1)$$

where m is the slope and is given in (2) on below and x1,y1 are centroid coordinates.

$m = \tan(\theta)$  .... (2) where  $\theta$  is the angular coordinate.

Similarly, the processed image is scanned and those pixels that satisfy the line equation and having the high intensity value is noted. The Euclidian distance between the centroid pixel and the outline pixel is noted for every 5 degree increment with respect to the centroid pixel, thus creating an array of 72 vectors.

The Euclidian distance is measured as:

$$D = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2} \dots (3)$$

Where  $x_1, y_1, x_2, y_2$  are the pixel co-ordinates.

Completely connected outline is necessary for the object in order to obtain the correct values of distance vectors.

The distance vectors so obtained is fed to a classifier that detects the exact object.

## CLASSIFICATION

Classification is the core operation in object detection. There are different types of classifier used for this purpose. The main function of the classifier is to segregate the test sample to the predefined class. The predefined class is created by training the classifier with large number of training samples.

Basically 2 steps are involved in a classifier:

1. Training the classifier using the training samples.
2. Classifying the test sample.

## BAYESIAN CLASSIFIER

Bayesian Classifier is used to determine the class to which the test sample belongs. It is based on the conditional probability  $P(X/Y)$ , where X and Y represents the random sequence. It is the probability of occurrence of the event X given the event Y has occurred [7].

Since ACO is a probabilistic method of determining the features of the object to be classified, Bayesian Classifier suits well for classifying the objects based on the features extracted by the ACO.

## RESULTS

The results of complete execution of the algorithm discussed above are shown below

### PARAMETER VARIATION RESULT

The below set of images show the effect of the variation in the ACO parameter for detecting the edges in the image.

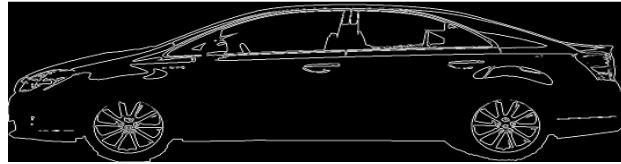
The parameters taken here for consideration are the number of iterations in the algorithm and the number of ant cells used.



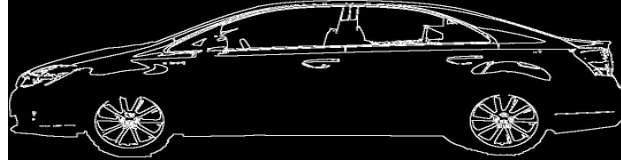
*Original Image*



*2 Iterations, 300 ants*



2 Iterations, 500 ants



3 Iterations, 500 ants

**Fig.3. ACO Parameter Variation – Car**

Fig.3. shows the parameter variation results. After analysis it is clear that for the below specified parameter values, the edges detected are near to exact.

Number of Transition Steps : 100 - 150

Number of Iteration : 2 - 3

Number of Ants : 400 – 500

The determination of these parameters are crucial in getting the most efficient results. They play an important role in reducing the load of the classifier thereby pruning the number of the training set required for the same.

#### FEATURE EXTRACTION RESULTS

From the edges detected after applying ACO, The feature of distance vector is extracted in following steps :

1. Outline determination
2. Boundary Box creation
3. Resizing to a common value (250 x 250)

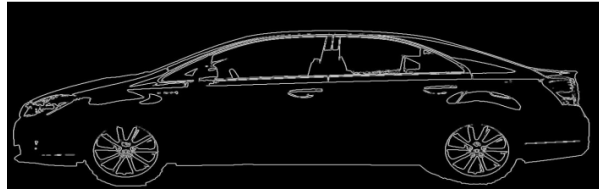
Finally from the resized image the distance vector is calculated. The calculation procedure for the distance vector is shown in the Feature Extraction segment.

For the analysis we have taken two sets of images, one from a Car set and another with a different shape of a motorcycle. When the distance vector is calculated for these two sets, they vary widely giving thereby easy to understand the best-case effect of the proposed methodology.

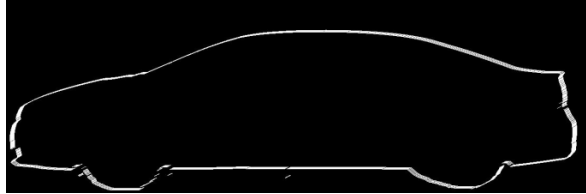
The outputs of the sample images are shown below :

Image 1:

*Original Image*



*ACO Output*



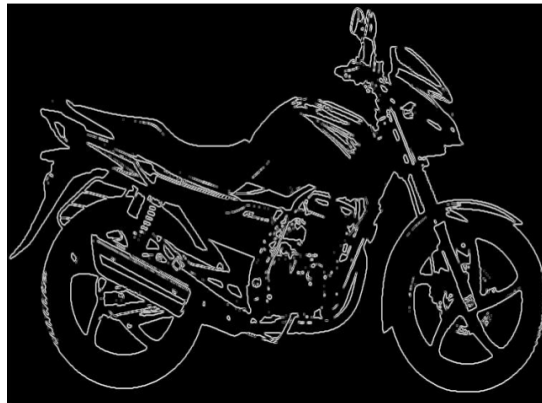
*Outer Boundary*

**Fig.4. Feature Extraction Stages – Car model**

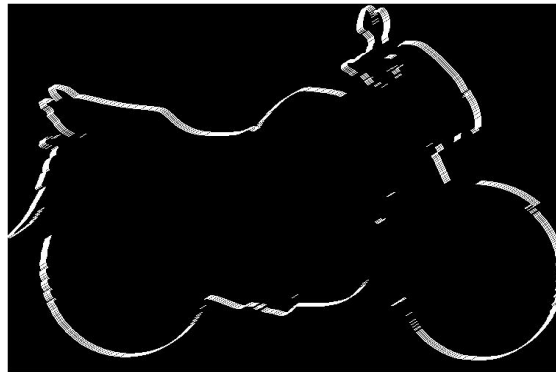
Image 2:



*Original Image*



*ACO Output*



Outer Boundary

Fig.5. Feature Extraction Stages – Bike model

**CLASSIFICATION RESULT**

The distance vector obtained is stored as a matrix. For training the classifier nearly 250 different images of car and bike models are chosen and their distance vectors are saved in the same mat file thus creating a matrix of size 250 X 72.

	1	2	3	4	5	6	7	8	9
1	44	0	43.8406	63.6396	73.7902	44	0	44	6
2	38	85.3815	48.0833	39.5980	69.3181	38	0	38	3
3	63	104.3552	86.2670	65.0538	125.2198	63	0	63	6
4	45	69.5701	65.0538	50.9117	87.2067	45	0	45	5
5	38	0	56.5685	70.7107	107.3313	38	0	38	7
6	39	94.8683	36.7696	94.7523	71.5542	39	0	39	9
7	29	120.1666	25.4558	52.3259	38.0132	29	60.8276	29	5
8	48	60.0833	22.6274	100.4092	33.5410	48	60.8276	48	10
9	47	0	42.4264	65.0538	120.7477	47	0	47	6
10	27	120.1666	52.3259	26.8701	76.0263	27	103.4070	27	2

A predefined class is specified for the corresponding row vector.

The graphs corresponding to the distance vector of car and bike variants are shown below:

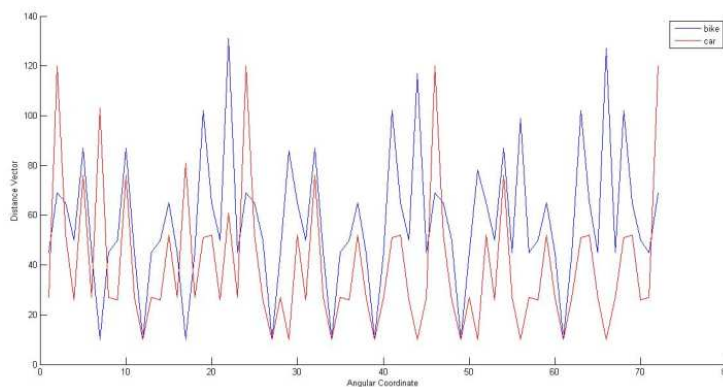


Fig.6. Distance Vector variation

Test image values are fed as a row vector of 72 values. In order to get a more accurate result, the number of training set can be increased. Once all the training set has been fed to the classifier, the Bayesian parameters are well set in the classifier. Now if the vector corresponding to the actual object is presented to the classifier, based on the training parameters the corresponding class is predicted.

## CONCLUSION

A classification technique that uses an optimized method for feature detection and lucid approach for feature extraction is developed. Ant Colony Optimization technique, with its greater average predictive accuracy than other optimization and data mining techniques, proves to determine the features in the image with near accuracy. It optimizes the external illumination variations and provides a standard result. The feature extraction technique that extracts the distance vectors from the edges detected from the ACO, provides a simple and elegant solution. The classification of the object from the distance vector created is effected with the help of the Bayesian Classifier. This probabilistic model gives better classification results with less error.

Various input dataset spanning across different classes of images are given as input to the algorithm. The outputs obtained at each step of the algorithm is captured. Input images include objects belonging to different class but has close outline resemblance. The effective working of the algorithm is checked with such input images and it is verified to be executing without any misconception errors.

## REFERENCES

- [1] M. Dorigo, V. Maniezzo, and A. Coloni, Ant System: "Optimization by a Colony of Cooperating Agents", *IEEE Transactions on Systems, Man and Cybernetics* - 1996.
- [2] Dengfeng Xu, Liping Fu and Dengfeng Xu, "Ant Colony Optimization and Its Applications", *IEEE Transactions on Intelligent Techniques and Soft Computing* – 2009.
- [3] Y. Tyagi, T. A. Puntambekar, PreetiSexena and Sanjay Tanwani, "A Hybrid Approach to Edge Detection using Ant Colony Optimization and Fuzzy Logic", *International Journal of Hybrid Information Technology* Vol. 5, No. 1, January, 2012.
- [4] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- *International Journal of Engineering Science and Technology (IJEST)*, Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [5] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, *Electrical Engineering*, Vol.93 (3), pp.167-178, September 2011.
- [6] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- *Iranian Journal of Electrical & Electronic Engineering*, Vol.8 (3), pp.259-267, September 2012.
- [7] M Ramoni, P Sebastiani, "Robust Bayes Classifiers", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2001.
- [8] Anna Veronica Bateria et al., "Image Edge Detection Using Ant Colony Optimization", *International Journal of Circuits systems and signal processing*, Issue 2, Volume 4 (2010).
- [9] Marco Dorigo, Mauro Birattari, and Thomas Stutzle, "Ant Colony Optimization Artificial Ants as a Computational Intelligence Technique", *IEEE COMPUTATIONAL INTELLIGENCE MAGAZINE* | NOVEMBER 2006.
- [10] MATLAB – 1984-2009 The Mathworks Inc., Statistics Toolbox- NaiveBayes Classification.
- [11] Duan Wei ,Lu Xiang-yang, " Weighted Naive Bayesian Classifier Model Based on Information Gain", *International Conference on Intelligent System Design and Engineering Application (ISDEA)*, 2010.

## RTPG BASED BUILT IN SELF TEST FOR TEST COMPRESSION

*D. Ramya<sup>1</sup>, R. Vanithamani<sup>1</sup>, D. Yasmin<sup>1</sup>, and K. Elamathi<sup>2</sup>*

<sup>1</sup>PG Scholar, Dept of ECE, P.A.College of Engineering and Technology, Pollachi, India

<sup>2</sup>Assistant Professor, Muthayammal Engineering College, Rasipuram, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Built In Self Test (BIST) is used to test the working functions of IC circuit and it is one of the merit in IC's to check all the working functions inside the IC circuit. And one of the other cons of BIST is it does not need any other additional device or circuit to test the functions of IC as it has additional power and additional circuit than other devices. Thus BIST reduces the power consumption of addition circuit by consuming considerable power. There is no solution to overcome the problem of consumption of larger power even there are vast methods to reduce consumption of power. But one of the best existing power reduction method in BIST is PRPG, as it gives pseudo Random patterns to test. But it also produce considerable power consumption due to toggling and repetition of patterns. Therefore we can use RTPG to overcome the drawbacks of toggling and repetition in PRPG. RTPG is the Random Test Pattern Generator uses Multiple in Input Signature Register (MISR) in order to reduce the repetition. So the power consumption can be reduced by reducing the pattern in our proposed system.

**KEYWORDS:** BIST (Built In Self Test), PRPG, Multiple in input Signature Register, Design For Testability (DFT), RTPG, VLSI chips.

### INTRODUCTION

Invention of transistor was the driving factor of growth in the Very Large Scale Integration (VLSI) technology. Integrated circuit is the circuit in which all the passive and active components are fabricated into a single chip. Initially the integrated chip could accommodate only a few components. As the days passed, the device become more complex and require more number of circuits which made the device look bulky. Instead of accommodating more circuits in the system, an integration technology was developed to increase the number of components that are to be placed on a single chip. This technology not only helped to reduce the size of the device but also improved their speed.

Tests are applied at several steps in the hardware manufacturing flow and for certain products, may also be used for hardware maintenance in the customer's environment. The tests are generally driven by test programs that execute using automatic test equipment (ATE) or, in the case of system maintenance, inside the assembled system itself. In addition to finding and indicating the presence of defects (i.e., the test fails), tests may be able to log diagnostic information about the nature of the encountered test fails. The diagnostic information can be used to locate the source of the failure.

It is really difficult to test digital circuits as a bulky amount of test data have to be delivered to the circuit under test (CUT). It is more difficult to test VLSI chips, because of their complicated functionality and size caused by increased integration levels of VLSI chips. Testing of VLSI chips are expensive. The two important factors to contribute the test cost are the test data volume and test power.

### EXISTING SYSTEM

Built-In-Self-test (BIST) is a design-for-test (DFT) methodology in which the testing logic to detect faulty chips is built inside the chip. BIST possess reduced test development time, low test application time, eliminating the need for high-speed

hardware testers, provision for at-speed tests, in-field test capability, and high fault coverage. Power dissipation during scan-based tests is higher than the normal operation of the circuit due to increased switching activity. Power dissipation during scan-based tests is higher than the normal operation of the circuit due to increased switching activity.

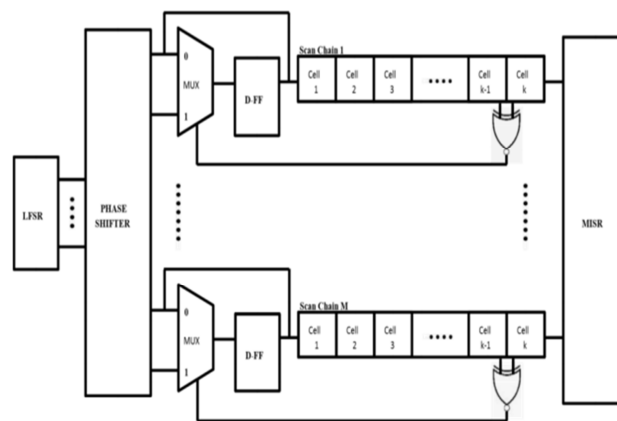
### DISADVANTAGES OF EXISTING SYSTEM

- It consumes high power
- Repetition of patterns in the test
- Pattern is not checked before processing
- Slower fault detection
- Low quality testing

### PROPOSED SYSTEM

A new technique is applied to get low shift power RTPG to improve the trade-off between test coverage loss and shift power reduction in logic. To get the required tradeoff, an additional hardware module named transition controller is implemented by which the adjacent test vector's correlation is increased. To calculate the power consumption during scanning, weighted transition by adjacent test patterns is selected. During shift mode the previous test responses in scan flip flops are given as feedback to a transition controller which is capable of generating highly correlated test patterns so that the switching activity will reduce.

### BLOCK DIAGRAM



*Fig. 1 Block Diagram*

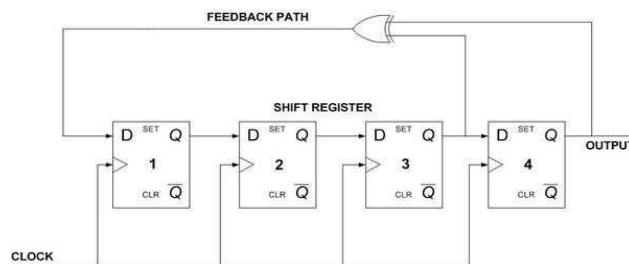
### LINEAR FEEDBACK SHIFT REGISTER

The XOR gate provides feedback to the register that shifts bits from left to right. The maximal sequence consists of every possible state except the "0000" state is called linear-feedback shift register (LFSR). A linear-feedback shift register (LFSR) is a shift register whose input bit is a linear function of its previous state. The most commonly used linear function of single bits is XOR. Thus, an LFSR is most often a shift register whose input bit is driven by the XOR of some bits of the overall shift register value.

The initial value of the LFSR is called the seed, and because the operation of the register is deterministic, the stream of values produced by the register is completely determined by its current (or previous) state. Likewise, because the register has a finite number of possible states, it must eventually enter a repeating cycle. An LFSR with a well-chosen feedback function can produce a sequence of bits which appears random and which has a very long cycle.

The function is an affine map, not strictly a linear map, but it results in an equivalent polynomial counter whose state is the complement of the state of an LFSR. A state with all ones is illegal when using an XNOR feedback, in the same way as a state with all zeroes is illegal when using XOR. This state is considered illegal because the counter would remain "locked-up" in this state. The sequence of numbers generated by an LFSR or its XNOR counter part can be considered a binary numeral system just as valid as Gray code or the natural binary code. The arrangement of taps for feedback in an LFSR can be expressed infinite field arithmetic as  $\text{apolynomialmod2}$ . This means that the coefficients of the polynomial must be 1's or 0's. This is called the feedback polynomial or reciprocal characteristic polynomial.

LFSR can be implemented in hardware, and this makes them useful in applications that require very fast generation of a pseudo-random sequence, such as direct-sequence spread spectrum. LFSRs have also been used for generating an approximation of white noise in various programmable sound generators.



**Fig. 2 Linear Feedback Shift Register**

## PHASE SHIFTER

Phase shifters are used to change the transmission phase angle of a network. Ideal phase shifters provide low insertion loss, and equal amplitude (or loss) in all phase states. While the loss of a phase shifter is often overcome using an amplifier stage, the less loss, the less power that is needed to overcome it. Most phase shifters are reciprocal networks, meaning that they work effectively on signals passing in either direction. Phase shifters can be controlled electrically, magnetically or mechanically. Most of the phase shifters described on this web site is passive reciprocal networks; we will concentrate mainly on those that are electrically controlled.

While the applications of microwave phase shifters are numerous, perhaps the most important application is within a phased array antenna system (a.k.a. electrically steerable array, or ESA), in which the phase of a large number of radiating elements are controlled to force the electro-magnetic wave to add up at a particular angle to the array.

## SCAN CHAIN

Scan chain is a technique used in design for testing. The objective is to make testing easier by providing a simple way to set and observe every flip flop in an IC. The basic structure of scan includes the following set of signals in order to control and observe the scan mechanism. Scan-in and scan-out define the input and output of a scan chain. In a full scan mode usually each input drives only one chain and scan out observe one as well. A scan enable pin is a special signal that is added to a design. When this signal is asserted, every flip-flop in the design is connected into a long shift register.

Clock signal which is used for controlling all the FFs in the chain during shift phase and the capture phase. An arbitrary pattern can be entered into the chain of flip-flops, and the state of every flip-flop can be read out. In a full scan design, automatic test pattern generation (ATPG) is particularly simple. No sequential pattern generation is required - combinatorial tests, which are much easier to generate, will suffice. If we have a combinatorial test, it can be easily applied. Assert scan mode, and set up the desired inputs.

De-assert scan mode, and apply one clock. Now the results of the test are captured in the target flip-flops. Re-assert scan mode, and see if the combinatorial test passed. In a chip that does not have a full scan design i.e., the chip has sequential circuits, such as memory elements that are not part of the scan chain, sequential pattern generation is required. Test pattern generation for sequential circuits searches for a sequence of vectors to detect a particular fault through the space of all possible vector sequences.

Even a simple stuck-at fault requires a sequence of vectors for detection in a sequential circuit. Also, due to the presence of memory elements, the controllability and observability of the internal signals in a sequential circuit are in general much

more difficult than those in a combinational logic circuit. These factors make the complexity of sequential ATPG much higher than that of combinational ATPG.

### MULTIPLE INPUT SIGNAL REGISTER

A serial-input signature register can only be used to test logic with a single output. We can extend the idea of a serial-input signature register to the multiple-input signature register (MISR). There are several ways to connect the inputs to both types (type 1 and type 2) of LFSRs to form an MISR. Since the XOR operation is linear and associative, so that  $(A \oplus B) \oplus C = A \oplus (B \oplus C)$ , as long as the result of the additions are the same then the different representations are equivalent. If we have an  $n$ -bit long MISR we can accommodate up to  $n$  inputs to form the signature. If we use  $m < n$  inputs we do not need the extra XOR gates in the last  $n - m$  positions of the MISR.

Multiple-input signature register (MISR). This MISR is formed from the type 2 LFSR (with  $P^*(x) = 1 - x^2 - x^3$ ) by adding XOR gates  $xor\_i1$ ,  $xor\_i2$ , and  $xor\_i3$ . This 3-bit MISR can form a signature from logic with three outputs. If we only need to test two outputs then we do not need XOR gate,  $xor\_i3$ , corresponding to input.

There are several types of BIST architecture based on the MISR. By including extra logic we can reconfigure an MISR to be an LFSR or a signature register; this is called a built-in logic block observer (BILBO). By including the logic that we wish to test in the feedback path of an MISR, we can construct circular BIST structures. One of these is known as the circular self-test path (CSTP).

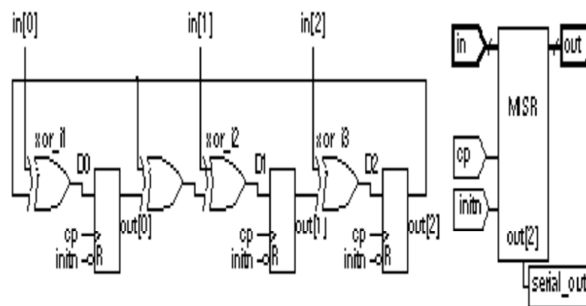


Fig. 3 Multiple Input Signal Register

We can test compiled blocks including RAM, ROM, and data path elements using an LFSR generator and a MISR. To generate all  $2^n$  address values for a RAM or ROM we can modify the LFSR feedback path to force entrance and exit from the all-zeros state. This is known as a complete LFSR. The pattern generator does not have to be an LFSR or exhaustive.

### SCAN CELLS IN RTPG

In normal RTPG the test vectors generated is passing directly to the scan chains which results in high switching activity. In our work, we have included a transition controller by which the adjacent test vector's correlation is increased. Scan cells in RTPG is used to test the cells in the chip which are working in a prescribed manner. Each scan cells denotes the gates in the chip. This cells are checked through the inputs from the linear feedback shift register. Between each scan cell, shift registers are used to shift the input.

### FAULT COVERAGE

A fault represents the defect existing in a physical condition, which causes a circuit to fail to perform in a desired manner. A test vector is an input pattern that can produce a different output response in a faulty circuit from that of the fault-free circuit. Structural testing cannot guarantee detection of all possible manufacturing defects, as the test vectors are generated based on specific fault models.

Fault models provide a quantitative measure of the fault-detection capabilities of a given set of test vectors for a targeted fault model and this measure is called fault coverage and is defined as:

$$\text{Fault coverage} = \frac{\text{Detected faults}}{\text{Total faults}}$$

The test result obtained from Cadence Encounter Test and Diagnostics tool consists of two types of test coverage (fault coverage), i.e., test coverage ( $T_{cov}$ ) and adjusted test coverage ( $A_{Tcov}$ ) and are defined as:

$$A_{Tcov} = \frac{\# \text{ Tested faults}}{\# \text{ Total faults} - \text{Redundant faults}}$$

Redundant faults does not deviate the functionality of the circuit and this faults cannot be detected by any test vector. Therefore it can be removed from the circuit by optimization. So  $A_{Tcov}$  is more useful in practice because it holds in consideration that redundant faults can be expressed in more than one form, so the measure is more accurate.

**TRANSITION CONTROLLER**

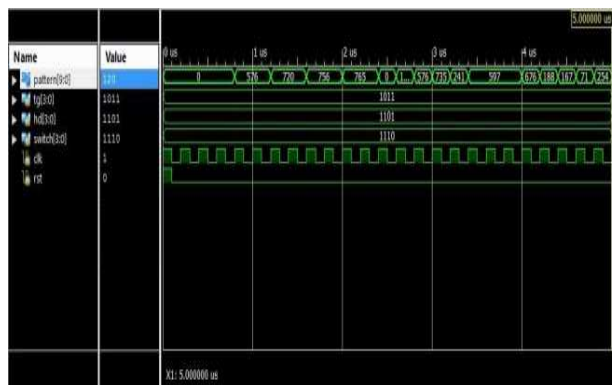
The transition controller composed of a multiplexer, a XNOR gate and a D-flip-flop. The inputs of the XNOR gate is driven by the outputs of last two scan cells in the same scan chain,  $SC_{k-1}$  and  $SC_k$ . The output of the XNOR gate connects to multiplexer select input. To simplify discussion assume that there is no inversion between  $SC_k$  and  $SC_{k-1}$ . When  $SC_k$  and  $SC_{k-1}$  have different values, the value implied at the XNOR gate output is 0 and it causes the D-FF hold its previous value. Otherwise, the DFF will be updated by the phase shifter output. The value changes based on the last two cells as it is different it gives previous value, otherwise the same value is given as the input.

**IMPLEMENTATION OF ADAPTIVE LOW POWER RTPG**

Adaptive low power RTPG is used for shift power reduction in basic BIST (Built In Self Test). The implementation steps for low power RTPG are:

- Step1: Generate scan chain for ISCAS'89 circuits by applying DFT constraints.
- Step2: Generate netlist and ATPG files for the CUT.
- Step3: Find out the Test Coverage and generate test pattern the Benchmark circuits without transition controller.
- Step4: Modify the netlist to incorporate the Transition Controller circuit and find out the Test Coverage and generate test patterns of the benchmark circuits.
- Step5: Determine the WTM.

**IMPLEMENTATION AND RESULT**



*Fig. 4 output of the RTPG based test compression*

The figure shows the output of the RTPG based test compression .the pattern which are generated is implemented through checking MISR circuit. The output is checked for repetition in certain clock pulses and the repetition are neglected. The pattern which are generated before the checking is neglected in the final generation of pattern which are represented in the figure as dots.

Device Utilization Summary				
Logic Utilization	Used	Available	Utilization	Note(s)
Number of Slice Flip Flops	68	20,480	1%	
Number of 4 input LUTs	41	20,480	1%	
Number of occupied Slices	44	10,240	1%	
Number of Slices containing only related logic	44	44	100%	
Number of Slices containing unrelated logic	0	44	0%	
Total Number of 4 input LUTs	41	20,480	1%	
Number used as logic	31			
Number used as Shift registers	10			
Number of bonded IOBs	12	320	3%	
Number of BUFG/BUFGCTRLs	1	32	3%	
Number used as BUFGs	1			
Average Fanout of Non-Clock Nets	2.63			

Fig. 5 device utilization in RTPG

The above figure shows the device utilization in RTPG. The device utilization is low compared to the existing system. The existing system will use 61 number of LUTs for the process. The proposed will use 41 LUTs instead of 61.this shows that the proposed system consumes very low utilization than the existing system. Thus the power consumption is lower than the existing system.

Device	On-Chip Power (W)	Used	Available	Utilization (%)	Supply Summary	Total	Dynamic	Quiescent		
Family	Virtex4	Clocks	0.005	1	---	Source	Voltage	Current (A)	Current (A)	
Part	xc4vs25	Logic	0.000	41	20480	Vccint	1.200	0.148	0.004	0.144
Package	1668	Signals	0.000	74	---	Vccaux	2.500	0.062	0.000	0.062
Temp Grade	Commercial	DCMs	0.000	0	4	Vcco25	2.500	0.001	0.000	0.001
Process	Typical	IOs	0.000	12	320					
Speed Grade	-12	Leakage	0.331							
		Total	0.336			Supply Power (W)	Total	Dynamic	Quiescent	
							0.336	0.005	0.331	
Environment										
Ambient Temp (C)	50.0				Effective TjA	Max Ambient	Junction Temp			
Use custom TjA	No	Thermal Properties	(C/W)	(C)	(C)					
Custom TjA (C/W)	NA		8.7	82.1	52.9					
Airflow (LFM)	250									

Fig. 6 power consumption of the proposed system

This shows that the power consumption of the proposed system. The proposed system will consumes the power of 0.336.the power in this is small compared to the existing system. The existing will consumes the power of 0.338 which is higher than the proposed system. So the proposed system is very efficient than the all other existing system.

**CONCLUSION AND FUTURE WORK**

In this paper, lower test power in shift mode is achieved by introducing a transition controller module which is capable of generating highly correlated test vectors depending upon the previous switching activities in the scan chain during shift mode. The architecture improves the trade-off between test coverage and shift power. Shift power is reduced considerably with a negligible test coverage loss so that the high power dissipation effects in CUT can be reduced. Since the transition controller covers a negligible portion of chip area, the burden of area overhead can be avoided. RTPG is implemented instead of PRPG. This reduces the power consumption and repetition of test patterns. This reduction in repetition allows low time consumption and reduced system complexity. RTPG is the Random Test Pattern Generator which is used to reduce the repetition by using Multiple Input Signature Register (MISR). MISR avoids repetition of patterns. RTPG achieves the shift

power ranges from 37.2% to 47.6% for the given circuit with small area penalty. By reducing the test pattern the power consumption is reduced. Thus by using our proposed system the power consumption is reduced.

In this project, the repeated patterns are reduced by using MISR which compares the previous test patterns and produced test pattern for certain cycles. In the scan chain toggling and repetitions can be reduced by using algorithms. Though it reduces the repeated patterns there is also repetition for a maximum of two or three times which is not able to be avoided so the power consumption for this pattern is unavoidable. So in future work, the repetition of the maximum two should be avoided so that the power consumption for this pattern is reduced considerably. Though it reduces power consumption of additional circuit it also consumes considerable power. Hence, in future a suitable circuit can be designed to reduce the power consumption to very low level.

## REFERENCES

- [1] A.S. Abu- Issa and S.F.Qyigely, "Bit-swapping LFSR for low power BIST ", *Electron Lett*, vol. 44, no.6, pp. 401-402, Mar 2008.
- [2] Chao Wang, "BIST Methodology, Architecture and Circuits for Pre-Bond TSV Testing in 3D Stacking IC Systems Senior Member, IEEE.
- [3] Daniel Arumí, Rosa Rodríguez-Montañés, and Joan Figueras, "Prezbond Testing of Weak Defects in TSVs" Member, IEEE.
- [4] S.Gerstendorfer and H.Wunderlich, "Minimised power consumption for scan-based BIST," in *Proc. Int. Test Conf. (ITC)*, 1999, pp. 77-84.
- [5] A.Hertwig and H.J.Wunderlich, "Low power built-in self-test." in *Proc. Eur. Test Workshop. (ETS)*, May 1998, pp. 49-53.
- [6] B.Koenemann, "LFSR-coded test patterns for scan designs," in *Proc. Eur. Test Workshop. (ETS)*, May 1998, pp. 237-242.
- [7] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING*, Vol.63 (6), pp.365-372, Dec.2012.
- [8] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, *Electric Power Components and Systems*, Vol.39 (8), pp.780-793, May 2011.
- [9] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [10] Michał Filipek, Grzegorz Mrugalski, Senior Member, IEEE, Nilanjan Mukherjee, Senior Member, IEEE, "Low-Power Programmable PRPG With Test Compression Capabilities" vol.23,no.6,June 2015
- [11] Mukesh Agrawal, Student Member, IEEE, Krishnendu Chakrabarty, and Bill Eklow, A Distributed, Reconfigurable, and Reusable BIST Infrastructure for Test and Diagnosis of 3D-Stacked ICs Fellow IEEE.
- [12] Shao-Feng Hung, Student Member and Hao-Chiao Hong, "A Fully Integrated BIST & ADC Using the In-Phase and Quadrature Waves Fitting Procedure" Senior Member IEEE.
- [13] X.Zhang and K.Roy, "Power reduction in test-per-scan BIST," in *Proc. 6<sup>th</sup> IEEE Int. On-line Test. Workshop (OLTW)*, Jul. 2000, pp. 133-138.

## BIBLIOGRAPHY



D. Ramya is pursuing Master of Engineering in VLSI Design at P.A.College of Engineering and Technology. She completed her Bachelor of Engineering in Electronics and Communication in 2016 at P.A.College of Engineering and Technology. Her area of interest are digital electronics and computer networks.



R. Vanithamani is pursuing Master of Engineering in VLSI Design at P.A.College of Engineering and Technology. She completed her Bachelor of Engineering in Electronics and Communication in 2016 at SCAD Institute of Technology. Her area of interest are low power VLSI and Embedded system.



D. Yasmin is pursuing master of engineering in VLSI Design at P.A.College of engineering and Technology. She completed her Bachelor of Engineering in Electronics and Communication in 2016 at Muthayammal Engineering of College. Her area of interest are VLSI and Embedded system.



K. Elamathi, Assistant Professor in Muthayammal Engineering College. Has completed Bachelor of Engineering in Electronics and Communication in 2011 and Master of Engineering in 2013. Area of intrest of Embedded System Technologies.

## VLSI Implementation of Compression Engine using DWT/IDWT for JPEG 2000 in VHDL

*P.S. Neethu<sup>1</sup> and B. Gowri Shankari<sup>2</sup>*

<sup>1</sup>Assistant Professor, Electronics and Communication engineering, New Prince Shri Bhavani College of Engineering and Technology, Chennai – 600072, Tamil Nadu, India

<sup>2</sup>Assistant Professor, Electrical and Electronics engineering, New Prince Shri Bhavani College of Engineering and Technology, Chennai – 600072, Tamil Nadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** This paper presents an approach towards VLSI implementation of the Discrete Wavelet Transform (DWT) for image compression. The design follows the JPEG2000 standard and can be used for both lossy and lossless compression. In order to reduce complexities of the design, linear algebra view of DWT and IDWT has been used in this paper. This design can be used for image compression in a robotic system.

**KEYWORDS:** discrete wavelet transforms (DWT); image compression; thresholding; VLSI design; JPEG 2000.

### 1 INTRODUCTION

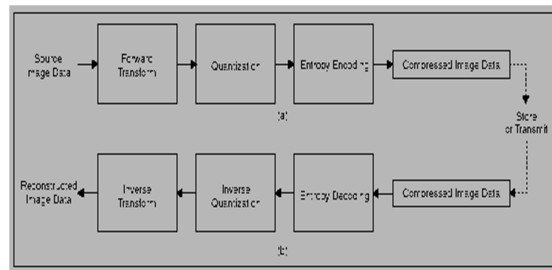
Microchips are complex, tiny modules that provide logic circuitry or store computer memory. A chip is manufactured from a wafer of silicon (or, in some special cases, a sapphire), which is first cut to size and then etched with circuits and electronic devices. A chip is also sometimes called an IC or integrated circuit. VLSI (Very Large Scale Integration) is the level of microchip miniaturization and refers to microchips containing hundreds of thousands of transistors. Many special-purpose chips, known as application-specific integrated circuits, are being made today for automobiles, home appliances, telephones, and other devices.

Digital design was a manual process of designing and capturing circuits using schematic entry tools in the earlier days. With the advent of VLSI technology designers could design single chips using more number of transistors. Because of the complexity of these circuits, it was not possible to verify these circuits on a breadboard. Computer aided techniques became critical for verification and design of VLSI digital circuits. Programs to do automatic placement and routing of circuit layouts also become popular. In the digital design field, designers felt the need for a standard language to describe digital circuits.

Thus Hardware Description Languages came into existence. These are software-programming languages used to model the intended operation of a piece of hardware. Though HDLs were very popular for logic verification, designers had to manually translate the HDL based design into a schematic circuit with interconnections between gates. The advent of logic synthesis pushed the HDLs into the forefront of digital design. Designers could describe complex circuits at an abstract level in terms of functionality and dataflow by designing those circuits in HDLs. Logic synthesis tools would implement the circuit in terms of gates and gate interconnections. A common design is to design each IC chip, using an HDL, and then verify system functionality via simulation. A product is any electronic equipment containing Application-Specific Integrated Circuits (ASICs) or Field-Programmable Gate-Arrays (FPGA).

## 2 DWT ALGORITHM

### 2.1 THE JPEG 2000 COMPRESSION ENGINE



**Figure: 1 The JPEG 2000 Compression Engine**

At the encoder, the discrete transform is first applied on the source image data. The transform coefficients are then quantized and entropy coded before forming the output code stream (bit stream). The decoder is the reverse of the encoder. The code stream is first entropy decoded, dequantized, and inverse discrete transformed, thus resulting in the reconstructed image data. Although this general block diagram looks like the one for the conventional JPEG, there are radical differences in all of the processes of each block of the diagram. A quick overview of the whole system is as follows:

- The source image is decomposed into components.
- The image components are (optionally) decomposed into rectangular tiles. The tile-component is the basic unit of the original or reconstructed image.
- A wavelet transform is applied on each tile. The tile is decomposed into different resolution levels.
- The decomposition levels are made up of sub bands of coefficients that describe the frequency characteristics of local areas of the tile components, rather than across the entire image component.
- The sub bands of coefficients are quantized and collected into rectangular arrays of “code blocks.”
- The bit planes of the coefficients in a code block (the bits of equal significance across the coefficients in a code block) are entropy coded.
- The encoding can be done in such a way that certain regions of interest can be coded at a higher quality than the background.
- Markers are added to the bit stream to allow for error resilience.
- The code stream has a main header at the beginning that describes the original image and the various decomposition and coding styles that are used to locate, extract, decode and reconstruct the image with the desired resolution, fidelity, region of interest or other characteristics.

We have decomposed the whole compression engine into three parts: the pre-processing, the core processing, and the bit-stream formation part, although there exist high inter-relation between them. In the pre-processing part the image tiling, the dc-level shifting and the component transformations are included. The core processing part consists of the discrete transform, the quantization and the entropy coding processes. Finally, the concepts of the precincts, code blocks, layers, and packets are included in the bit-stream formation part.

#### 2.1.1 IMAGETILING

The term “tiling” refers to the partition of the original (source) image into rectangular non-overlapping blocks (tiles), which are compressed independently, as though they were entirely distinct images. All operations, including component mixing, wavelet transform, quantization and entropy coding are performed independently on the image tiles (Fig. 2). The tile component is the basic unit of the original or reconstructed image. Tiling reduces memory requirements, and since they are also reconstructed independently, they can be used for decoding specific parts of the image instead of the whole image. All tiles have exactly the same dimensions, except maybe those at the boundary of the image. Arbitrary tile sizes are allowed, up to and including the entire image (i.e., the whole image is regarded as one tile). Components with different sub sampling

factors are tiled with respect to a high-resolution grid, which ensures spa-tial consistency on the resulting tile components. In other words, larger tiles perform visually better than smaller tiles. Image degradation is more severe in the case of low bit rate than the case of high bit rate. It is seen, for example, that at 0.125 b/p there is a quality difference of more than 4.5 dB between no-tiling and tiling at 64 x64, while at 0.5 b/p this difference is reduced to approximately 1.5 dB

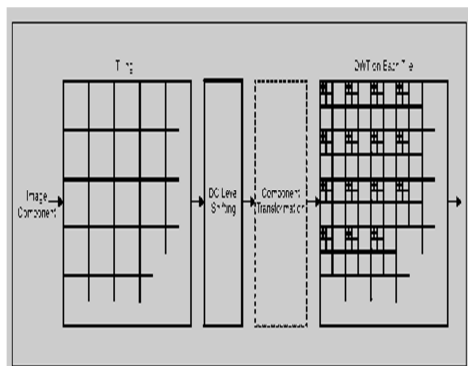


Figure: 2 Image Tiling

2.1.2 DC LEVEL SHIFTING

Prior to computation of the forward discrete wavelet transform (DWT) on each image tile, all samples of the image tile component are dc level shifted by subtracting the same quantity  $2^{P-1}$ , where P is the component’s precision. DC level shifting is performed on samples of components that are unsigned only. Level shifting does not affect variances. It actually converts an unsigned representation to a two’s complement representation, or vice versa.

2.1.3 COMPONENT TRANSFORMATIONS

JPEG 2000 supports multiple component images. Different components need not have the same bit depths nor need to all be signed or unsigned]. For reversible (i.e., lossless) systems, the only requirement is that the bit depth of each output image component must be identical to the bit depth of the corresponding input image component. Component transformations improve compression and allow for visually relevant quantization.

The standard supports two different component transformations, one irreversible component transformation (ICT) that can be used for lossy coding and one reversible component transformation (RCT) that may be used for lossless or lossy coding, and all this in addition to encoding without colour transformation. The block diagram of the JPEG 2000 multicomponent encoder is depicted in Fig. 3. (Without restricting the generality, only three components are shown in the figure. These components could correspond to the RGB of a colour image.

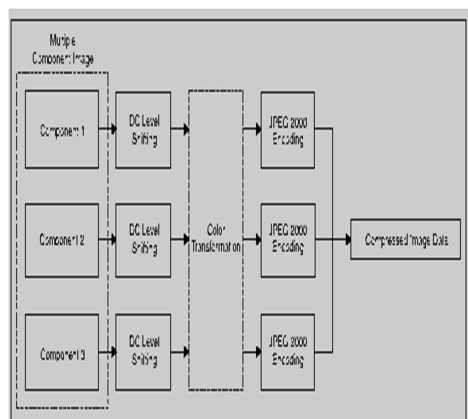


Figure: 3 JPEG 2000 Multicomponent Encoder Image Tiling

Since the RCT may be used for lossless or lossy coding, it may only be used with the 5/3 reversible wavelet transform. The RCT is a decorrelating transformation, which is applied to the three first components of an image. Three goals are achieved by this transformation, namely, colour decorrelation for efficient compression, reasonable colour space with respect to the human visual system for quantization, and ability of having lossless compression, i.e., exact reconstruction with finite integer precision.

**2.1.4 CORE PROCESSING**

Wavelet transform is used for the analysis of the tile components into different decomposition levels. These decomposition levels contain a number of subbands, which consist of coefficients that describe the horizontal and vertical spatial frequency characteristics of the original tile component. In Part I of the JPEG 2000 standard only power of 2 decompositions are allowed in the form of dyadic decomposition as shown in Fig. 6 for the image "Lena". To perform the forward DWT the standard uses a one-dimensional (1-D) subband decomposition of a 1-D set of samples into low-pass and high-pass samples. Low-pass samples represent a down-sampled, low-resolution version of the original set. High-pass samples represent a down-sampled residual version of the original set, needed for the perfect reconstruction of the original set from the low-pass set. The DWT can be irreversible or reversible. The default irreversible transform is implemented by means of the Daubechies 9-tap/7-tap filter [4]. The analysis and the corresponding synthesis filter coefficients in Table 3. The default reversible transformation is implemented by means of the Le Gall 5-tap/3-tap filter. The standard can support two filtering modes: convolution based and lifting based.

Convolution-based filtering consists in performing a series of dot products between the two filter masks and the extended 1-D signal. Lifting-based filtering consists of a sequence of very simple filtering operations for which alternately odd sample values of the signal are updated with a weighted sum of even sample values, and even sample values are updated with a weighted sum of odd sample values. For the reversible (lossless) case the results are rounded to integer values.

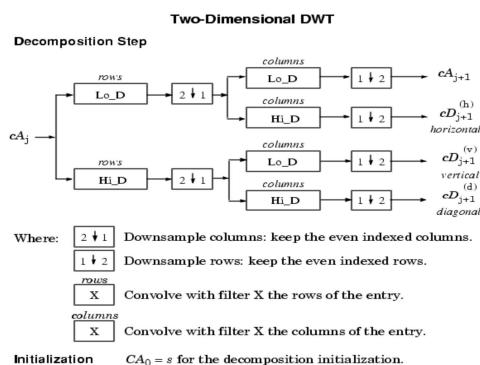
$$y(2n + 1) = x_{ext}(2n + 1) - \left\lfloor \frac{x_{ext}(2n) + x_{ext}(2n + 2)}{2} \right\rfloor$$

$$y(2n) = x_{ext}(2n) + \left\lfloor \frac{y(2n - 1) + y(2n + 1) + 2}{4} \right\rfloor$$

Where  $x_{ext}$  is the extended input signal and  $y$  is the output signal. The 5/3 filter allows repetitive encoding and decoding of an image without any loss. Of course, this is true when the decompressed image values are not clipped when they fall outside the full dynamic range (i.e., 0-255 for an 8 b/p image).

**3 BLOCK DIAGRAMS OF DWT\IDWT**

**3.1 BLOCK DIAGRAM OF DWT**



**Figure: 4 Block Diagram of DWT**

### 3.2 BLOCK DIAGRAM OF IDWT

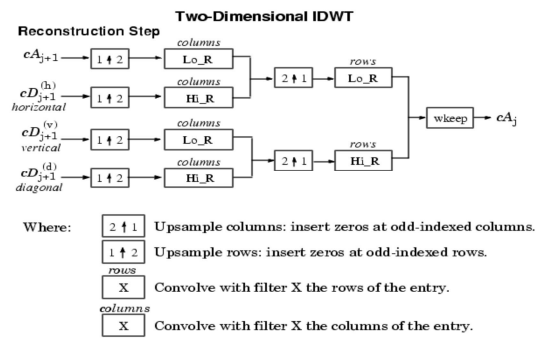


Figure:5 Block Diagram of IDWT

## 4 IMPLEMENTATION OF DISCRETE WAVELET TRANSFORMS IN VHDL

Discrete wavelet transformation (DWT) transforms discrete signal from time domain into time-frequency domain. The transformation product is set of coefficients organized in the way that enables not only spectrum analyses of the signal, but also spectral behaviour of the signal in time. This is achieved by decomposing signal, breaking it into two components, each carrying information about source signal. Filters from the filter bank used for decomposition come in pairs: low pass and high pass.

Low pass filtered signal contains information about slow changing component of the signal, looking very similar to the original signal, only two times shorter in term of number of samples. High pass filtered signal contains information about fast changing component of the signal. In most cases high pass component is not so rich with data offering good property for compression. In some cases, such as audio or video signal, it is possible to discard some of the samples of the high pass component without noticing any significant changes in signal. Filters from the filter bank are called "wavelets".

The theory is based on the fact that some signals, such as audio or video signals often carry redundant information. For instance, in a picture the neighbouring pixels often differ very slightly. The idea is to find a mathematical relation that connects neighbouring data samples (pixels) and reduces their number. The inverse process is needed to reconstruct the original. The low pass component can be subjected to another transformation of the same kind, decimating the original signal even more. This decorrelation process can be continued until we are certain that neighbouring samples differ significantly enough. This is multilevel decomposition and it holds the key to time-frequency mapping of the spectral behavior of the signal. Also, this allows even better signal compression. Standard JPEG2000 for picture compression is based on this process.

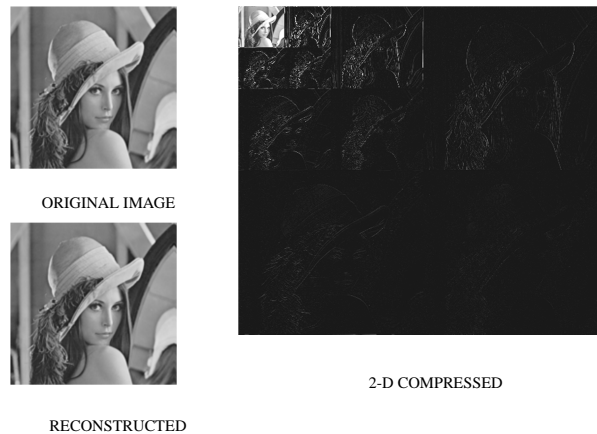
The VHDL code here implements DWT using Le Gall 5/3 filter bank. The filtering process is called "lifted", this is more efficient than conventional approach using convolution. Also, integer arithmetic is used, and hence precision with more than 8 bits is not required. Additionally, the coefficients of Le Gall filter bank filters in "lifted" filtering are multiples of 2, so division and multiplication are replaced by shifting.

The system is divided into two parts, each containing a top level entity: DWT2D and IDWT2D. DWT2D is used for direct transformation and IDWT2D for inverse transformation. The entities require external memory source, where original data and coefficients are stored. Entities DWT and IDWT perform one-dimensional DWT and IDWT of the signal, stored in external memory. These two are based on 1D\_SD and 1D\_SR filtering process from the JPEG2000 standard.

The top level entities require parameters of transformation. Picture width and height should be specified along with the alignment of the rows in memory. The parameters are written using control signals. The process begins when number of levels of transformation is specified. Signal READY indicates that entity is busy (when low) or the transformation has finished and another can begin (when high). Top level entities configure DWT and IDWT in similar way.

There are two test bench configurations. Test DWT2D and testIDWT2D. Each uses input file to initialize memory. Configuration of DWT2D or IDWT2D instances is performed, supplying size of the picture and number of levels of decomposition. The result of the operation is written to a text file by dumping memory. Data Converter application is used to transform picture from known picture formats (bmp, jpg, gif...) into textual files used as input for test bench configurations. Pixels are level shifted prior to conversion.

## 5 SIMULATION RESULTS



## 6 CONCLUSION

A model scheme for lossless image compression using DWT/IDWT for JPEG 2000 standard was successfully implemented using VHDL and the VLSI design was developed. The compression engine is capable of image decoding applications, both with integer and floating-point kernels. The customizable design allows setting the basic features of the decoder, such as maximum image size, maximum kernel length and computational precision. The synthesized decoder may be programmed to process images with different sizes, coded on a different numbers of layers and using different kernels, while always guaranteeing the correct mirroring operations at layers' borders.

By means of an on-chip cache and of a specifically optimized scheduling of operations, the decoder requires a minimum number of accesses to external memory, making it suitable for low-power embedded applications.

## REFERENCES

- [1] Multimedia communications: Applications, Protocols and standards- Fred Halsall
- [2] Discrete time speech signal processing: principles and practice- Thomas.F.Quatier
- [3] Principles of communication system second edition- Herbert Taube, Donald.L.Schilling
- [4] Digital image processing- Gonzalez and woods
- [5] Wavelet tutorials- Robipolkar,University of California
- [6] Ten Lectures on wavelets- Ingrid Daubechies
- [7] <http://homepages.cae.wisc.edu/~ece533/images/>,
- [8] C.Nagarajan and M.Madheswaran – ‘Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller’- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [9] C.Nagarajan and M.Madheswaran - ‘Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis’- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [10] C.Nagarajan and M.Madheswaran - ‘Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis’- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
- [11] C. Chakrabarti, M. Vishwanath and R. Owens, “Architectures for wavelet transforms,” VLSI Signal Processing VI, IEEE special publications
- [12] M. Vishwanath, “The recursive pyramid algorithm for the discrete wavelet transform,” IEEE Transactions on Signal Processing, vol. 42, March 1994

## VIRTUAL REALITY BASED ON HUMAN COMPUTER INTERACTION

*M. Gayathri, R. Kasthuri, K. Kayalvizhi, and J. Priyadharshini*

AP/ECE,  
Mahendra Engineering College for Women,  
Namakkal, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The main aim of this system is to implementing Virtual Touch Buttons and sliders with camera using a laptop /pc. We propose a large interactive display with Virtual touch buttons on a pale-colored flat wall. Our easy- to-install system consists of a front projector and a single commodity camera. A button touch is detected based on the area of the shadow cast by the user's hand. Background subtraction is used to extract the foreground region. The reference image for the background is continuously adjusted to match the ambient light. The Virtual sliders are based on this touch-button mechanism. When tested, our scheme proved robust to difference in illumination.

**KEYWORDS:** Virtual reality system and sliders

### 1 INTRODUCTION

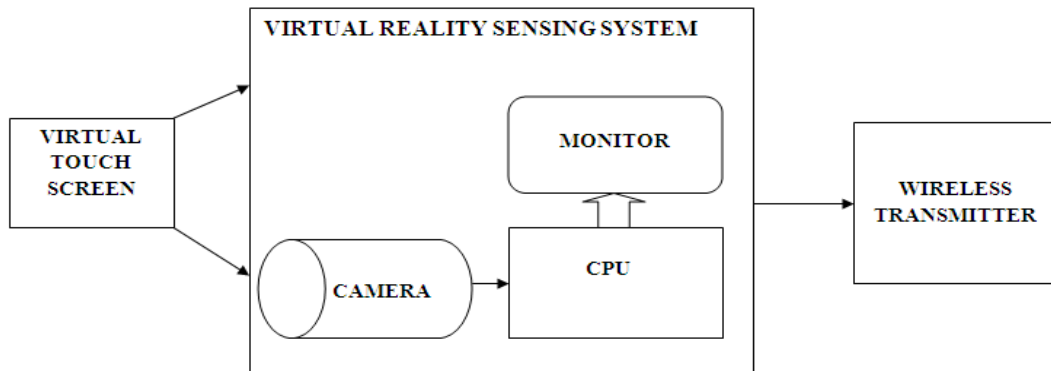
As consumer-grade digital projectors and cameras have become less expensive, many interactive projector-camera systems have been proposed. In particular, since ordinary flat walls can be used as the screen, large interactive displays can be used for digital signage and information boards in public spaces without the need for expensive touch panels. Our aim is to make large, easy-to-install, economical interactive displays; therefore, we use a front projector and a nearby camera. A hand touch on the screen is detected by the area of the shadow cast by the user's hand. The key idea is that the shadow color does not depend on the projected color. The issue is when and how to alter the button color to capitalize on this idea without sacrificing usability.

### 2 SYSTEM ARCHITECTURE

The system consists of two module-Transmitter and Receiver module. The transmitting module holds Virtual touch screen, Virtual Reality sensing system and Wireless Transmitter. The Receiver module holds Wireless Receiver, Arduino Ic and Pc. The PC which is attached to this setup will contains mouse control software which shows the control of our mouse action.

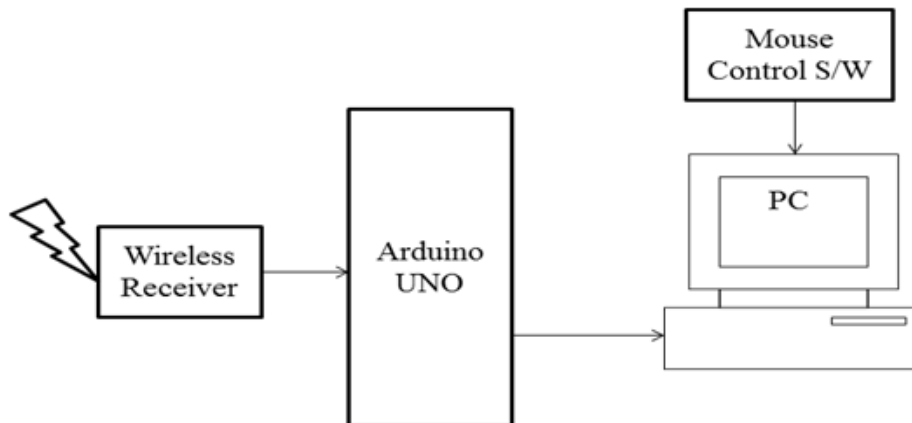
The sensing system can be detected by Track software. The result of sensing will be shown in the PC where our receiver is connected. The figure shows that the general block diagram of Virtual Reality based on Human computer Interaction. Arduino can be act as the centralized unit, because it performs all essential operations.

## 2.1 TRANSMITTER MODULE



*Fig 1: Transmitter*

## 2.2 RECEIVER MODULE

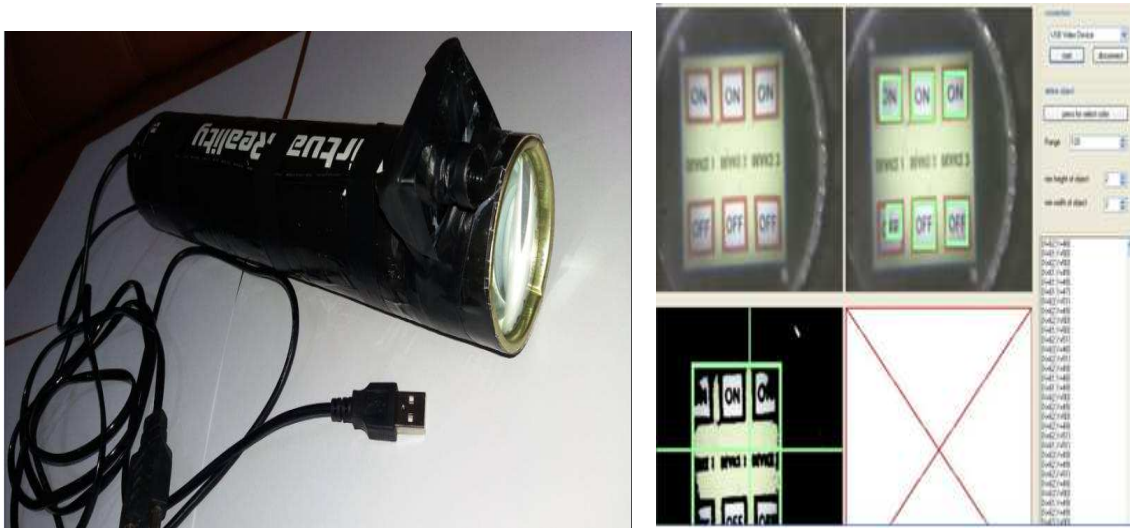


*Fig 2: Receiver*

## 2.3 VIRTUAL REALITY SYSTEM

Virtual Reality board designed to meet new forms of human-machine interaction (HMI). The advantage that enable the embedded system designer to easily, quickly and seamlessly add with the microcontroller by UART to their applications.

Virtual Reality board can easily interface with PC or Laptop by the USB driver provided. By running the setup application, you can adjust the distance by viewing the camera image available in the PC or Laptop in which the optimize interaction can done.

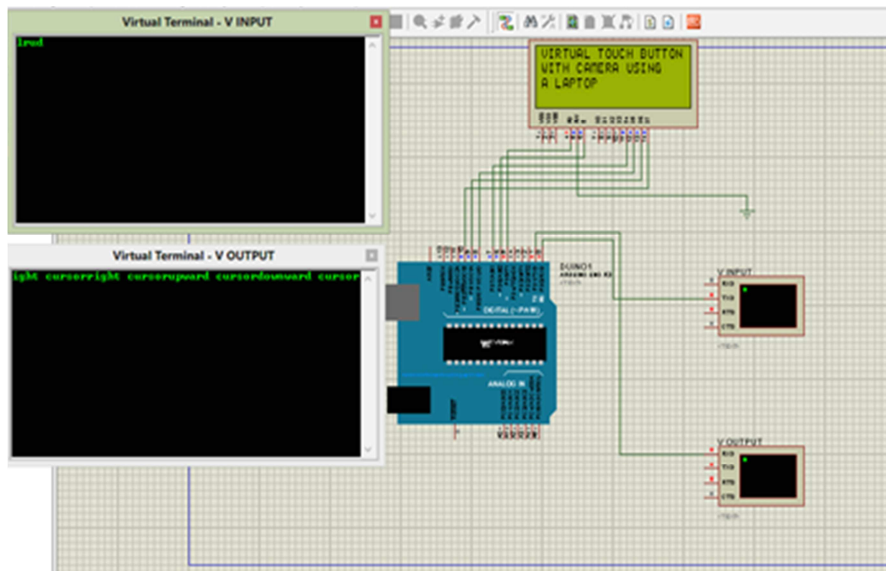


**2.4 ZIGBEE MODULE**

The Wireless transmitter and receiver using here is ZigBee modules. ZigBee devices are required to conform to the IEEE 802.15.4-2003 Low- Rate Wireless Personal Area Network standard. Its low power consumption limits transmission distances to 10–100 meters line-of- sight, depending on power output and environmental characteristics.

ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking. ZigBee has a defined rate of 250kbit/s, best suited for intermittent data transmissions from a sensor or input device.

**3 RESULT AND DISCUSSION**



*Fig 4: Proteus simulation*

The output of the virtual touch buttons can be viewed in the proteus software. While pressing the key, the output can be viewed in the virtual terminal and also displayed in the LCD display.

When we press the button keys the display will shows the direction of the mouse control where we interact with the computer.

The Embedded C code is used for moment of the mouse keys. Simultaneously the other mouse moment can be viewed in this software.

Further work will be hardware implementation of Virtual touch buttons by the usage of Virtual reality system and the zigbee module. This allows the user's to interact with the Laptops/PC virtually.

#### 4 CONCLUSION

We proposed a large interactive display named VIRTOS, with virtual touch buttons and touch sliders, which consist of a projector, a pale-colored wall, a computer, and one commodity camera as a highly practical and useful projector-camera system. In VIRTOS, a button touch is detected from the area of the shadow of the user's hand. The shadow area is segmented from the foreground (non-Projected) image by a momentary change of the button.

#### REFERENCES

- [1] Audet, S., Okutomi, M., and Tanaka, M. (2012). Augmenting Moving Planar Surfaces Interactively with Video Projection and a Color Camera. *IEEE Virtual Reality (VRW '12)*, pages 111-112.
- [2] Borkowski, S., Letessier, J., and Crowley, J. L. (2004). Spatial Control of Interactive Surfaces in an Augmented Environment. *EHCI/DS-VIS Lecture Notes in Computer Science*, vol. 3425, pages 228-244.
- [3] Borkowski, S., Letessier, J., Bérard, F., and Crowley, J.L. (2006).
- [4] User-Centric Design of a Vision System for Interactive Applications. *IEEE Conf. on Computer Vision Systems (ICVS '06)*, pages 9.
- [5] Brutzer, S., Höferlin, B., and Heidemann, G. (2011). Evaluation of Background Subtraction Techniques for Video Surveillance. *IEEE Conf. on Computer Vision and Pattern Recognition (CVPR '11)*, pages 1937-1944.
- [6] 1944.
- [7] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING*, Vol.63 (6), pp.365-372, Dec.2012.
- [8] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- *Taylor & Francis, Electric Power Components and Systems*, Vol.39 (8), pp.780-793, May 2011.
- [9] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in *ICTES'08*, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [10] Kale, A., Kenneth, K., and Jaynes, C. (2004). Epipolar Constrained User Pushbutton Selection in Projected Interfaces. *IEEE Conf. on Computer Vision and Pattern Recognition Workshops (CVPRW '04)*, pages 156-163.
- [11] Kim, S., Takahashi, S., and Tanaka, J. (2010). New Interface Using Palm and Fingertip without Marker for Ubiquitous Environment. In *Proc. of International Conf. on Computer and Information Science (ACIS'10)*, pages 819-824.
- [12] (ACIS'10), pages 819-824.
- [13] Kjeldsen R., Pinhanez C., Pingali, G., and Hartman, J. (2002). Interacting with Steerable Projected Displays. *International Conf. on Automatic Face and Gesture Recognition (FGR '02)*, pages 402-407.

## A New Approach For Reducing Ripples In Transformer-less DC DC Converter For High Power Application

S. RAJARETHINAM<sup>1</sup>, BHARATH RAJ<sup>2</sup>, R. MANOJ<sup>3</sup>, and N. JANA<sup>4</sup>

<sup>1</sup>U.G. Department of EEE, VELS University, Chennai, India

<sup>2</sup>Department of EEE, VELS University, Chennai, India

<sup>3</sup>Department of EEE, VELS University, Chennai, India

<sup>4</sup>Assistant Professor Department of EEE, VELS University, Chennai, India

---

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** A new transformer-less Buck–Boost converter with superb output voltage with fault tolerance capability is proposed in this undertaking. Compare with the traditional Buck–boost converter, the proposed buck–boost converter's voltage advantage is squared instances of the former's and its output voltage polarity is wonderful. These benefits enable it to work in a wider variety of nice output. The power switches of the proposed buck–boost converter operate synchronously. In the continuous conduction mode (CCM), two inductors are magnetized and capacitors are discharged during the transfer-on period, at the same time as two inductors are demagnetized and two capacitors are charged throughout the switch-off duration. The operating concepts, the steady-country analyses, and the small-sign version for the proposed buck–boost converter running in CCM are provided in element. The power electronics simulator (PSIM) and the circuit experiments are supplied to validate the effectiveness of the proposed buck–boost converter. Deriving a family of dual-switch of step-down dc/dc converters with fault-tolerant capability. The constraint sets within the derivation process make certain that minimum extra element is used to attain fault-tolerant operation. The operation of converters derived is flexible. Under regular operating situations, one in all the two switches can function a primary transfer to manipulate the electricity drift and the opposite switch is in stand-by mode. When a fault takes place on the main switch, the others which may be activated to provide an change present day direction to continue converter operation and hold output law. The fault-tolerant converters are derived with the aid of integrating a buck converter with a buck–boost converter.

**KEYWORDS:** Reducing Ripples, Transformer-less DC DC Converter, High Power Application.

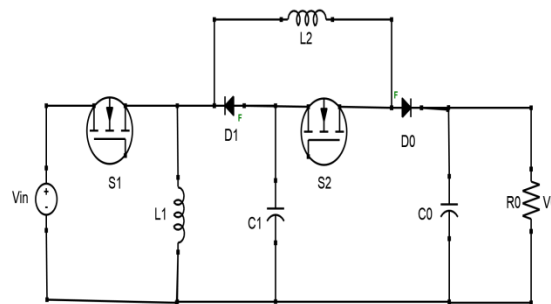
### 1 INTRODUCTION

Switching-mode power is the core of recent power conversion technology, which is widely used in electric power, communication system, household device, railway, aviation and many other domains. As the basis of switching-mode power supply, converters topologies attract a great deal of attention and many converter topologies have been proposed. Buck and boost converter have simple structure and high efficiency. However, due to the limited voltage gain, their applications are constrained when the reduced or high output voltage are needed. Converters can obtain high voltage gain by employing the voltage lift up technique, but the topological complexity, cost, volume, and losses increase at the same time Interleaved converters can achieve high step-up or step down conversion rate with low-voltage stress, while their operating mode, conversion structure, and control strategy are complicated. Quadratic converters can reach the voltage gain of cascade converters with fewer switches; however, the efficiency of these converters are low. Additionally, some switched networks are added into the basic converters to obtain the high-voltage step-up or step-down gain, at the price of complicating construction and increasing cost. Compared with the above-mentioned converter topologies which can only step-up or step-

down voltage, the voltage bucking/boosting converters, which can regulate output voltage under wider range of input voltage or load variants, are popular with the applications such as compactable electronic devices, car digital or electronic devices, and so etc. The traditional buck-boost converter with simple structure and very effective, as we all known, has the drawbacks such as limited voltage gain, negative output voltage, and floating power switch, at the same time discontinuous input and output currents. The other 3 basic non-isolated converters: 1) Cuk converter; 2) Sepic converter; and 3) Zeta converter, which also have the peculiarity of step-up and step-down voltage, have been provided. Yet the limits of the voltage gain along with other disadvantages in Cuk, Sepic, and Zeta converters are also non-ignorable. The quadratic buck-boost converter, proposed by Maksimovic and Cukin, has one common-grounds witch; meanwhile, it can achieve the voltage gain  $D^2/(1-D)^2$ . Due to the diodes D1 and D2 grip the outcome voltage to the input voltage while the duty cycle is bigger than 0.5, so that this converters can only work in step-down mode. By incorporating KY converter and the traditional synchronously rectified buck converter, Hwu and Peng proposed a new buck-boost converter which can realize the continuous output current, positive output voltage, constant conduction mode (CCM) operation all the time, and no right-half plane zero. Unfortunately, its voltage gain of two multiplies the duty cycle ( $2D$ ) is not sufficiently high or low in the situation where the converter needs to operate in a wide range of output voltage. Moreover, based on the Cuk converter, a new buck-boost converter, which containing the low output voltage ripple, minimal radio frequency interference, and one common-ground power-switch. However, as a seventh-order circuit, the converter has complex construction, and both its input terminal and output terminal do not share the same ground. Besides, the voltage gain is still limited. Boost-buck cascade converter, aggregating two separated converters with current source and current sink, is applied for the thermoelectric generator. However, the voltage gain of this cascade converter is also constrained.

Particularly, keeping in mind the end goal to get high-voltage venture up or step down pick up, these converters must work under greatly high or low obligation cycle, and this indicate is too hard acknowledge due to the viable requirements. Henceforth, investigating new topology of buck-boost converter to beat the downsides of the customary ones for fulfilling the undeniably necessities in mechanical applications is critical and important. In this review, by embeddings an extra exchanged system into the conventional buck-boost converter, another transformer-less buck-boost converter is proposed. The primary value of the proposed buck-boost converter is that its voltage pick up is quadratic of the customary buck-boost converter, so it can work in an extensive variety of yield voltage, i.e., the proposed buck-support converter can accomplish high or low voltage pick up without outrageous obligation cycle. In addition, the yield voltage of this new transformer-less buck-boost converter is shared belief with the info voltage, and its extremity is sure.

## 2 PROPOSED SYSTEM



**Fig.1.Circuit diagram of proposed system**

Fig. 1 shows the expedition configuration of the dressy transformerless buck-boost converter, which consists of two capacity switches (S1 and S2), two diodes (D1 and D0), two inductors (L1 and L2), two capacitors (C1 and C0), and such resistive jade R. Power switches S1 and S2 are discreet synchronously. According to the situation of the capacity switches and diodes, several typical time-domain waveforms for this polished transformerless buck-boost converter in a job in CCM are noted in Fig. 2, and the convenient operation states for the about to be buck-boost converter are unprotected in Fig. 3. For Fig. 3(a), it denotes that the genius switches S1 and S2 are turned on, whereas the diodes D1 and D0 do not conduct. Consequently, both the inductor L1 and the inductor L2 are magnetized, and both the urge pump capacitor C1 and the product capacitor C0 are discharged.

For Fig. 3(b), it portrays that the power switches S1 and S2 are killed while the diodes D1 and D0 lead for its forward one-sided voltage. Henceforth, both the inductor L1 and the inductor L2 are demagnetized, and both the charge pump capacitor C1 and the yield capacitor C0 are charged. Here, so as to streamline the circuit examinations and reasoning, we expected that

the converter works in consistent express, all com-ponents are perfect, and all capacitors are sufficiently vast to keep the voltage crosswise over them steady.

### 3 TIME DOMAIN ANALYSIS OF THE PROPOSED CONVERTER IN CONTINUOUS CONDUCTION MODE

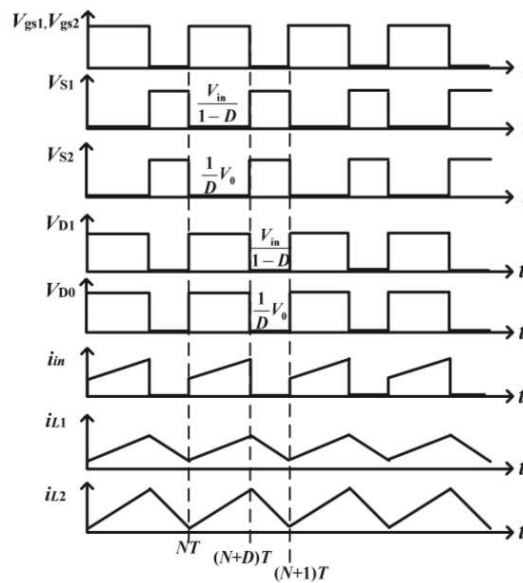


Fig.2. Time-domain analysis of proposed buck-boost converter in Continuous conduction mode

## 4 MODES OF OPERATION

### 4.1 OPERATING PRINCIPLES

As shown in Fig. 3, there are two states, i.e., nation 1 and state 2, in the new transformerless buck-boost converter while it operates in CCM operation.

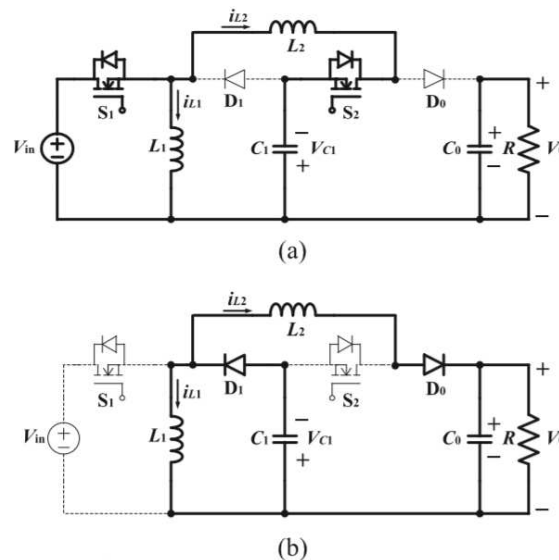


Fig.3.Operational diagram of proposed system

**State 1**( $NT < t < (N + D)T$ ): During this time interim, the switches S1 and S2 are turned on, while D1 and D0 are invert one-sided. From Fig. 3(a), it is seen that L1 is polarized from the information voltage  $V_{in}$  while L2 is charged from the info voltage

$V_{in}$  and the charge pump capacitor C1. Besides, the yield vitality is provided from the yield capacitor C0. Along these lines, the relating conditions can be set up as

$$V_{L1} = V_{IN} \quad [1]$$

$$V_{L2} = V_{IN} + V_{C1} \quad [2]$$

**State 2**  $((N + D)T < t < (N + 1)T)$ : During this time interim, the switches S1 and S2 are killed, while D1 and D0 are forward one-sided. From Fig. 3(b), it is seen that the vitality put away in the inductor L1 is discharged to the charge pump capacitor C1 by means of the diode D1. In the meantime, the vitality put away in the inductor L2 is discharged to the charge pump capacitor C1, the yield capacitor C0, and the resistive load R through the diodes D0 and D1. The conditions of the state 2 are depicted as takes after:

$$V_{L1} = -V_{C1} \quad [3]$$

$$V_{L2} = -(V_{C1} + V_0) \quad [4]$$

In the event that applying the voltage-second adjust rule on the inductor L1, then the voltage over the charge pump capacitor C1 is promptly acquired from (1) and (3) as

$$V_{C1} = \frac{D}{1-D} V_{IN} \quad [5]$$

Here, D is the Duty cycle, which speaks to the extent of the power switches turn-on time to the entire exchanging cycle. Essentially, by utilizing the voltage-second adjust guideline on the inductor L2, the voltage pick up of the proposed buck-boost converter can be acquired from (2), (4), and (5) as

$$M = \frac{V_0}{V_{IN}} = \left(\frac{D}{1-D}\right)^2 \quad [6]$$

From (6), it is clear that the proposed buck-boost converter can venture up the information voltage when the obligation cycle is greater than 0.5, and venture down the information voltage when the obligation cycle is littler than 0.5.

## 4.2 VOLTAGE STRESS

The voltage over the charge pump capacitor C1 can be communicated as Obviously, VC1 is not as much as the info voltage in venture down mode, and not as much as the yield voltage in venture up mode. Thus, the voltage weight on the charge pump capacitor C1 is little with the goal that we can pick the little measured capacitor which have little parasitic resistor to lessen the power misfortune.

$$V_{C1} = \frac{D}{1-D} V_{IN} = \frac{1-D}{D} V_0 \quad [7]$$

## 4.3 VOLTAGE RIPPLES OF CAPACITORS

The swells of the voltage over the capacitors C1 and C0, i.e.,  $\Delta v_{C1}$  and  $\Delta v_{C0}$  are

$$\Delta i_{L1} = \frac{V_{L1}}{L1} DT_s = \frac{DV_{in}}{L1f_s} \quad [8]$$

$$\Delta i_{L2} = \frac{V_{L2}}{L2} DT_s = \frac{DV_{in}}{(1-D)L2f_s} \quad [9]$$

#### 4.4 BOUNDARY CONDITION

For a converter working in the limit condition mode (BCM), the current of inductor just decreases to zero toward the finish of every exchanging cycle. Take note of that, here, we accept that the inductor current  $i_{L1}$  is constant and just take the inductor  $L2$  for instance. The dc current of the inductor  $L2$  is

$$\Delta_{vc1} = \frac{\Delta Q}{C} = \frac{DV_0}{(1-D)RC_1f_s} [10]$$

$$\Delta_{vc0} = \frac{\Delta Q}{C} = \left(\frac{DV_0}{RC_0f_s}\right) [11]$$

Furthermore, defining the standardized inductor time steady on the inductor  $L2$  as

$$I_{L2} = \frac{V_{in} + V_{C1}}{2L_2} DT_s [12]$$

$$T_{L2} = \frac{L_2 f_s}{R} [13]$$

$$T_{L2B} = \frac{(1-D)^2}{2D} [14]$$

It is clear from (28) and (29) that when  $\tau_{L2} > \tau_{L2B}$ , the proposed buck–boost converter works in CCM. Else, it works in DCM.

#### 4.5 EFFICIENCY ANALYSIS

To streamline computing, the voltage and current swells over the inductors and the capacitors are disregarded.  $r_{DS1}$  and  $r_{DS2}$  are the MOSFET's ( $S1$  and  $S2$ ) ON-resistances.  $V_{F1}$  and  $V_{F0}$  are the diodes' ( $D1$  and  $D0$ ) edge voltage.  $r_{L1}, r_{L2}, r_{C1}$ , and  $r_{C0}$  are the comparable arrangement resistances of the inductors ( $L1$  and  $L2$ ) and the capacitors ( $C1$  and  $C0$ ), individually. The switches conduction misfortunes can be figured as takes after:

$$P_{sw}(cond) = I_{s1(rms)}^2 r_{DS1} + I_{s2(rms)}^2 r_{DS2} [15]$$

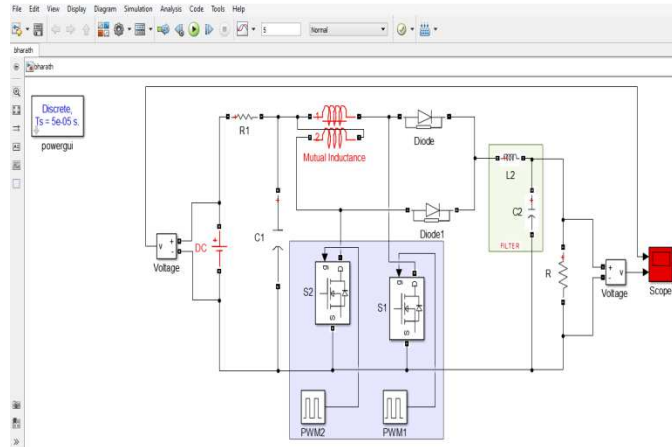
$$= \frac{D^3 P_0 r_{DS1}}{(1-D)^4 R} + \frac{D P_0 r_{DS2}}{(1-D)^2 R} [16]$$

### 5 SIMULINK SIMULATION

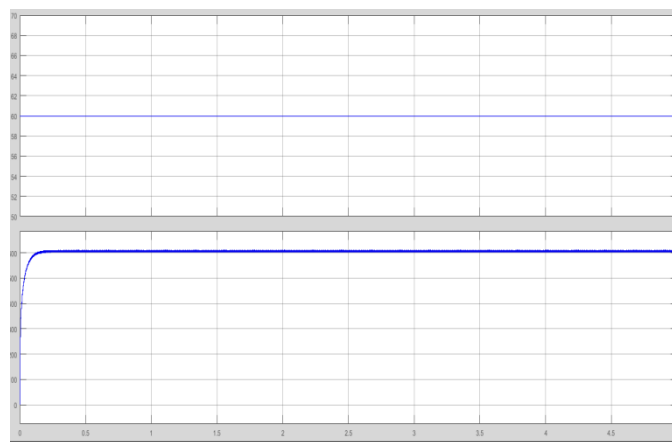
In light of the MATLAB programming and Fig. 1, the recreation circuit of the new transformerless buck–boost converter can be built for the MATLAB reenactments to confirm the up to said investigations in Section III preparatory. Take note of that circuit parameters here are picked as:  $V_{in} = 18V, f_s = 20kHz, D = 0.4-0.6, L1 = 1mH, L2 = 3mH, C1 = 10\mu F, C0 = 20\mu F, R = 30-150 \Omega$ . Fig. 5 demonstrates the time-space waveforms of the yield voltage  $v_0$ , the charge pump capacitor voltage  $v_{C1}$ , the streams of the two inductors  $L1$  and  $L2$ , and the driving sign  $v_g$  for the new transformerless buck–boost converter working in venture up mode when the obligation cycle is 0.6. Since the two power switches lead synchronously, just a single driving sign  $v_g$  is picked. From Fig. 5, one can get that the charge pump capacitor voltage  $v_{C1}$  is inside (25.8 V, 27.8 V), the yield voltage  $v_0$  is inside (40.2 V, 40.6 V), the inductor current  $i_{L1}$  is inside (0.07 A, 0.61 An), and the inductor current  $i_{L2}$  is inside (0.45 A, 0.90 A). In addition, the swells of the inductor current  $\Delta i_{L1}$  and the inductor current  $\Delta i_{L2}$  are 0.54 and 0.45 A, separately. Moreover, the swells of the two capacitors  $\Delta v_{C1}$  and  $\Delta v_{C0}$  are 2 and 0.4 V, individually.

From (5), (6), (17), (18), and (23)–(26), the hypothetical outcomes are  $V_{C1} = 27 V, V_0 = 40.5 V, i_{L1} = 0.34 A, i_{L2} = 0.68 A, \Delta i_{L1} = 0.54 A, \Delta i_{L2} = 0.45 A, \Delta v_{C1} = 2V, \Delta v_{C0} = 0.4 V$ , separately. For the proposed buck–boost converter working in venture down mode when the obligation cycle is picking as 0.4, Fig. 6 shows the time-area waveforms of the yield voltage  $v_0$ , the charge pump capacitor voltage  $v_{C1}$ , the streams of the two inductors  $L1$  and  $L2$ , and the driving sign  $v_g$ .

It is plainly observed that the charge pump capacitor voltage  $v_{C1}$ , the yield voltage  $v_0$ , the inductor current  $i_{L1}$ , and the inductor current  $i_{L2}$  are inside (11.44 V, 12.32 V), (7.77 V, 8.04 V), (–0.33 A, 0.03 An) and (0.34 A, 0.54 An), individually. Also, the swells of the inductor current  $\Delta i_{L1}$  and the inductor current  $\Delta i_{L2}$  are 0.36 and 0.2 An, individually. The swells of the two capacitors  $\Delta v_{C1}$  and  $\Delta v_{C0}$  are 0.88 and 0.27 V, separately.



**Fig.4. Circuit diagram of Simulink Simulation**



**Fig.5. Simulink Simulation input and output waveforms comparisons**

## 6 CIRCUIT EXPERIMENTS

With a specific end goal to approve the viability of the new transformerless buck–boost converter, we develop the model circuit as appeared in Fig. 1. In the examinations, the power switches S1 and S2 are acknowledged by the HEXFET control MOS-FET IRFP264, the diodes D1 and D0 by the switch mode rectifier MUR810, the other circuit parameters are picked as the same with the MATLAB reenactments in Section V. In addition, the photocoupler TLP250 is utilized to create the segregated driving sign for the two floating power switches S1 and S2. In this driving circuit,  $V_D = 15V$ ,  $C_{n1} = 0.1 \mu F$ ,  $C_{n2} = 0.1 \mu F$ ,  $R_1 = 1.5 k\Omega$ ,  $R_2 = 1.5 k\Omega$ ,  $R_3 = 20 \Omega$ ,  $R_4 = 20 \Omega$ . Here, one ought to give careful consideration that there exist three diverse ground motions in the circuit, i.e., N, M, and P. N speaks to the ground of the power stage, and M and P remain for the ground of the two dc control supplies for the two TLP250, separately. The high-voltage differential test P5200A is utilized to recognize the yield voltage  $v_0$ .

## 7 CONCLUSION

This paper has proposed another transformerless buck–boost converter as a fourth-arrange circuit, which understands the advancement between the topology development and the voltage pick up to 600V as output conquer the downsides of the customary buck–boost converter. The working standards, unflinching state examinations, little flag displaying, and correlations with different converters are introduced. From the hypothetical examinations, the MATLAB reproductions, and the circuit tests, it is demonstrated that the new transformerless buck–boost converter has the benefits, for example, high stride up/venture down voltage increase, positive yield volt-age, basic development, and basic control procedure. Consequently, the proposed buck–boost converter is appropriate for the mechanical applications requiring high stride up or venture down voltage pick up.

**REFERENCES**

- [1] W. H. Li and X. N. He, "Review of non-isolated high step-up DC/DC converters in photovoltaic grid-connected applications," *IEEE Trans. Ind. Electron.*, vol. 58, no. 4, pp. 1239–1250, Apr. 2011.
- [2] C. T. Pan and C. M. Lai, "A high-efficiency high step-up converter with low switch voltage stress for fuel-cell system applications," *IEEE Trans. Ind. Electron.*, vol. 57, no. 6, pp. 1998–2006, Jun. 2010.
- [3] T. F. Wu and Y. K. Chen, "Modeling PWM DC–DC converters out of basic converter units," *IEEE Trans. Power Electron.*, vol. 13, no. 5, pp. 870–881, Sep. 1998.
- [4] F. L. Luo, "Six self-lift DC–DC converters, voltage lift technique," *IEEE Trans. Ind. Electron.*, vol. 48, no. 6, pp. 1268–1272, Dec. 2001.
- [5] F. L. Luo and H. Ye, "Positive output cascade boost converters," *Proc. Inst. Elect. Eng. Elect. Power Appl.*, vol. 151, no. 5, pp. 590–606, Sep. 2004.
- [6] Y. He and F. L. Luo, "Analysis of Luo converters with voltage-lift circuit," *Proc. Inst. Elect. Eng. Elect. Power Appl.*, vol. 152, no. 5, pp. 1239–1252, Sep. 2005.
- [7] Y. T. Chen, W. C. Lin, and R. H. Liang, "An interleaved high step-up DC–DC converter with double boost paths," *Int. J. Circ. Theor. Appl.*, vol. 43, no. 8, pp. 967–983, Aug. 2015.
- [8] L. W. Zhou, B. X. Zhu, Q. M. Luo, and S. Chen, "Interleaved non-isolated high step-up DC/DC converter based on the diode–capacitor multiplier," *IET Power Electron.*, vol. 7, no. 2, pp. 390–397, Feb. 2014.
- [9] C. T. Pan, C. F. Chuang, and C. C. Chu, "A novel transformerless interleaved high step-down conversion ratio DC–DC converter with low switch voltage stress," *IEEE Trans. Ind. Electron.*, vol. 61, no. 10, pp. 5290–5299, Oct. 2014.
- [10] C. T. Pan, C. F. Chuang, and C. C. Chu, "A novel transformerless adaptable voltage quadrupler DC converter with low switch voltage stress," *IEEE Trans. Power Electron.*, vol. 29, no. 9, pp. 4787–4796, Sep. 2014.
- [11] C. Nagarajan and M. Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- *International Journal of Engineering Science and Technology (IJEST)*, Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [12] C. Nagarajan and M. Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [13] C. Nagarajan and M. Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- *Iranian Journal of Electrical & Electronic Engineering*, Vol.8 (3), pp.259-267, September 2012.
- [14] J. A. Morales-Saldaña, R. Loera-Palomo, E. Palacios-Hernández, and J. L. González-Martínez, "Modelling and control of a DC–DC quadratic boost converter with R2P2," *IET Power Electron.*, vol. 7, no. 1, pp. 11– 22, Jan. 2014.
- [15] Y. M. Ye and K. W. E. Cheng, "Quadratic boost converter with low buffer capacitor stress," *IET Power Electron.*, vol. 7, no. 5, pp. 1162–1170, May 2014.

## Modeling And Analysis Of Series-Switch Five-Level Dual-Buck Full-Bridge Inverters For Grid-Tied Applications

P. SELVAKUMAR<sup>1</sup> and R. GANDHI<sup>2</sup>

<sup>1</sup>PG Scholar, M.E (Power Electronics And Drives), Gnanamani College of Engineering, A.K. Samuthiram, Namakkal, India

<sup>2</sup>Professor, Dept of EEE, Gnanamani College of Engineering, A.K. Samuthiram, Namakkal, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Dual-buck inverters feature some attractive merits, such as no reverse recovery issues of the body diodes and free of shoot-through. However, since the filter inductors of dual-buck inverters operate at each half cycle of the utility grid alternately, the inductor capacity of dual-buck inverters is twice as much as H-bridge inverters. Thus, the power density of dual-buck converters needs to be improved, as well as the conversion efficiency.

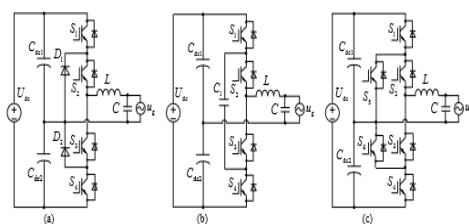
The detailed derivation process of two five-level full-bridge topology modeling is presented. The operation modes, modulation methods and control strategies of the series-switch five-level DBFBI topology are analyzed in detail. The THIPWM technique operates by adding a third harmonic component to the sinusoidal modulating wave. It is possible to increase the fundamental by about 15.5% and hence, allow a better utilization of the DC power supply.

The power device losses of the three-level DBFBI topology and five-level DBFBI topologies, with different switching frequencies are calculated and compared. Both the relationship between the neutral point potential self-balancing and the modulation index of inverters are revealed. Simulation results have shown that the five-level series DBFBI topology exhibit higher efficiency than the five-level H-bridge inverter topology and the three-level DBFBI topology.

**KEYWORDS:** Series-switch five-level DBFBI topology modeling, Switching State Analysis, Power losses and efficiency, THIsine PWM and THI reduction

### 1 INTRODUCTION

The multilevel technique is an effective way to achieve high power density. There are three widely used topologies of single-phase multilevel inverters, diode neutral point clamped (DNPC) multilevel inverters, flying capacitor clamped (FCC) multilevel inverters and active neutral point clamped (ANPC) multilevel inverters. The basic concept of the above three multilevel topologies is to use smaller rating power devices to generate appreciable high-level output voltage waveforms. However, conventional multilevel inverters require a large number of power devices and auxiliary dc links when the output voltage levels are higher than three-level.



**Fig.1** Three popular topologies of H-bridge multilevel inverters.  
(a) Diode neutral point clamped (DNPC) (b) Flying capacitor clamped (FCC) (c) Active neutral point clamped (ANPC)

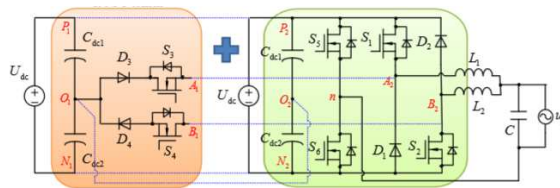
A five-level H-bridge inverter topology was proposed by introducing a neutral point clamped bi-directional switch (NPC branch) based on the existing conventional full-bridge inverter. Comparing with the DNPC five-level inverter topology, the FCC five-level inverter topology, and the ANPC five-level inverter topology, the number of power devices in the new five-level H-bridge inverter has been reduced significantly.

The series-switch five-level DBFBI topology is taken for analysis in terms of the operation principle and the THIsine PWM modulation method. Simulation results were obtained to evaluate the performance and harmonic reduction.

**2 FIVE-LEVEL SERIES DBFBI-TOPOLOGY MODELLING**

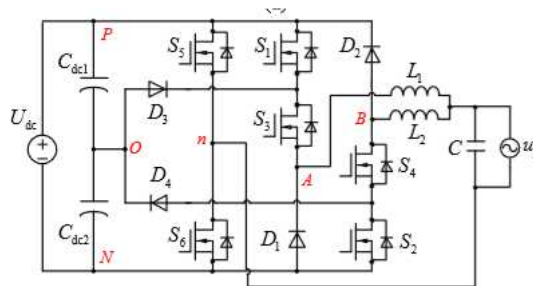
The conventional three-level full-bridge inverter is combined with a two-level capacitive voltage divider and NPC branch. The nodes of the capacitive voltage divider, P1, N1 and O1, are connected to the nodes, P2, N2 and O2, respectively. The node of the NPC branch A1 is connected to the node of the three-level DBFBI A2.

By employing the topology generation above rule, a three-level DBFBI topology is combined with a two-level capacitive voltage divider and a NPC branch, as shown in Fig.2



**Fig.2. The topology generation: three-level DBFBI combined with a two-level capacitive voltage divider and a NPC branch**

The node of the NPC branch B1 is connected to the node of the three-level DBFBI B2. Then, the redundant capacitors, Cdc1 and Cdc2, can be removed. As a result, a NPC five-level DBFBI topology is generated.



**Fig.3. Series-switch five-level DBFBI topology**

Compared with the three-level DBFBI topology there are two additional switches and two additional diodes in the proposed NPC five-level DBFBI topology.

**3 ANALYSIS ON THE SERIES-SWITCH FIVE-LEVEL DBFBI TOPOLOGY**

**SWITCHING STATE ANALYSIS**

The Series-switch five-level DBFBI topology is taken as an example for detailed analysis. The key waveforms of the Series-switch five-level DBFBI are shown in Fig.4. Two reference signals, ur1 and ur2, are compared with a carrier signal to produce THIsine pulse width modulation (PWM) signals for the switches. ugS1 to ugS6 represent the gate drive signals of power switches S1 to S6.

In order to avoid the shoot-through problem, the dead time has been set within the drive signals of the switches S5 and S6. uAn represents the voltage difference between the node A and node n, and uBn is the voltage difference between the node B and node n. Two filter inductors, L1 and L2, are operating at each half cycle of the utility grid alternately. Therefore, uAB-n is defined as the output levels of the DBFBI topologies, and uAB-n is represented as,

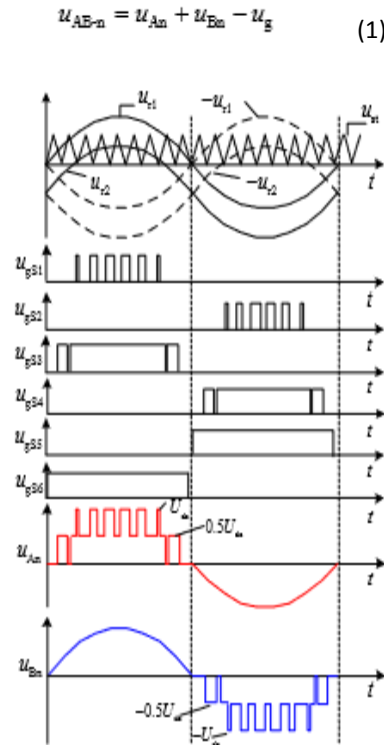


Fig.4.Key waveforms of the series-switch five-level DBFBI topology.

On the other hand, the series-switch five-level DBFBI topology is operating with unity power factor. In order to avoid the inductor current distortion, at the beginning of the positive half cycle of the utility grid, the switches S1, S3 and S6 are turned ON at the same time. At the end of the positive half cycle, the switch S3 is turned OFF before the switch S6, and the current of inductor L1 decreases to zero naturally. Similarly, at the beginning of the negative half cycle of the utility grid, the switches S2, S4 and S5 are turned ON at the same time. Since the series-switch five-level DBFBI topology is digitally controlled, this modulation method is easy to implement.

Furthermore, it is also suitable to both the NPC five-level DBFBI topology, the series-diode five-level DBFBI topology, and the family of five-level DBFBI topologies with high reliability. The series-switch five-level DBFBI has six operation modes, which are shown in Fig 5.

$$L_1 \frac{di_{L1}}{dt} = U_{dc} - u_g \quad (2)$$

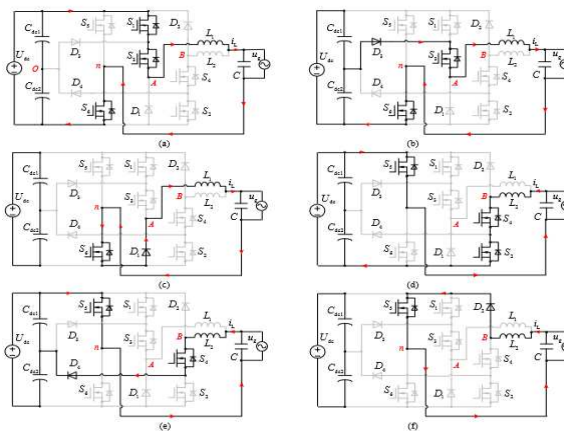


Fig.5 Equivalent circuits of switching state.  
(a) State #1. (b) State #2. (c) State #3. (d) State #4. (e) State #5. (f) State #6.

**(1) State #1** . Maximum positive output,  $u_{An}=U_{dc}$ . There is no current flowing through the inductor L2, thus the voltage on the inductor L2 is equal to zero, and  $u_{Bn}=u_g>0$ . As a result,  $u_{AB-n}=U_{dc}$ . S1, S3 and S6 are turned ON, and the other switches are turned OFF. The active current path at this state is shown in Fig.5. The reverse blocking voltage on D3 is equal to  $0.5U_{dc}$ , and the reverse blocking voltage on D1 is equal to  $U_{dc}$ . The drain-source voltage on S5 is equal to  $U_{dc}$ . During this state, the inductor current  $i_{L1}$  increases linearly

$$-L_1 \frac{di_{L1}}{dt} = \frac{U_{dc}}{2} - u_g \quad (3)$$

The inductor current  $i_{L1}$  increases linearly when the voltage of the utility grid is lower than  $0.5U_{dc}$

$$L_1 \frac{di_{L1}}{dt} = \frac{U_{dc}}{2} - u_g \quad (4)$$

**(3) State #3** .Zero output at the positive half period of the utility grid,  $u_{An}=0$ . There is no current flowing through the inductor L2, thus the voltage on the inductor L2 is equal to zero, and  $u_{Bn}=u_g>0$ . As a result,  $u_{AB-n}=0$ . S6 is turned ON, and the other switches are turned OFF. The active current path at this mode is shown in Fig.5 Both the drain-source voltages on S1 and S3 are equal to  $0.5U_{dc}$ . During this state, the inductor current  $i_{L1}$  decreases linearly

$$L_1 \frac{di_{L1}}{dt} = -u_g \quad (5)$$

**(4) State #4** Zero output at the negative half period of the utility grid,  $u_{Bn}=0$ . There is no current flowing through the inductor L1, thus the voltage on the inductor L1 is equal to zero, and  $u_{An}=u_g<0$ . As a result,  $u_{AB-n}=0$ . S5 is turned ON, and the other switches are turned OFF. The active current path at this mode is shown in Fig.5 Both the drain-source voltages on S2 and S4 are equal to  $0.5U_{dc}$ . During this state, the inductor current  $i_{L2}$  increases linearly

$$L_2 \frac{di_{L2}}{dt} = -u_g \quad (6)$$

**(5) State #5** Half-level negative output,  $u_{Bn}=-0.5U_{dc}$ . There is no current flowing through the inductor L1, thus the voltage on the inductor L1 is equal to zero, and  $u_{An}=u_g<0$ . As a result,  $u_{AB-n}=-0.5U_{dc}$ . S4 and S5 are turned ON, and the other switches are turned OFF. The active current path at this mode is shown in Fig.5 .The drain-source voltage on S2 is equal to  $0.5U_{dc}$ , and the reverse blocking voltage on D2 is equal to  $0.5U_{dc}$ . During this state, the inductor current  $i_{L2}$  decreases linearly when the voltage of the utility grid is lower than  $0.5U_{dc}$

$$-L_2 \frac{di_{L2}}{dt} = -\frac{U_{dc}}{2} - u_g \quad (7)$$

The inductor current  $i_{L2}$  increases linearly when the voltage of the utility grid is higher than  $0.5U_{dc}$

$$L_2 \frac{di_{L2}}{dt} = -\frac{U_{dc}}{2} - u_g \quad (8)$$

**(6) State #6**. Maximum negative output,  $u_{Bn}=-U_{dc}$ . There is no current flowing through the inductor L1, thus the voltage on the inductor L1 is equal to zero, and  $u_{An}=u_g<0$ . As a result,  $u_{AB-n}=-U_{dc}$ . S2, S4 and S5 are turned ON, and the other switches are turned OFF. The active current path at this mode is shown in Fig.5. The reverse blocking voltage on D4 is equal to  $0.5U_{dc}$ , and the reverse blocking voltage on D2 is equal to  $U_{dc}$ . During this state, the drain-source voltage on S6 is equal to  $U_{dc}$ . In this mode, the inductor current  $i_{L2}$  decreases linearly

$$-L_2 \frac{di_{L2}}{dt} = -U_{dc} - u_g \quad (9)$$

Based on the equations (2) to (9), it can be seen that the voltage jump of filter inductors is  $0.5U_{dc}$ , and the duty cycles of switches, S1 to S4, can be derived as,

**Table 1.**

	NPC	Series-switch	Series-diode	H-bridge
$u_{S1}, u_{S2}$	$U_{dc}$	$0.5U_{dc}$	$U_{dc}$	$U_{dc}$
$u_{S3}, u_{S4}$	$0.5U_{dc}$	$0.5U_{dc}$	$0.5U_{dc}$	$U_{dc}$
$u_{S5}, u_{S6}$	$U_{dc}$	$U_{dc}$	$U_{dc}$	$0.5U_{dc}(S_7)$
$u_{D1}, u_{D2}$	$U_{dc}$	$U_{dc}$	$0.5U_{dc}$	$0.25U_{dc}$
$u_{D3}, u_{D4}$	$U_{dc}$	$0.5U_{dc}$	$U_{dc}$	$0.25U_{dc}$

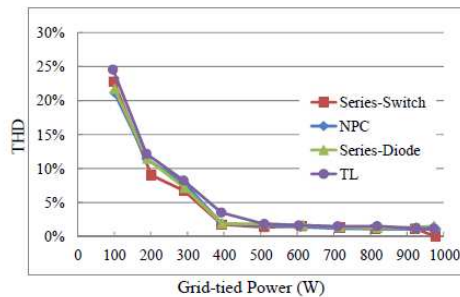
THE MAXIMUM VOLTAGE STRESSES OF THE POWER DEVICES IN BOTH DBFBI TOPOLOGIES AND THE H-BRIDGE TOPOLOGY

$$\begin{cases} d_{S1} = (2u_g / U_{dc}) - 1 & u_g > 0.5U_{dc} \\ d_{S2} = (-2u_g / U_{dc}) - 1 & -u_g > 0.5U_{dc} \\ d_{S3} = 2u_g / U_{dc} & 0 < u_g < 0.5U_{dc} \\ d_{S4} = -2u_g / U_{dc} & -0.5U_{dc} < u_g < 0 \end{cases} \quad (10)$$

From the above operation analysis, there is no current flowing through the body diodes of the switches. Therefore, compared with the conventional five-level H-bridge inverter topology shown in Fig.2, the presented five-level DBFBI topologies are free of reverse recovery problem in the freewheeling mode, and the MOSFETs with low on-resistances can be used instead of IGBTs.

In addition, compared with the three-level DBFBI topology, the voltage jump of each high-frequency switch in the presented five-level DBFBI topology is only half of the input voltage.

Therefore, the switching loss of the presented five-level DBFBI topology is much lower than that of the three-level DBFBI topology. Furthermore, the voltage jump of each inductor in the presented five-level DBFBI topology is only half of the input voltage as well, which means this topology



**Fig.6. THD comparison of the three-level DBFBI and three proposed five-level DBFBI topologies**

#### 4 SIMULATION AND RESULTS

A series-switch five-level dual-buck full-bridge inverters model simulation obtained with number of outputs, less harmonic distortions and reduced the switches using simulink developed by Math works

The gating pulses trigger thyristors to convert input dc to ac supply. Output filters are also used. The THIPWM Technique was used .

Table 2. PARAMETERS OF THE SIMULATION PROTOTYPE

Parameter	Value
Input voltage	350~450V
Grid voltage	230V/50Hz
Grid frequency	50Hz
Rated power	1kW
Switching frequency	40kHz
Three-level filter inductor $L_1$ & $L_2$	4mH
Five-level filter inductor $L_1$ & $L_2$	2mH
Filter Capacitor $C_o$	0.47uF
High-voltage MOSFET	SPW47N60C3(650V)

In order to make a trade-off between the power density and the efficiency, the switching frequency of these three inverters were set at 40kHz. The YOKOGAWA WT1800 power analyzer was used to measure the efficiencies of these inverters.

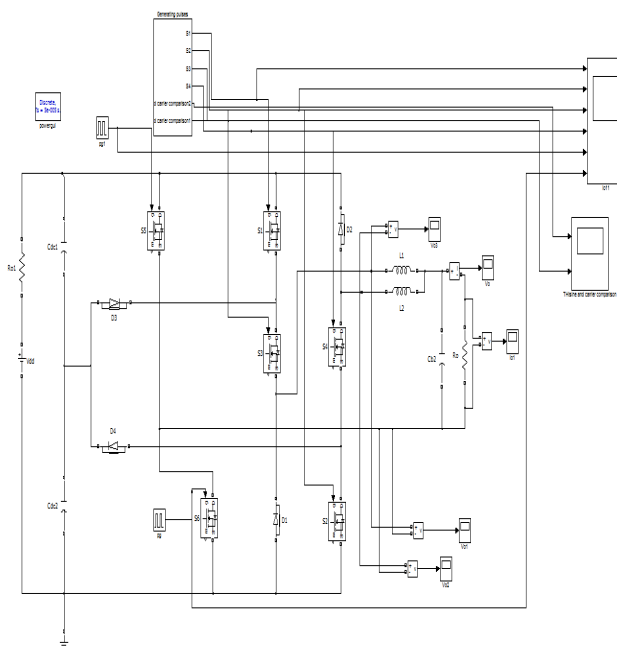


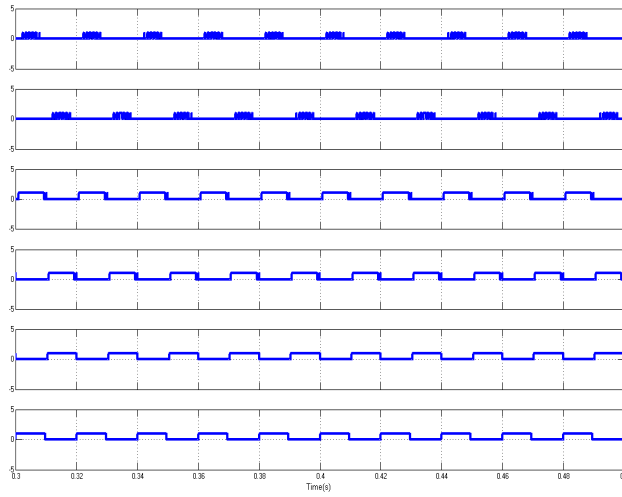
Fig 7:Simulation circuit diagram

## 5 RESULTS

The various wave forms voltage, current and pulses are discussed below

Gate pulses:

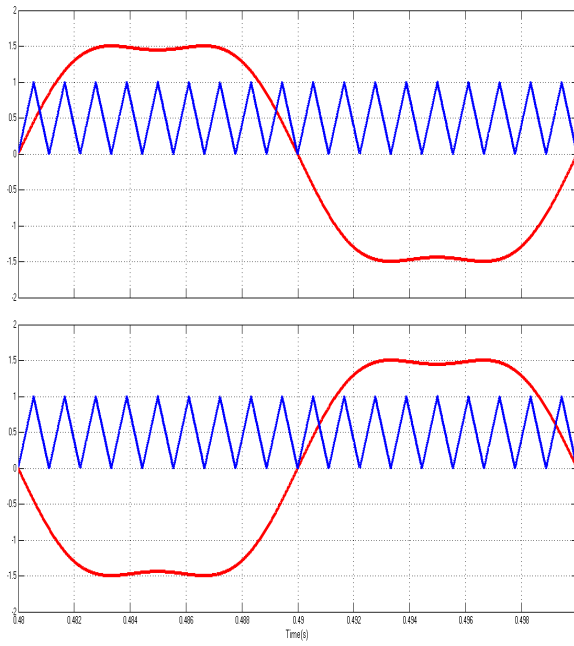
The gate pulses for S1 to S6 are below



**Fig 8 Gate pulses for S1 to S6**

**TH sine and carrier comparison:**

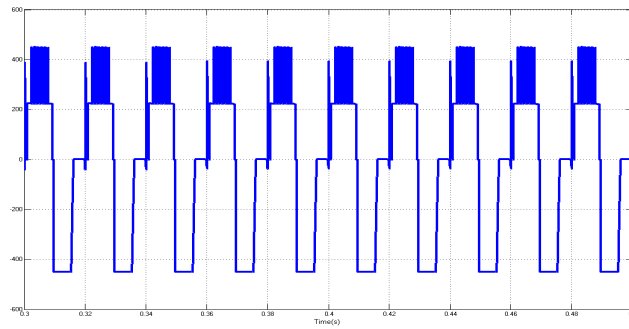
Here the PWM technique used is THIPWM and it is generated as



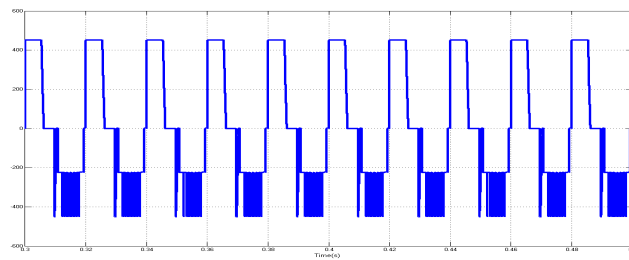
**Fig 9 THIPWM**

**Voltage on inductors:**

Vo1:



Vo2:



Vo3:

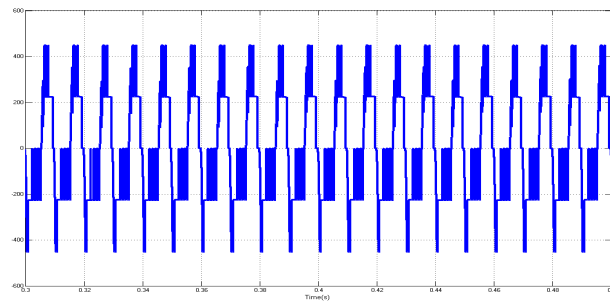
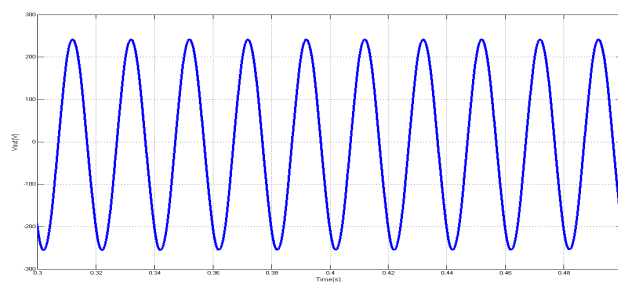
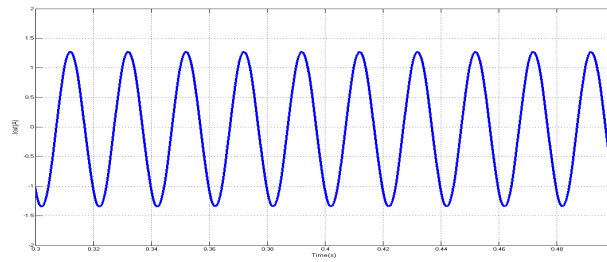


Fig 10 Voltage on inductors

**Output voltage:**



**Output current:**

**Fig 11 Output voltage and current for voltage wave form**

## 6 CONCLUSION AND FUTURE WORK

The Series-switch five-level dual-buck full-bridge inverters has been proposed in this project. The detailed derivation processes of two five-level full-bridge topology generation rules, including conventional full-bridge inverters and dual-buck full-bridge inverters, have been presented and explained

The two-level half-bridge inverter is replaced by a two-level dual-buck half-bridge inverter, and a family of five-level DBFBI topologies with high reliability has been generated. Furthermore, the relationship between the NP potential self-balancing and the modulation index of inverters are revealed. Simulation results have verified that the five-level DBFBI topologies have the following advantages:

(1) Compared with the three-level DBFBI, the voltage jumps of high-frequency switching devices and the filter inductances are only half. Therefore, the family of five-level DBFBI topologies requires lower power rating devices and smaller filter inductors, which result in higher conversion efficiency and higher power density

(2) The series-switch five-level DBFBI has the highest efficiency compared with the three-level DBFBI, the conventional five-level H-bridge inverter, the NPC five-level DBFBI and the series-diode five-level DBFBI. Hence, the family of five-level DBFBI topologies is an attractive solution for grid-tied renewable generation systems with high efficiency and high power density

## REFERENCES

- [1] X. Guo, R. He, J. Jian, Z. Lu, X. Sun, Z. Lu, and J. M. Guerrero, "Leakage current elimination of four-leg inverter for transformerless three-phase PV systems," *IEEE Trans. Power Electron.*, vol. 31, no. 3, pp. 1841–1846, Mar. 2016.
- [2] H. Wu, K. Sun, R. Chen, H. Hu, and Y. Xing, " Full-Bridge three-port converters with wide input voltage range for renewable power systems," *IEEE Trans. Power Electron.*, vol. 27, no. 9, pp. 3965-3974, Sep. 2012.
- [3] K. Wang, Z. Zheng, Y. Li, K. Liu, and J. Shang, "Neutral-point potential balancing of a five-level active neutral-point-clamped inverter," *IEEE Trans. Ind. Electron.*, vol. 60, no. 5, pp. 1907 - 1918, May. 2013.
- [4] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING*, Vol.63 (6), pp.365-372, Dec.2012.
- [5] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, *Electric Power Components and Systems*, Vol.39 (8), pp.780-793, May 2011.
- [6] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [7] J. Li, J. Liu, D. Boroyecich, P. Mattavelli, and Y. Xue, "Three-level active neutral-point-clamped zero-current- transition converter for sustainable energy systems," *IEEE Trans. Power Electron.*, vol. 26, no. 12, pp. 3680-3693, Dec. 2011.
- [8] G. Ceglia, V. Guzman, C. Sanchez, F. Ibanez, J. Walter, and M. I. Gimenez, "A new simplified multilevel inverter topology for DC-AC conversion," *IEEE Trans. Power Electron.*, vol. 21, no. 5, pp. 1311-1319, Sep. 2006.
- [9] Li Zhang, Kai Sun, Yan Xing and Jinquan Zhao "A Family of Five-Level Dual-Buck Full-bridge Inverters for Grid-tied Applications," *IEEE Trans. Power Electron.*, vol. 43, no. 5, pp. 311-319, Dec 2015.

## PHOTOVOLTAIC WATER PUMPING SYSTEM BASED ON MAXIMUM POWER POINT TRACKING TECHNIQUES

*M. VIJAY and S. Vijayakumar*

Department of EEE,  
Gnanamani College of Engineering,  
Pachal, Namakkal – 637018,  
Anna University Chennai – 600 005, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the *Creative Commons Attribution License*, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** An investigation into the design of a standalone photovoltaic water pumping system for supplying rural areas is presented. It includes a study of system components and their modelling. The PV water pumping system comprises a solar cell array, DC DC buck chopper and permanent magnet DC motor driving a centrifugal pump. Thesis focuses on increasing energy extraction by improving maximum power point tracking (MPPT). P&O MPPT algorithm is investigated which uses to automatically adjust stepsize to better track maximum power point. These use PV source output power and the speed of the DC pump motor as input variables. Both generate pulse width modulation (PWM) control signals to continually adjust the buck converter to maximize power from the PV array, and thus motor speed and the water discharge rate of a centrifugal pump. System elements are individually modelled in MATLAB/SIMULINK and then connected to assess performance under different PV irradiation levels. First, the MP&O MPPT technique is compared with the conventional direct method .The results show that the MP&O MPPT has faster dynamic response and eliminates oscillations around the MPPT under steady state conditions. The MPPT methods are implemented in the simulated PV water pumping system and compared. The results confirm that the new methods have improved energy extraction and dynamic tracking compared with simpler methods.

**KEYWORDS:** pv, MPPT, DC- DC buck chopper, PWM, permanent magnet DC motor and centrifugal pump.

### 1 INTRODUCTION

The stand-alone photovoltaic (PV) water pumping system has received increasing attention in the last 20 years because of the significant, on-going cost reductions achieved in manufacturing PV arrays. Past studies of PV energised water pumping systems have previously considered a number of suitable pumps and motors. Two types of pumps are widely employed in PV systems: the centrifugal pump and volumetric pump. The centrifugal pump is capable of pumping a high volume of water and operating at relatively high efficiency. These pumps are used to pump the water from boreholes and from surface water reservoir and they are ideally suitable for medium to high water demands.

There are two categories of centrifugal pumps are commercially available: submersible (stacked impeller) and non-submersible (vertical turbine, floating, and surface centrifugal). Similarly, there are two types of volumetric pumps are commercially available and they categorised: submersible(diaphragm) and non-submersible (piston, jack, and rotary vane). The volumetric pumps are usually used when a low flow rate is require. The centrifugal pumps have operational characteristics which well match with the PV array. However, the operational characteristics of the volumetric pumps are not a good match to the output of PV array. This is because the motor driving volumetric pump requires high starting current and they require constant current for a given head. Whereas, the PV array current varies almost linearly with the solar radiation.

## 2 PHOTOVOLTAIC CELL

The structure of solar cells is illustrated in Fig. 3.2. A semiconductor of p-type with a small quantity of added boron atoms forms the substrate. Then atoms of phosphorous are added to the substrate to form a p-n junction by applying high-temperature diffusion processing. Near the junction of the two semiconductors, the electrons from the n-side diffuse into the p-side leaving behind a layer of ions with positive charge in the n-side.

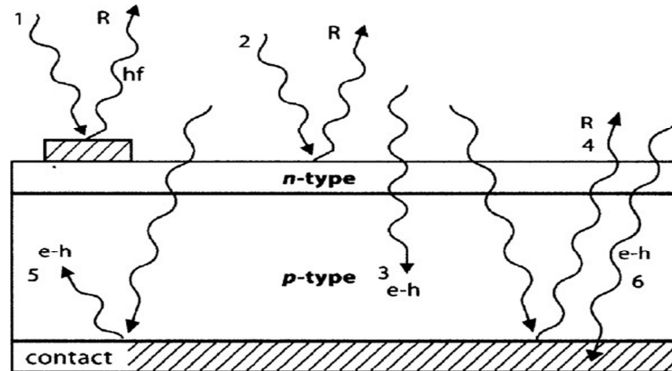


Figure 1. photovoltaic cell

The growth of such technology depends on materials and structure development; however the goal will always be maximum power at minimum cost. In any structure, solar cells, which are connected in series and in parallel in order to form the desired voltage and current levels, remain the basic semiconductor components of a PV panel. To maximize the power rating of a solar cell which ensures the highest efficiency, hence designed to raise the desired absorption and absorption after reflection (Fig. 1). This chapter will briefly describe the principles and history of photovoltaic (PV) energy systems and will explore in details the various available technologies while reflecting on the advancement of each technology and its advantages and disadvantages and photovoltaic applications. Included are discussions of the status, development and applications of various PV and solar thermal technologies. This chapter is a full review on the development of existing photovoltaic (PV) technology. It highlights the four major current types of PV: crystalline, thin film, compound and nanotechnology. The aim of continuous development of PV technology is not only to improve the efficiency of the cells but also to reduce production cost of the modules, hence make it more feasible for various applications. In the same manner, the holes in the p region diffuse into the n region, which leaves behind a layer of ions with negative charge in the p-side. A potential barrier is formed from the rearranged positively and negatively charged ions. The most popular model used to represent the PV module is the current source in parallel with a diode, with a parallel and series resistors ( $R_p$ ,  $R_s$ ) as illustrated in figure 1.

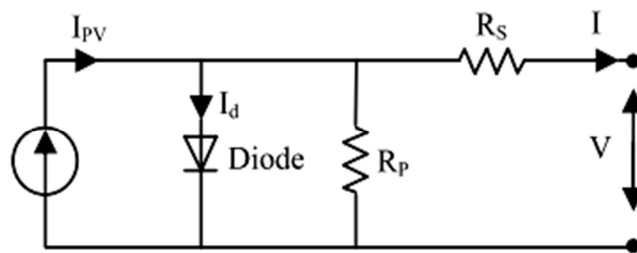


Figure 2. Equivalent Circuit of pv cell

There are various mathematical models that have been discussed in the literature to theoretically model photovoltaic cells. All of these models give an approximate behaviour of the solar cell. The accuracy of each model is classified according to how many internal phenomena are considered. The basic solar cell is usually represented by a p-n junction diode connected in parallel with current source. This conventional equivalent circuit as illustrated in Fig. The basic model does not provide a high range of accuracy but it shows the basic behaviour of the solar cell.

The current source represents the photocurrent produced by sunlight and the diode determines the current-voltage characteristic of the cell. The current-voltage characteristic function can be gained by applying Kirchhoff’s current law in Fig. 3.4 which gives Equation.

$$I_{PV} = I_{Ph} - I_D$$

In the circuit above shown in Fig. 3.4,  $I_D$  is the ideal p-n diode,  $I_D$  the diode internal diffusion current and  $I_{Ph}$  the photocurrent, or light generated current, which is proportional to the radiation and surface temperature.

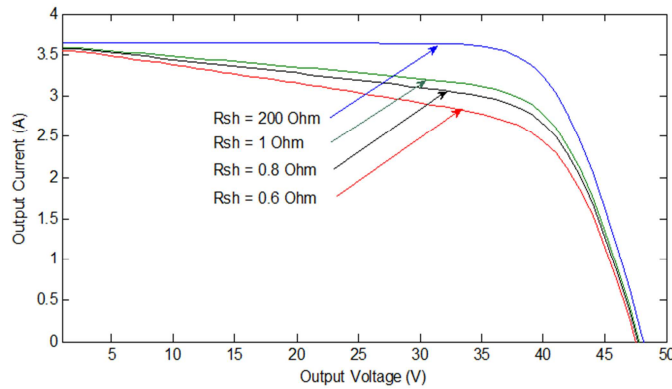


Figure .3 Effect of shunt resistance on the I-V characteristic.

The output current and voltage of the solar cell is represented by  $I_{PV}$  and  $V_{PV}$ , respectively. The diode internal diffusion current is modelled by Equation. Where  $q$  is the charge of electron,  $1.6 \times 10^{-19}$  C,  $A$  is diode ideality factor and it takes the value between 1 and 2,  $k$  is Boltzmann’s constant,  $1.38 \times 10^{-23}$  J/K, and  $T_C$  is the cell’s operating temperature in kelvin. The cell dark saturation current,  $I_S$ , varies with temperature according to Equation (3.4). The photocurrent,  $I_{Ph}$ , is related to the cell’s operating temperature and solar intensity as shown in Equation.

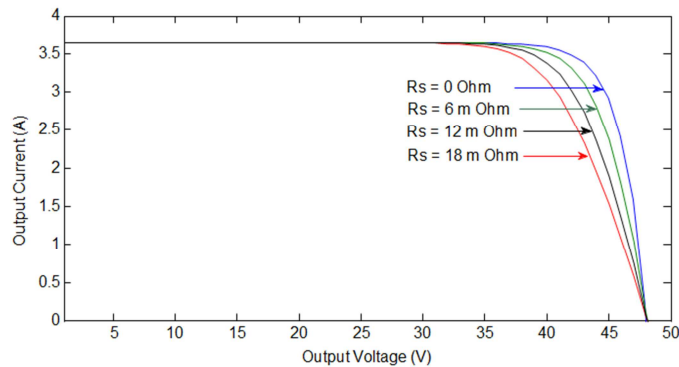


Figure 4.Effect of series resistance on the I-V characteristic.

### 3 MAXIMUM POWER POINT TRACKING (MPPT)

Maximum Power Point Tracking, frequently referred to as MPPT, is an electronic system that operates the Photovoltaic (PV) modules in a manner that allows the modules to produce all the power they are capable of. MPPT is not a mechanical tracking system that “physically moves” the modules to make them point more directly at the sun. MPPT is a fully electronic system that varies the electrical operating point of the modules so that the modules are able to deliver maximum available power. Additional power harvested from the modules is then made available as increased battery charge current. MPPT can be used in conjunction with a mechanical tracking system, but the two systems are completely different.

To understand how MPPT works, let’s first consider the operation of a conventional (non- MPPT) charge controller. When a conventional controller is charging a discharged battery, it simply connects the modules directly to the battery. This forces the modules to operate at battery voltage, typically not the ideal operating voltage at which the modules are able to produce

their maximum available power. The PV Module Power/Voltage/Current graph shows the traditional Current/Voltage curve for a typical 75W module at standard test conditions of 25°C cell temperature and 1000W/m<sup>2</sup> of insolation.

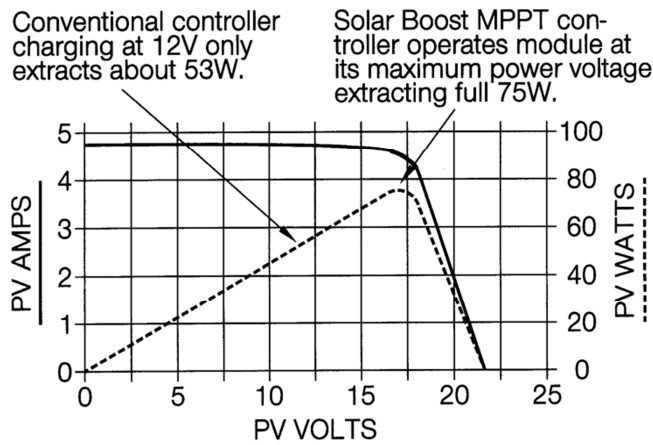


Figure 5. Typical 75W PV Module Power/Voltage/Current At Standard Test

Actual charge current increase varies with operating conditions. As shown above, the greater the difference between PV module maximum power voltage VMP and battery voltage, the greater the charge current increase will be. Cooler PV module cell temperatures tend to produce higher VMP and therefore greater charge current increase.

This is because VMP and available power increase as module cell temperature decreases as shown in the PV Module Temperature Performance graph. Modules with a 25°C VMP rating higher than 17V will also tend to produce more charge current increase because the difference between actual VMP and battery voltage will be greater. A highly discharged battery will also increase charge current since battery voltage is lower, and output to the battery during MPPT could be thought of as being “constant power”.

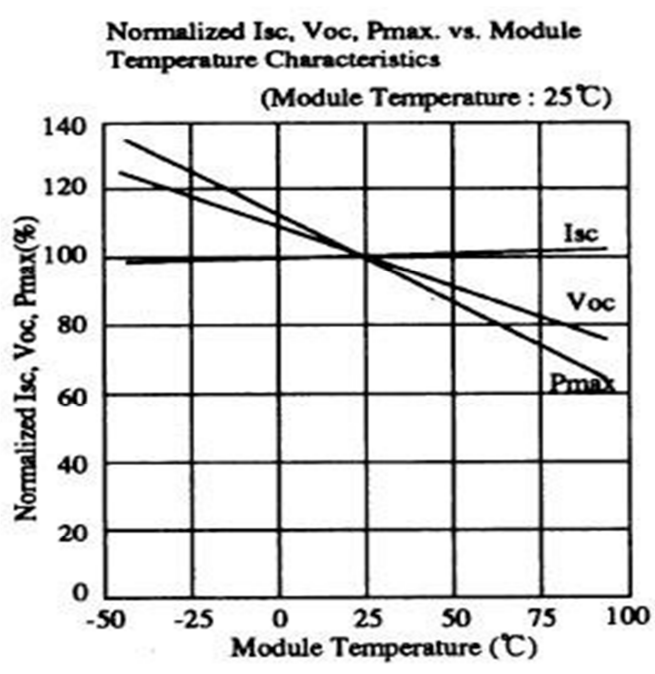


Figure 6. Typical PV Module Temperature Performance

### 3.1 MPPT ALGORITHM

There are a large number of algorithms that are able to track MPPs. An improved method for INC on the basis of variable step is presented. Some of them are simple, such as those based on voltage and current feedback, and some are more complicated, such as perturbation and observation (P&O) or the incremental conductance (IncCond) method. They also vary in complexity, sensor requirement, speed of convergence, cost, range of operation, popularity, ability to detect multiple local maxima, and their applications.

Having a curious look at the recommended methods, hill climbing and P&O are the algorithms that were in the center of consideration because of their simplicity and ease of implementation. Hill climbing is perturbation in the duty ratio of the power converter, and the P&O method is perturbation in the operating voltage of the PV array.

However, the P&O algorithm cannot compare the array terminal voltage with the actual MPP voltage, since the change in power is only considered to be a result of the array terminal voltage perturbation. As a result, they are not accurate enough because they perform steady-state oscillations, which consequently waste the energy. By minimizing the perturbation step size, oscillation can be reduced, but a smaller perturbation size slows down the speed of tracking MPPs. Thus, there are some disadvantages with these methods, where they fail under rapidly changing atmospheric conditions.

MATLAB Functions script for P&O Algorithm

```
function D_k = fun (D_k2,D_k1,V_k,V_k1,I_k,I_k1,ds)
P_k1=I_k1*V_k1;
P_k=I_k*V_k;
dP=P_k1-P_k;
dD=D_k2-D_k1;
if dP>0
if dD>0
D_k=D_k2+ds;
Else
D_k=D_k2-ds;
End
else
if dD>0
D_k=D_k2-ds;
else
D_k=D_k2+ds;
end
end
end
%P_k=P_k1
%D_k2=D_k1
```

#### 3.1.1 SYSTEM DESIGN AND SIMULATION

The system has been modelled and simulated in MATLAB/SIMULINK. The complete SIMULINK model of the proposed system is illustrated in Fig. The modelled system consists mainly of PV array model, DC/DC buck converter model used to interface PV output to the resistive load to track the maximum power of the PV array. To perform the tracking of maximum power, a modified perturbation and observation algorithm has been implemented.

### 3.1.2 COMPARATIVE PERFORMANCE BETWEEN MP&O AND DIRECT METHOD

In this section, a comparative analysis between MP&O and DM is carried out to show the performance of the both techniques in the same condition. The comparative study considers two important features: the maximum power point tracking speed and steady-state oscillation.

To show the performance of the proposed MP&O MPPT algorithm with the DM MPPT algorithm in the steady-state and dynamic condition, the DM was tested with two different duty ratio step-sizes, 0.01 and 0.04. The output performance of the proposed MP&O MPPT and the DM MPPT with fixed step-size of 0.01 and 0.04 under three step changes of in irradiation levels.

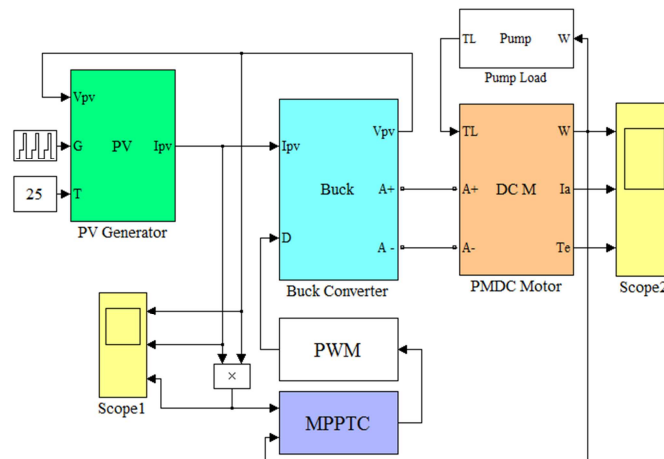


Figure 7. Simulation model diagram

The irradiation was abruptly changed from 1000 to 700 W/m<sup>2</sup> at 1s and then increased to 900 W/m<sup>2</sup> at 2s and then decreased back to 700 W/m<sup>2</sup> at 3s as shown in Fig. 3.1. Compared with the DM with fixed step-size of 0.01, the P&O MPPT with fixed step-size of 0.04 shows a good dynamic performance, it can converge faster to the steady-state but the oscillation in the steady-state is much higher. The tracking time of DM with fixed step-size of 0.04 under an irradiation step change is only several MPPT sampling periods. It takes 0.015s to reach the MPP, while the DM with fixed step size of 0.01 takes 0.037s to track the MPP as shown in Fig. 3.1. The dynamic performance of the DM algorithm can be further improved with a larger step-size. However, this will have a negative effect on the MPPT efficiency. Fig. 7.21 to Fig. 7.2 prove that the proposed MP&O MPPT method with variable step-size can eliminate the need to perform a complicated trade-off between the steady-state and dynamic performance. Fig. 7.2 shows that the steady-state oscillation has been totally eliminated in the case of the MP&O and the output power of PV array is above 179.9 W. In addition the proposed MP&O MPPT provides faster dynamic response than the P&O MPPT at both step sizes of 0.01 and 0.04, as shown in Fig. 7.2 and Fig. 7.2. The efficiency of the MP&O MPPT method is clearly improved in comparison with P&O MPPT method with both step sizes of 0.01 and 0.04. Table 7.3 provides a summary of tracking performance for the MP&O MPPT and P&O MPPT methods with different levels of illumination.

Furthermore, the tracking efficiency comparison of the proposed MP&O with the DM algorithm with step size of 0.04 and 0.01 is displayed in Fig. 7.25. However it should be noted that the efficiency is calculated based on a simulation that represented a short operating time. In practice, the PV array will operate all day. Hence the oscillation effect will be accumulated, and as a result the total efficiency of the MP&O method will be higher than the P&O method. In order to compare the performance of the MP&O against the conventional P&O in tracking the maximum power, the simulation power of the PV array is compared to the calculated power at the theoretical MPP for the same level of solar irradiation.

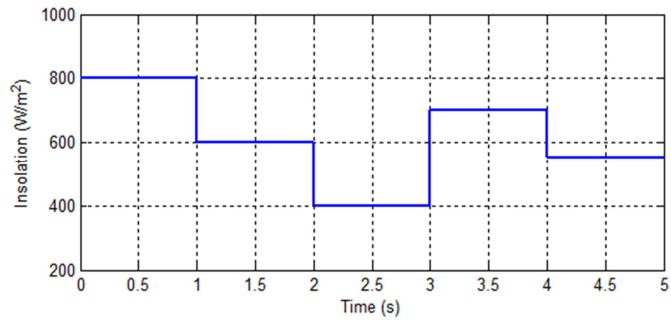


Figure 7.1 Solar Irradiation

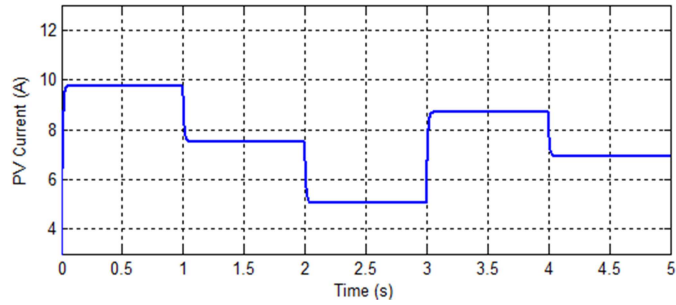


Figure 7.2 PV array output current without MPPT under varying irradiation

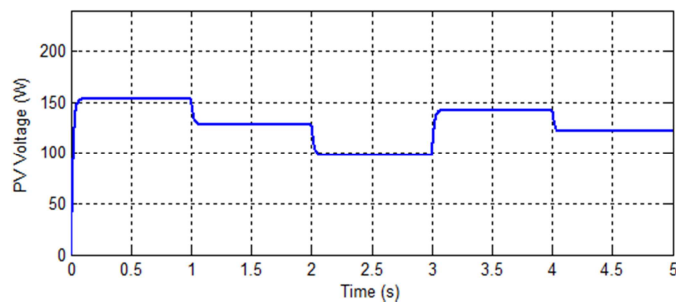


Figure 7.3 PV array output voltage under varying irradiation without MPPT

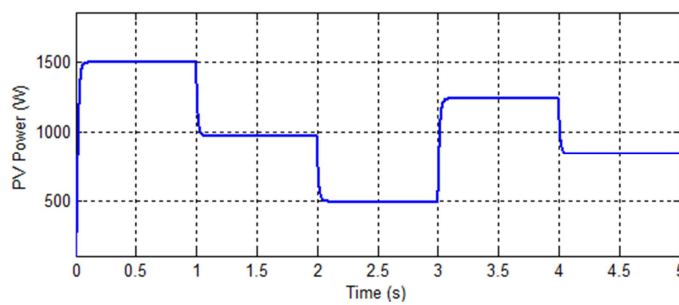


Figure 7.4 PV array output power varying irradiation without using MPPT

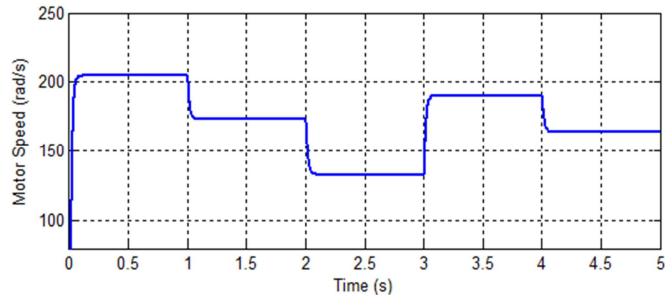


Figure 7.5 Rotational speed under varying irradiation levels without MPPT controller

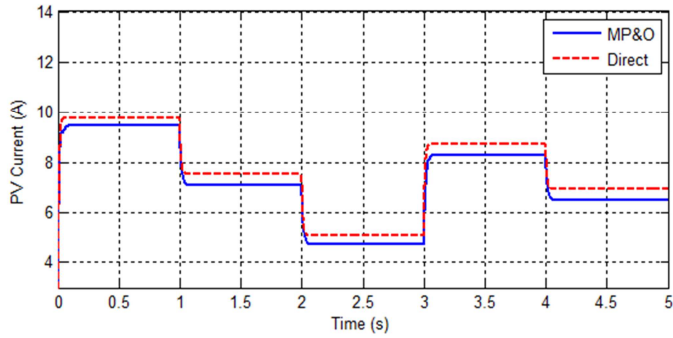


Figure 7.6 PV array output current under varying irradiation levels for MP&O MPPT.

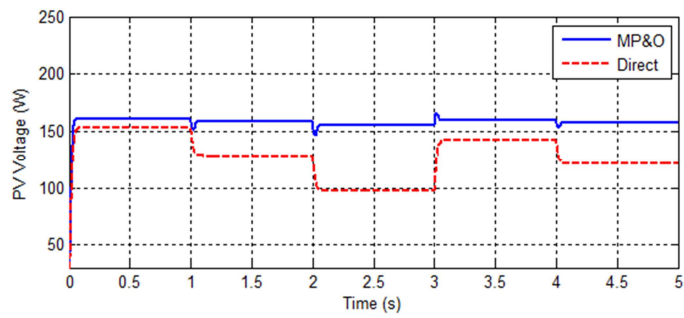


Figure 7.7 PV array output voltage under varying irradiation levels for MP&O MPPT

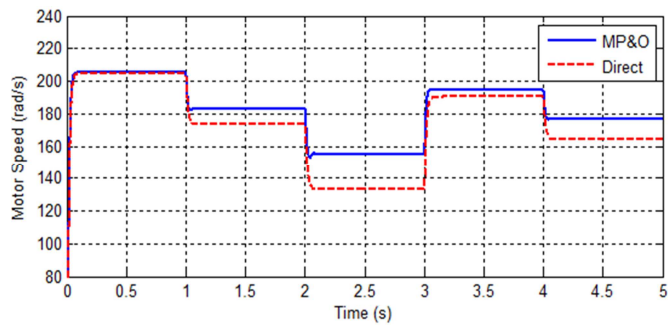


Figure 7.8 Rotational speed under varying irradiation levels for MP&O MPPT

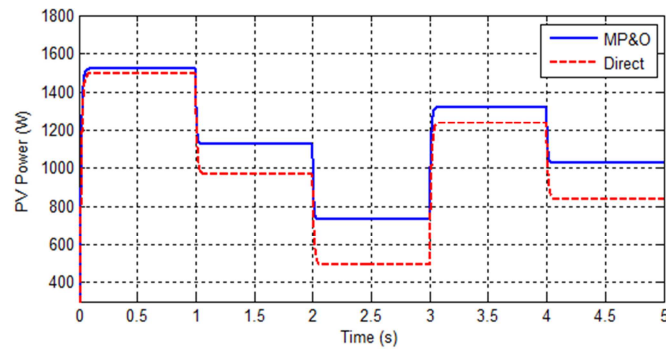


Figure 7.9 P<sub>v</sub> Power under varying irradiation levels for MP&O MPPT

#### 4 CONCLUSIONS

In this research, a stand-alone photovoltaic water pumping system is presented to supply the water in remote location areas with a clean and sustainable source of energy. The main focuses of this research was how to improve the total system efficiency by implementing an efficient MPPT techniques to transfer the maximum available power to the load especially under rapidly changing atmospheric conditions. The thesis reviewed and discussed some existing MPPT controller methods, including constant voltage method, P&O, INC, fractional short-circuit current, fractional open-circuit voltage, etc., and showed their ability to track the MPPT under rapidly changing weather conditions. It illustrated the advantages and disadvantages of each individual MPPT technique tracking performance. Based on the outcome of this evaluation, three proposed MPPT techniques were identified which substantially address the disadvantages that most MPPT techniques suffer from. The three more efficient MPPT controllers proposed were analysed and developed in more depth using new system simulations to clearly show improvements. The first proposed technique is a modified perturb and observe MP&O technique. The P&O MPPT method is very simple in comparison with other techniques, which makes it the easiest to design and implement. However, a P&O method with fixed perturbation step makes it difficult to achieve both a fast response and optimal steady-state operating conditions when atmospheric conditions are changeable.

#### REFERENCES

- [1] UNEP, "Water Policy and Strategy viewed on," [www.unep.org/dpdl/water/](http://www.unep.org/dpdl/water/) September 2015.
- [2] UNESCO, "The UN World Water Development Report (2003)," (viewed on [www.unesco.org/water/wwap/wwdr/](http://www.unesco.org/water/wwap/wwdr/), September 2015).
- [3] UNESCO, "The UN World Water Development Report (2014)," (viewed on [www.unesco.org/water/wwap/wwdr/](http://www.unesco.org/water/wwap/wwdr/), September 2015).
- [4] A. Z. Sahin and S. Rehman, "Economical Feasibility of Utilizing Photovoltaics for Water Pumping in Saudi Arabia," *International Journal of Photoenergy*, vol. 2012, p. 9, 2012.
- [5] A. Oi, "Design and simulation of photovoltaic water pumping system," Master Thesis, California Polytechnic State University, 2005.
- [6] L. A. C. Greenwood, "Green investing: Towards a clean energy infrastructure," *WorldEconomic Forum USA Inc*, January 2009.
- [7] M. Thomson, "Reverse-osmosis desalination of seawater powered by photovoltaics without batteries," Doctoral Thesis, Loughborough University, 2003.
- [8] E. Koutroulis, et al., "Development of a microcontroller-based maximum power point tracking control system," *Power Electronics, IEEE Transactions on*, vol. 16, pp. 46-54, 2001.
- [9] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- *International Journal of Engineering Science and Technology (IJEST)*, *Applied Power Electronics and Intelligent Motion Control*. Vol.2 (10), pp 35-43, December 2010
- [10] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- *Springer, Electrical Engineering*, Vol.93 (3), pp.167-178, September 2011.
- [11] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- *Iranian Journal of Electrical & Electronic Engineering*, Vol.8 (3), pp.259-267, September 2012.

- [12] T. M. Pavlović, et al., "A review of concentrating solar power plants in the world and their potential use in Serbia," *Renewable and Sustainable Energy Reviews*, vol. 16, pp. 3891-3902, 2012.
- [13] Tyagi, et al., "Progress in solar PV technology: Research and achievement," *Renewable and Sustainable Energy Reviews*, vol. 20, pp. 443- 461, 2013.
- [14] F. R. Pazheri, et al., "A review on global renewable electricity scenario," *Renewable and Sustainable Energy Reviews*, vol. 31, pp. 835-845, 2014.
- [15] J. S. Ramos and H. M. Ramos, "Solar powered pumps to supply water for rural or isolated zones: A case study," *Energy for Sustainable Development*, vol. 13, pp. 151-158, 2009.
- [16] P. Purohit and A. Michaelowa, "CDM potential of SPV pumps in India," *Renewable and Sustainable Energy Reviews*, vol. 12, pp. 181-199, 2008.

## ARDUINO BASED AUTOMATED MOBILE BRIDGE ACROSS THE RAILWAY PLATFORM

*S. Nagalaksmi<sup>1</sup>, P.M. Natarajan<sup>2</sup>, R. Abinaya<sup>2</sup>, S. Hemalatha<sup>2</sup>, and S. Meenaka<sup>2</sup>*

<sup>1</sup>Professor, Dept. of EEE, Sethu Institute of Technology, Kariapatti, Virudhunagar, India

<sup>2</sup>Student, Dept. of EEE, Sethu Institute of Technology, Kariapatti, Virudhunagar, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Indian Railways was established on 16 April, 1853. For the past decades, the vertical lift forms, swings and foot-over bridges were used in railway stations. But it is difficult for aged and handicapped persons to reach the other platform through the foot-over bridges. To provide the flexible bridge for the railway platforms in order to overcome these difficulties in the usage of foot-over bridges in railway stations. It is planned to go with a pair of IR(Proximity) sensors on either side of the railway station at certain distance. Initially, the flexible bridge is connected between the platforms which are fixed at one end and other end is movable by the functioning of the sensors and control unit.

**KEYWORDS:** Arduino Uno R3, IR Obstacle sensor (pair), 16\*2 LCD Display, L293D Motor Drive Module, Rack and Pinion Set (Actuator), Arduino IDE (Software).

### 1 INTRODUCTION

In India most of the commercial transport is being carried out by the railway network and therefore as any problem occurred during transportation directly affects the economy and railway operation efficiency, also consume lots of time for reproduction. The difficulty of the existing methodology is shown in *Figure: 1*.

Over the last few decades, Rail Transportation has become one of the most effective means of transporting passengers and goods, so the safety and reliability is highly considered.

The old Indian railways had the Footbridge, Swing bridge, Level crossing, etc. to travel from one platform to another platform in railway station [1]. There are many disadvantages in these types of bridges they are, Pedestrian overpasses over highways or railroads are expensive, especially when elevators or long ramps for wheel chairs users are required. Without elevators or ramps, people with mobility handicaps will not be able to use the structure. Often, people will prefer to walk across a busy road at grade rather than expend the effort to climb up the bridge and go over it. Overpasses should only be used where the number of users justify the costs.

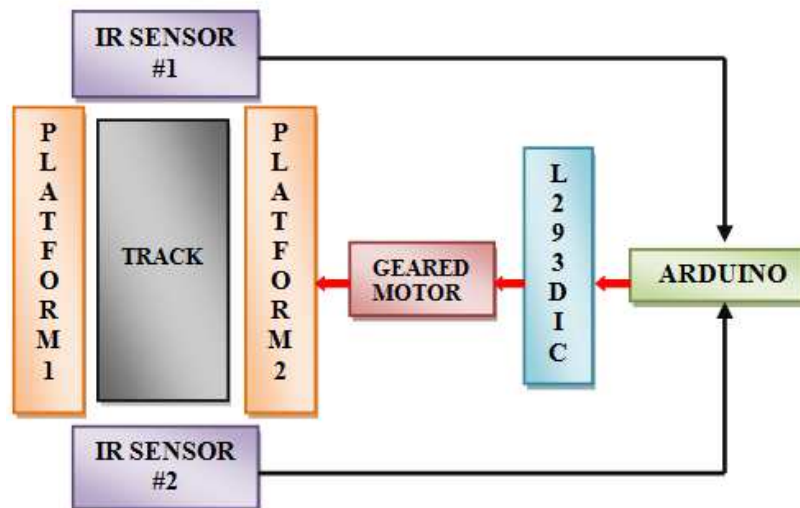


*Figure: 1 Existing System*

For a symmetrical bridge, the central pier forms a hazard to navigation. Asymmetrical bridges may place the pivot near one side of the channel.[2] Where a wide channel is not available, a large portion of the bridge may be over an area that would be easily spanned by other means. A wide channel will be reduced by the center pivot and foundation. When open, the bridge will have to maintain its own weight as a balance double cantilever, while when close an in use for traffic, the live loads will be distributed as in a pair of conventional truss bridges, which may require additional stiffness in some members whose loading will be alternately in compression or tension.

## 2 PROPOSED METHODOLOGY

The proposed system has to overcome the difficulties in the existing system. It is planned to go with a pair of IR(Proximity) sensors on the either side of the railway station at certain distance. Initially, the flexible bridge is connected between the platforms which are fixed at one end and other end is movable by the functioning of the sensors and control unit. The sensors are connected to the Arduino Uno R3 microcontroller it is programmed with the logic and it is connected to the L293d driver circuit and the driver circuit is connected with the Geared motor. The function of the L293d driver circuit is to change the polarity of the terminals of motor to change the direction of the rotation of the motor shaft. The Geared motor is used to control the speed of the motor. Thus the sequential function of the connected components are controls the movements of the flexible bridge perfectly. The block diagram for the proposed methodology as shown in *Figure: 2*.



*Figure: 2 Block Diagram of Proposed System*

## 3 HARDWARE DESCRIPTION

### 3.1 ARDUINO UNO

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The **Arduino Uno R3** is a microcontroller board based on a removable, dual-inline-package (DIP) **ATmega328** AVR microcontroller. It has 20 digital input/output pins. Programs can be loaded on to it from the **easy-to-use Arduino computer program**. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics.

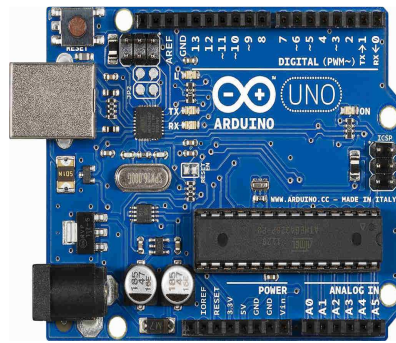


Figure: 3 Arduino Kit with different ports

The Arduino Uno R3 is shown in Figure: 3. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.[6] It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

### 3.2 INFRARED- SENSOR

An Infrared sensor is an electronic sensor that measures infrared light radiating from objects in its field of view. All objects with a temperature above absolute zero emit heat energy in the form of radiation. A pair of Infrared sensors are shown in Figure: 4.

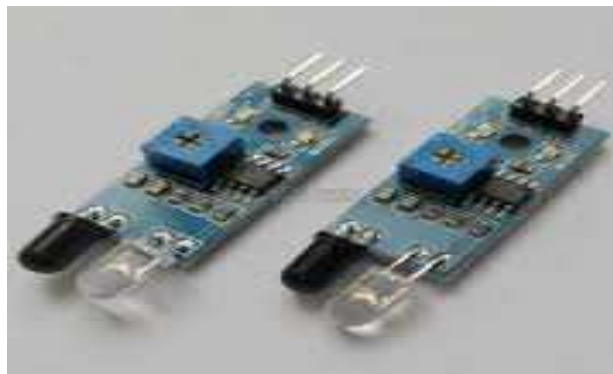


Figure: 4 Pictorial Representation Of Infrared-Sensor

Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose. The IR sensor consists of two parts: the emitter circuit and the receiver circuit.[8] The emitter is simply an IR LED (**Light Emitting Diode**). The detector is simply an IR **photodiode**, which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

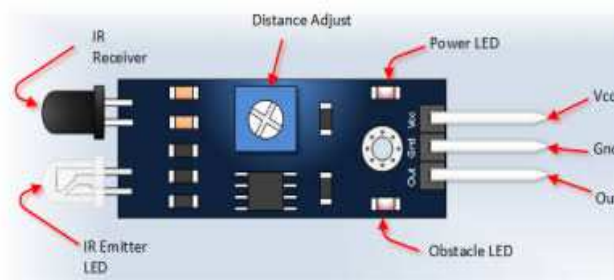
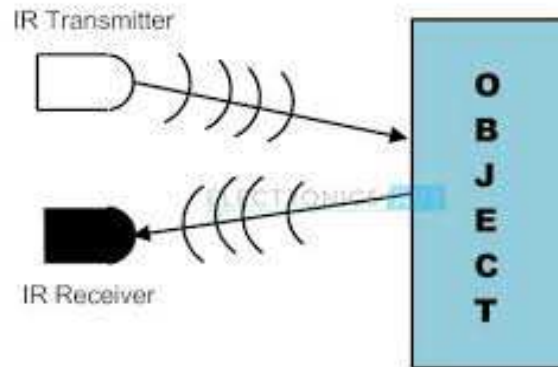


Figure: 5 Functional Pin Diagram of IR Sensor

The pin diagram of Infrared sensor is shown in *Figure:5*. HC-SR501 is based on infrared technology which acquires the information of train arrival. It has features of Voltage: 5V-20V is used. Power consumption: 65mA is available. TTL output: 3.3V, 0V. Sensor module is powered up after a minute, in this initialization time intervals during this module will output 0-3 times, a minute later enters the standby state. Should try to avoid the lights and other sources of interference close direct module surface of the lens, in order to avoid the introduction of interference signal malfunction; environment should avoid the wind flow, the wind will cause interference on the sensor.[7]



**Figure: 6 Functional Representation of IR Sensor**

The function of Infrared sensor is shown in *Figure: 6*. Sensor module with dual probe, the probe window is rectangular, dual (A B) in both ends of the longitudinal direction so when the human body from left to right or right to left through the infrared spectrum to reach dual time, distance difference, the greater the difference, the more sensitive the sensor, when the human body from the front to the probe or from top to bottom or from bottom to top on the direction traveled, double detects changes in the distance of less than infrared spectroscopy, no difference value the sensor insensitive or does not work; The dual direction of sensor should be installed parallel as far as possible in inline with human movement.

### 3.3 RACK AND PINION

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion.[4]A circular gear called the pinion engages teeth on a linear gear bar called the rack, the rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion. A rotational motion applied to the pinion causes the rack to move relative to the pinion. A rack and pinion with two racks and one pinion is used in actuators. The rack and pinion diagrammatic representation is shown in *Figure: 7*.



**Figure: 7 Pictorial Representation of Rack & Pinion**

Rack and Pinion combinations are often used as part of a simple linear actuator, where the rotation of a shaft powered by hand or by a motor is converted to linear motion. The rack carries the full load of the actuator directly and so the driving pinion is usually small, so that the gear ratio reduces the torque required. This force, thus torque, may still be substantial and so it is common for there to be a reduction gear immediately before this by either a gear or worm gear reduction. Rack gears have a higher ratio, thus require a greater driving torque, than screw actuators.

### 3.4 12V GEARED MOTOR

"Gear motor" refers to a combination of a motor plus a reduction geartrain. These are often conveniently packaged together in one unit. The Geared motor diagram is shown in *Figure: 8*. The gear reduction (gear train) reduces the speed of the motor, with a corresponding increase in torque. Gear ratios range from just a few to huge.[3] A small ration can be accomplished with a single gear pair, while a large ration requires a series of gear reduction steps and thus more gears. There are a lot of different kinds of gear reduction.



**Figure: 8 Pictorial Representation of Geared Motor**

In the case of a small transmission ration, the unit may be back drivable, meaning you can turn the output shaft, perhaps by hand, at angular velocity and cause the motor to rotate at angular velocity. A larger transmission ratio may make the unit non-back drivable. Each has advantages for different circumstances. Back drivability depends not just on transmission ration, but on many other factors. The combination of an electric motor and gearbox reduces design complexity and lowers cost, particularly for motors built for high torque and low speed applications.

### 3.5 L293D MOTOR DRIVER

The L293d motor driver is called as H-bridge. The term H-bridge is derived from the typical graphical representation of such a circuit. The L293d motor driver Ic is shown in *Figure: 9*.



**Figure: 9 Pictorial Representation of L293D IC**

The H-bridge arrangement is generally used to reverse the polarity/direction of the motor, but can also be used to brake the motor, where the motor comes to a sudden stop, as the motor terminals are shorted, or to let the motor free run to a stop, as the motor is effectively disconnected from the circuit.



Figure: 10 H Bridge with different ports

Most DC to AC converters, most AC/AC converters, the DC to DC push-pull converter, most motor controllers, and many other kinds of power electronics use H-bridges.[5] In particular, a bipolar stepper motor is almost invariably driven by a motor controller containing two H bridges. A way to build an H-bridge is to use an array of relays from relay board. The Pin diagram of L293d motor driver is shown in Figure: 11.

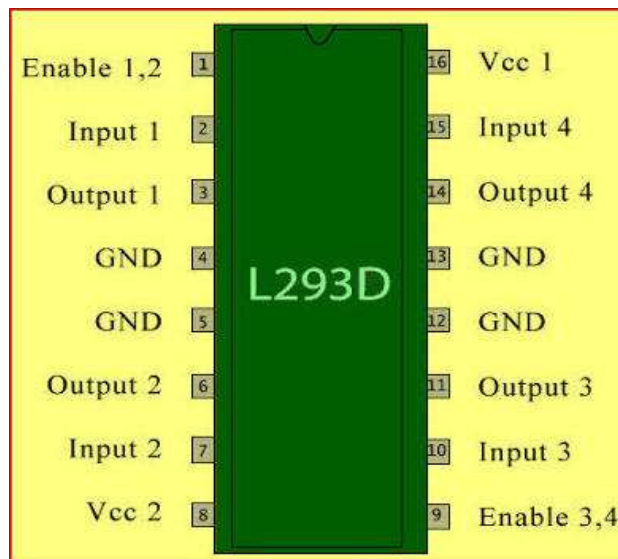


Figure: 11 L293D IC Pin Configuration

An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards or backwards[9]. The L293d motor driver circuit diagram is shown in Figure: 10.

#### 4 RESULT AND DISCUSSION

Initially, the flexible bridge is in closed condition passenger can utilize the bridge. When the train arrives the platform before it can sensed by the IR sensor, the signal from the sensor given to the Arduino Uno R3 microcontroller. The Arduino takes the signal as an input and runs the program and gives output to the L293d motor drive to change the polarity of motor terminals. It makes to change the direction of motor shaft depends upon the output of the Arduino. As per the motor rotation rack and pinion gets moved in the reverse direction and flexible bridge gets opened. LCD displays the instruction to the passengers.[10] After the train leaves the platform the sensor gets sensed and the process is repeated. The flexible bridge gets closed. The Final hardware kit pictorial representation is shown in Figure: 12.

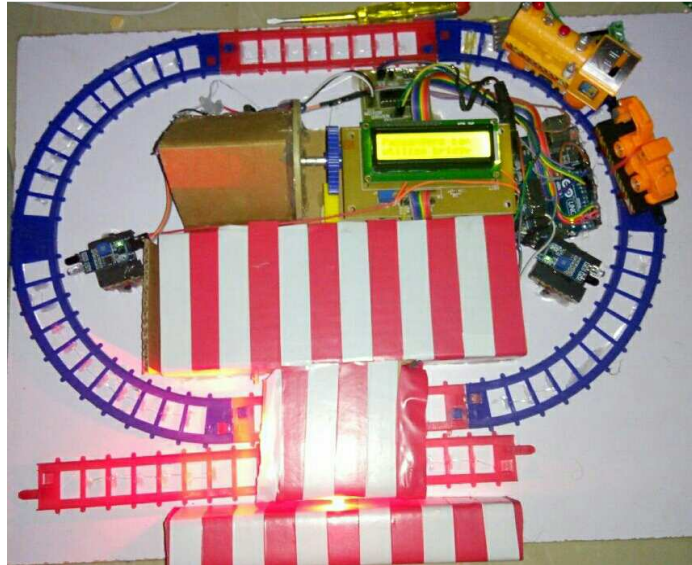


Figure: 12 Pictorial Representation of the Hardware kit

## 5 ADVANTAGES

- Enhance reliability at plat form crossing.
- Low cost and Less maintenance.
- It is very useful for handicapped and aged people to cross the platforms by using flexible bridges.

## 6 FUTURE SCOPE

- In future we can reduce accidents by using the camera pixels.
- By extending this Project the Platform of each train can be easily detected by each other.
- Train can transmit the info to station when the train is within some distance range from station.

## REFERENCES

- [1] J.Banuchandar, P.Balasubramanian, "Automated Unmanned Railway Level Crossing System," International Journal Modern Engineering Research Vol.2, Issue.1 , Jan- Feb 2012, pp-458-463.
- [2] Krishna, ShashiYadav, and Nidhi, "Automatic Railway Gate Control using Microcontroller", Oriental Journal of Computer Science, Vol.6, No.(4), Dec 2013, pp-372-385.
- [3] P. Kolakowski et al., "Structural health monitoring of a railway truss bridge using vibration-based and ultrasonic methods," Smart Mater. Struct., vol. 20, no. 3, p. 035016, Mar. 2011
- [4] D. Sala, J. Motylewski, and P. Koaakowsk, "Wireless transmission system for a railway bridge subject to structural health monitoring," Diagnostyka, vol. 50, no. 2, pp. 69–72, 2009
- [5] T. Hay et al., "Transforming bridge monitoring from time-based to predictive maintenance using acoustic emission MEMS sensors and artificial intelligence," in Proc. 7th World Congr. Railway Res., Montreal, Canada, 2006, CD-ROM.
- [6] Prakash Kumar *et al.*, "Arduino Based Wireless Intrusion Detection Using IR Sensor and GSM", International Journal of Computer Science, Vol.2 Issue. 5, May- 2013, pg. 417-424.
- [7] M.R. Eslaminejad, M. Sookhak, S.A. Razak, "A Review of Routing Mechanisms in Wireless Sensor Networks", International Journal of Computer Science and Telecommunication, Vol. 2, no. 7, October 2011.
- [8] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [9] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [10] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

- [11] Abhinaba Bhattacharjee , Partha Das “A Real-Time Face Motion Based Approach towards Modeling Socially Assistive Wireless Robot Control with Voice Recognition”, International Journal of Advanced Computer Science and Applications, Vol. 6, No. 10, 2015,page- 205.
- [12] Deepak Rasaily, Aarfin Ashraf, Cherryla Tobden, Rinku Bhutia, Shyam Chhinal, Karma Gyatsho” Designed Accident Prevention System Using Wireless Sensor Networks” International Journal of Engineering Trends and Technology (IJETT) – Volume 33 Number 9- March 2016.
- [13] S.Zheng, X.An, X.Chai, L. Li “Railway track gauge inspection method based on computer vision” IEEE International Conference on Mechatronics and Automation, 2012. pp 1292-1296.

## Experimental Evaluation of Mortar Embedded with PCM

*J. Esther Baby and R. Greesan*

Department of civil engineering, Chendhuran College of Engg & Tech., Pudukkottai, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Due to the modern development of construction industry, buildings and other appliances is becoming the highest energy consumer in developed countries. Improvement of the energy performance of the building is the prime objective of the paper to minimize the energy consumption and to control the global warming by utilizing alternate source of materials which is having less emission of CO<sub>2</sub>. Thus in-order to minimize the energy consumption of the building the phase change materials are used. Here the Polyethylene Glycol (PEG) and Perlite are used as a phase change material in cement mortar. The thermal behaviour of the PCM is analysed by measuring the room temperature with PCM and without PCM. The results are also showed that the range of temperature and its effects are decreased because of Latent heat characterized PCM.

**KEYWORDS:** Global Warming, Polyethylene Glycol, Perlite, Thermal Behaviour, PCM.

### 1 INTRODUCTION

Industry is the production of goods or related services within an economy. The construction industry is a major contributor towards the nation's growth, both directly and indirectly.

Energy and Environment are the two major issues facing the human comfort. Industrial developments and population boom in the past few years have resulted in an increase in energy demand with an annual increase of 2.3%. The energy consumption is the process of absorbing large amount of heat energy. This process was extensive so we were in a position where we had to ensure our efforts.

The increasing demand for energy saving and environment friendly technology is a driving the growth of the global phase change material (PCM) in the market. Nowadays the energy consumption of the building has increased in the developed and developing countries. To utilize the heat energy absorbed by the building, the phase change materials are used as the energy conservation system.

Phase change materials exhibits thermodynamic property of storing large amount of latent heat during its phase change. PCM solidifies on drop of ambient temperature giving off its latent heat of fusion. As compared to conventional materials PCMs have the property of storing high amount of latent heat giving more heat storage capacity per unit volume. PCMs can be used in building walls, ceilings and floors. In building applications, they have a phase transition close to human comfort.

Thus in-order to make the energy efficient building, the PCM is used and its thermal behaviour is analysed. Here two types of PCM are used such as PEG and Perlite. These materials are mixed with cement mortar and are used as the plastering material in the concrete wall. The whole arrangements are placed in the roof terrace to get the sun light. The thermal storage in the concrete wall is found out with a particular interval of time. The temperature sensor are used to measure the temperature within and outside the concrete wall.

## 2 MATERIAL DESCRIPTION

The normal ordinary Portland cement of grade 53 is used and the initial test for the cement is done such Fineness of cement, Consistency of the cement paste and the Initial and Final setting time of the cement. After that mortar cube is made and its compressive strength is calculated for 28 days curing.

### 2.1 POLYETHYLENE GLYCOL (PEG)

PEG is a polyether compound, which is used for various industrial purposes. It is also known as Polyethylene Oxide (PEO) or Polyoxyethylene (POE) based on its molecular weight. It is also known as Water soluble wax or Carbowax. PEGs are manufactured by polymerization of ethylene oxide and are commercially available in wide range of molecular weights from 300g/mol to 10,000,000g/mol.

Polyethylene glycols are chemically stable in air and in solution. They do not support any microbial growth. Sterilization of solid grades by dry heat at 150°C for one hour may induce oxidation, darkening and the formation of acidic degradation products.

They should be stored in well-closed containers in a cool and dry place. Stainless steel, aluminium, glass or lined steel containers are best to store liquid grades. However storage under nitrogen reduces the possibility of oxidation. PEG has low toxicity with systemic absorption less than 0.5%.

### 2.2 APPLICATIONS OF PEG

PEG is a successful PCM which may be used in various industries to overcome the thermal defects. Some of the Applications of PEG are listed below:

1. They act as a lubricant.
2. They are used as a plasticizer.
3. PEG esters are used as solvent.
4. They are used in wood treatment.
5. It also act as a chemical intermediates.
6. They are mainly used in industries for thermal insulations to reduce the heat.

### 2.3 PEG 600

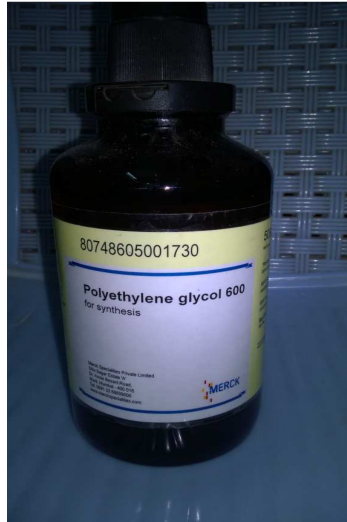
Here PEG 600 is used as the phase change material in concrete wall as a phase change material. PEG 600 is a clear, colourless liquid, made from sugarcane waste. It is also a renewable source. They have an average molecular weight of 380-420. It is soluble in water and it is hydrophilic. It has various applications in various industries.

**TABLE I**  
**PROPERTIES OF PEG**

Chemical Composition	Percentage
Melting Point	15 – 17°C
Appearance	Clear viscous colourless liquid at 25°C
PH	4 - 7
Average molecular weight	590 - 610
Hydroxyl value	176 – 200
Moisture content maximum	1.0%

### 2.4 PEG 600 PROPERTIES

PEG 600 consists of a distribution of polymers of varying molecular weights with an average of 600. Molecular weight has an effect on the physical properties of each product grade. Increased molecular weight results in decreased solubility in water and solvents, decreased hygroscopicity and vapour pressure and increased melting/freezing range and viscosity.



*Fig. 1 PEG - 600*

## 2.5 PERLITE

Perlite is an amorphous volcanic glass that has relatively high water content. Perlite is a white, lightweight, organic material that is used to increase the porosity for planting mixes in horticulture. It is a recyclable material that comes from diamond mines. It does not cause a reaction with waterproofing membranes. It is an industrial mineral and a commercial product useful for its lightweight after processing.

Mostly perlites are light in weight of white granular material that handles and pours easily. It can be easily provided in the masonry walls to reduce the heat transmission up to 50% or more. Due to its light weight it can be used in roof deck, floor fill, lightweight structural decks, insulation for steam and coolant lines, bases of storage tanks, sewer lines, etc.



*Fig. 2 Perlite*

## 2.6 PROPERTIES OF PERLITE

Perlite softens when it reaches a temperature of 850 – 900<sup>o</sup>C. Water trapped in the structure vaporises and escapes and this cause an expansion of material upto 7 to 16 times its original volume.

2.7 CHEMICAL COMPOSITION OF PERLITE

TABLE III  
COMPOSITION OF PERLITE

Chemical Composition	Percentage
Silicon dioxide (SiO <sub>2</sub> )	70 – 75%
Aluminium Oxide (Al <sub>2</sub> O <sub>3</sub> )	12 – 15%
Sodium Oxide (Na <sub>2</sub> O)	3 – 4%
Potassium Oxide ( K <sub>2</sub> O)	3 – 5%
Iron Oxide (Fe <sub>2</sub> O <sub>3</sub> )	0.5 – 2%
Magnesium Oxide (MgO)	0.2 – 0.7%
Calcium Oxide (CaO)	0.5 – 1.5%
Loss on Ignition	3– 5%

2.8 PHASE CHANGE OF PCM

When the temperature is low the PCM material will be in its solid state and when the temperature increases, it starts to melt and attains the liquid state, during this process the energy is balanced by them is an effective behaviour of the PCM material. This process is called a Phase Change. This process is represented in the fig. 3. The heat absorbed by the building in the external wall is used for this process and hence the heat in the internal wall is automatically reduced and it gives a pleasant & comfortable environment inside the room.

Thus it reduce the excessive use of electronics materials such as fan, air cooler, etc.

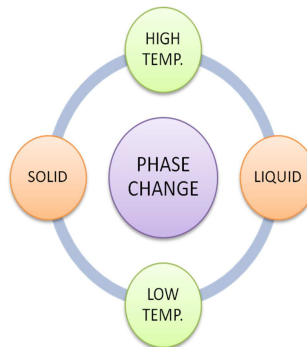


Fig. 3 Process of Changing from One Phase to Another

2.9 APPLICATION OF THE PCM MATERIALS

1. To minimize the use of space conditioning.
2. To minimize the operating energy use of the building.
3. To minimize the temperature fluctuations in the building based on climatic variations.
4. To provide comfort atmosphere for the human beings by providing PCM materials with in the interior surface of the concrete.

3 TEST RESULTS

The following are the test conducted for the cement and PCM.

### 3.1 CEMENT

The ordinary Portland cement of grade 53 is used. The various tests such as fineness of cement, consistency of cement, soundness test of cement, initial and final setting time of the cement and compressive test for mortar after 28 day curing are done and the result details are listed below

**TABLE III  
PROPERTIES OF CEMENT**

SI.No	Property	Result	Range
1	Specific Gravity	3.15	3.10 – 3.15
2	Consistency	31.5%	30 - 35
3	Initial setting time	91 min	30 minimum
4	Final setting time	211 min	600 minimum
5	Compressive strength of mortar	55 N/mm <sup>2</sup>	53N/mm <sup>2</sup> minimum

### 3.2 COMPRESSIVE STRENGTH OF PEG & PERLITE MORTAR

The cube mortar used is of the size 70.6 X 70.6 X 70.6mm. For normal cement mortar the mix proportion used is 1:3 ratio and its compressive strength is found out.

Now along with the normal cement mortar PEG is added for 1%, 2%, 3% and 4%. And also the perlite is added for 1%, 2%, 3% and 4%. The cubes were casted and its compressive strength is given below after the curing process.

#### 3.2.1 COMPRESSION STRENGTH OF CEMENT MORTAR AND PEG

**TABLE IV  
CEMENT MORTAR WITH PEG STRENGTH**

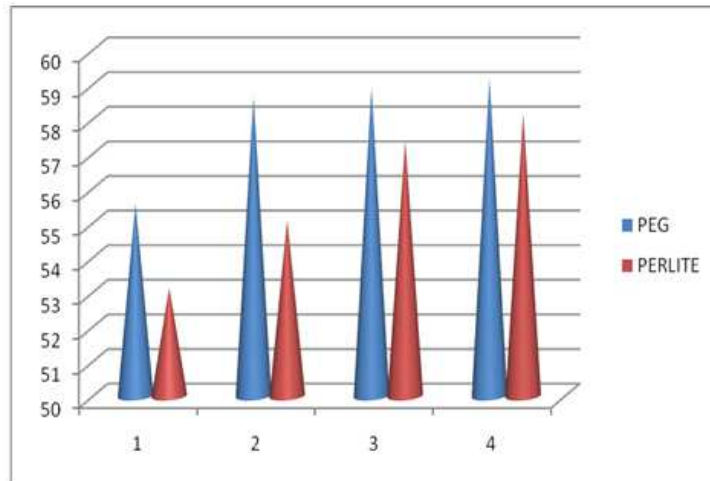
SI.No.	Addition of PEG	Compressive strength
1	1%	55.56
2	2%	58.65
3	3%	58.9
4	4%	59.17

#### 3.2.2 COMPRESSION STRENGTH OF CEMENT MORTAR AND PERLITE

**TABLE IV  
CEMENT MORTAR WITH PERLITE STRENGTH**

SI.No.	Addition of Perlite	Compressive strength
1	1%	53.12
2	2%	55.08
3	3%	57.39
4	4%	58.15

From the above test results, the compressive strength of the cement mortar increases with both of the PCM. And the attained value is appreciable for 4% when compare to other percentage levels. Hence the plaster embedded with 4% of PCM is selected for thermal analysis.



**Fig. 4 Compressive Strength of cement mortar with PEG & Perlite.**

**3.3 THERMAL TESTING**

The plastering is done along with the cement mortar with the addition of PCM materials (PEG & Perlite). The PEG and Perlite are added to the mortar is about 4%. The model wall is casted with the dimensions of 1’X1’X0.5’in the roof terrace to receive the sunlight directly.

Thus three small rooms model are made and their thermal values in the interior and exterior walls are found out. The temperature changes are measured using temperature sensor. The temperature variations are measured at 10.30 a.m, 12.30 p.m, 02.30 p.m and 04.30 p.m. and the readings are listed.

**TABLE V  
TEMPERATURE RANGE OF Conventional wall without PCM**

Day	Temperature Range			
	10.30 a.m	12.30 p.m	02.30 p.m	04.30 p.m
Day 1	33	35.3	37.7	34.4
Day 2	33.4	35.9	36.7	34.1
Day 3	31.8	34.9	36.9	35.7
Day 4	32.4	35.4	37.9	35
Day 5	34.6	37	40	37.1
Day 6	35.6	37.1	39.1	37.7
Day 7	33.5	38.2	37.3	37.5
Day 8	34.9	35.8	36.2	33.9
Day 9	34.8	36.9	38.1	34.9
Day 10	34.5	36.4	36.5	34.8

**TABLE VI**  
**TEMPERATURE RANGE OF wall PLASTERED WITH PEG**

Day	Temperature Range			
	10.30 a.m	12.30 p.m	02.30 p.m	04.30 p.m
Day 1	30.5	33.4	35.4	33.3
Day 2	30.8	33.8	34.8	33
Day 3	30.5	33.7	35	31.5
Day 4	30.4	33.9	34.7	31.9
Day 5	32	34.4	35.6	32.6
Day 6	33	35	37.3	33.9
Day 7	32	35.6	35.6	32.6
Day 8	31.2	33	33.2	31.3
Day 9	32.7	34.1	33.7	32
Day 10	32	33.5	33.9	32.4

**TABLE VII**  
**TEMPERATURE RANGE OF wall PLASTERED WITH PERLITE**

Day	Temperature Range			
	10.30 a.m	12.30 p.m	02.30 p.m	04.30 p.m
Day 1	32.5	34.9	36.8	34.3
Day 2	32.8	34.8	34.8	34
Day 3	31.3	34.1	36	35.5
Day 4	31.9	34.6	35.7	34.9
Day 5	35	36.4	37.2	36.8
Day 6	34	37.1	39.3	37.5
Day 7	34	37.3	37.2	37.3
Day 8	34.2	35	34.6	33.4
Day 9	34.2	36	35.5	34.6
Day 10	34	35.5	34.6	33.4

#### 4 CONCLUSIONS

This research developed a product that could realize important building energy savings, with the improvement of heat storage mortar, using an innovative type of phase change material called Perlite and PEG, regarding its thermal property.

The work here presented is the preparation of mortar with above mentioned PCM's for reducing the thermal defects and to control the room temperature. Some of the significant test are conducted, and the results showed that the addition of 4% of PCM gives better results of strength parameters. Among the thermal performance, the paper suggested to utilize PEG 600 because of its high thermal effectiveness.

#### REFERENCES

- [1] Aston Jeremiah Richard. N and C. Freeda Christy, "Experimental work on analysis of samples containing self curing agent", An international Journal (ESTLJ), vol.3, No.2, April 2013.
- [2] M. Deepika, R. Saranya and R. Rajakumari, "Experimental investigation on usage of polyethylene glycol as self-curing", Journal of Engineering, Scientific & Applications (JESRA), volume 2, Issue 2, July-December 2016.
- [3] Mohanraj. A, Rajendran. M, Ramesh. AS, Mahalakshmi. M and Manoj Prabhakar. S, "An Experimental Investigation of Eco-friendly self-curing concrete incorporated with polyethylene glycol", International Advanced Research Journal in Science, Engineering and Technology, vol.1, Issue 2, October 2014.
- [4] M Venkateswarlu, V Balaji, M Susmitha and D Suresh, "Study On Durability Characteristics Of Conventional Concrete With PEG-600 As Self Curing Compound", European Journal of Advances in Engineering and Technology, ISSN: 2394 - 658X, 2(12): 47-52, 2015.

- [5] G L Abishek , “ *Experimental Investigation Of High – Strength Characteristics Of Self Curing Concrete*”, Volume 2:Issue 07, ISSN: 2455-3778, 2016.
- [6] Frederic Kuznik and Joseph Virgone, “*Experimental Assessment Of A Phase Change Materials For Wall Building Use*”, Applied Energy, Elsevier,86(10), P.P.2038-2046, 2009.
- [7] Rai. M, Gupta. V, “*Energy conservation in production and management*”, Energy and habitat, pp-63-65, 1983.
- [8] Drury B. Crawleya, “ *Energy plus: creating a new generation building energy simulation program*”, Energy and Building, vol.3, pp-319-331.
- [9] Cheng, Rui. Pomianowski, Michal. Heiselber, Per. Wang, Xin and Zhang, Yinping, “A new method to determine thermo physical properties of PCM – concrete brick,” *Applied Energy.*, vol. 112, pp. 988–998, 2013.
- [10] C.Nagarajan and M.Madheswaran - ‘Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter’ - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [11] C.Nagarajan and M.Madheswaran - ‘Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques’- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [12] C.Nagarajan and M.Madheswaran, “Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation” has been presented in ICTES’08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [13] Moore Fuller, “*Environmental control system heating, cooling, lighting,*” McGraw-Hill International Editions, 1993.
- [14] Ubinasa-Edwin Rodriguez, Valero-Letzai Ruiz. Vega, Sergio and Neila, Javier, “*Application of phase change material in highly energy efficient houses ,*” Energy and Building Vol.50,pp.49-62 (2012).
- [15] Nicola Terry, Jason Palmer, Ian Cooper, “*Insulation And Thermal Storage Materials*”, June 2012.
- [16] Rahimi. M, Ranjbar. A.A., Ganji. D.D., Sedighi. K and Hosseini .M, “Experimental investigation of phase change material inside a Finned-Tube Heat Exchanger”, Journal of Engineering, Vol.2014, Article ID 641954, 11 pages.
- [17] (2002) The IEEE website. [Online]. Available: <http://www.ieee.org/>
- [18] ACME-HARDETY homepage [Online]. Available: <http://www.acme-hardesty.com/>

## KINETIC ENERGY RECOVERY SYSTEM IN BICYCLE BY USING FLYWHEEL

*G. Arun Deesh, R. Kannan, S. P. Gokul, M. Gopal, and V. Gowtham Mani Balaji*

Department of Mechanical Engineering, Gnanamani College of Technology, Pachal, Namakkal, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Kinetic energy recovery system (KERS) is a method used in automobiles for recovering the energy lost in braking of the automobiles and thus providing speed to the vehicle motion. In that same concept for braking regenerative can be applied in bicycle. When riding a bicycle, a great amount of kinetic energy is lost while braking, making start up fairly strenuous. Which method uses a flywheel? Flywheel will be mounted between the frames of the bicycle, in that flywheel can store the braking energy by rotating and this energy can be required time given to the system in that term engagement and disengagement mechanism used to reduce the pedaling power required to drive the bicycle. This Flywheel Energy Storage system uses flywheel with suitable clutch mechanism along with sprocket and chains. The flywheel increases maximum acceleration and nets 10% pedal energy savings during a ride where speeds are between 13 and 15 mph. Further this concludes about efficiency and pedaling power in flywheel bicycle.

**KEYWORDS:** KERS-kinetic energy recovery system, Flywheel, clutch mechanism.

### INTRODUCTION

KERS is a collection of parts which takes the kinetic energy of a vehicle under deceleration, stores this energy then release this stored energy back into the drive train of the vehicle, providing a power to that vehicle. For the driver, it is like having two power sources at his disposal, one of the power sources is the engine while the other is the stored kinetic energy. Kinetic energy recovery systems (KERS) store energy when the vehicle is braking and return it when accelerating. During braking, energy is wasted because kinetic energy is mostly converted into heat energy or sometimes sound energy that is dissipated into the environment. Vehicles with KERS are able to harness some of this kinetic energy and in doing so will assist in braking. By a proper mechanism, this stored energy is converted back into kinetic energy giving the vehicle extra boost of power. There are two basic types of KERS systems i.e. Electrical and Mechanical. The main difference between them is in the way they convert the energy and how that energy is stored within the vehicle. Battery-based electric KERS systems require a number of energy conversions each with corresponding efficiency losses. On reapplication of the energy to the driveline, the global energy conversion efficiency is 31–34%. The mechanical KERS system storing energy mechanically in a rotating fly wheel eliminates the various energy conversions and provides a global energy conversion efficiency exceeding 70%, more than twice the efficiency of an electric system. This design of KERS bicycle was motivated by a desire to build a flywheel energy storage unit as a proof of concept. On a flat road, the cyclist can maintain a fixed cruising speed to get from point to point. Globally all roads are flat with impediments such as intersections, cars, and turns that force the cyclist to reduce speed, then accelerate.

### LITERATURE REVIEW

Flywheels are having energy storing capabilities. It finds always every mechanism that involves gears and centrifugal motion. The flywheels are generating 10 to 15 percent more efficient in storing the energy when compared to the batteries. But if the stored energy would get dissipated and would be of no use at any time. But in the case the lithium-ion, alkaline batteries and some chemical batteries energy can be stored and can be used in near future.

In This idea of flywheel in a bicycle was brought up by a student Maxwell von Stein. Maxwellvon used a car flywheel which weighed about 15 pounds and he has also used a critical clutch mechanism it makes the device complicated. In this journal paper, a flywheel which weight just 4 kg. in This mechanism was incorporated and it has been tested successfully. It isa perfect in line assembly will enable this engaging mechanism to work smoothly.

## **METHODOLOGY**

By studying about the different literatures regarding to the project we are come to know that, weight of flywheel is high as compare to the efficiency of the bicycle. The project design is based on the weight of flywheel and design of the bicycle body. In this design we are going to reduce the weight of flywheel, the stresses produced on connecting rod it will also minimize and power required to drive the bicycle will also reduced.The material used for fabrication of the flywheel is cast iron which is brittle virtually non-malleable metal that is considered generally inflexible. stiffness and damping properties of cast iron make it an excellent material for flywheel. By fabrication of the flywheel and design is according to the main frame and design of bicycle we got good stability of the bicycle. The frame had modified by adding steel shafts which is of square shape. One end is welded at the handle end and the other at the rear frame of bicycle.

## **COMPONENTS DESIGNED**

- 1) Flywheel
- 2) clutch mechanism
- 3) Shaft
- 4) Frame
- 5) Bearing Selection

## **FLYWHEEL**

Flywheel is the energy storing device, mass moment of the force which is exist on the flywheel. It is used to store and restore the energy.

## **SHAFT**

Considering the inner diameter of the ball bearing and by carrying out shaft design the diameter of shaft is decided. Thus accordingly shaft and the related shaft support structure on the frame is manufactured.

## **FRAME**

In order to mount a flywheel an additional frame mounting is imperative as frame is the support structure for the flywheel' Frame mounting is the first step is manufacturing of the flywheel bicycle. Steel tubes are used as the frame structure, they are joined by welding.

## **FLYWHEEL DESIGN**

The flywheel has to be design according to the weight. steel Shaft is mounted on the frame on which bearing and hub arrangement is made. A hub is provide to run the freewheel along with the shaft. The efficiency of KERS system mainly depends upon the flywheel selection.



**MODIFICATION OF FRAME**

The modification of frame is help for The flywheel fitting arrangement. And frame is mounted on the bicycle. One end is clamped to the handle of the bicycle and other end of the frame is drilled inside the bolt of the rear wheel. The frame is strong enough to support the flywheel during the motion of the bicycle.The frame which is mounted on the bicycle will not disturbed the rider.



**COST OF THE EXPERIMENT**

S. No	Name Of The Materials	Material Cost
1	Cycle	1800
2	Flywheel	1600
3	Chain	150
4	Connecting Rod	200
5	Gears 2	800
6	Flywheel lock pin	300
7	Nut And Bolts	100
8	Flywheel Connecting rod	350
9	Gear And Wheel connecting setup	200
10	Clutch	450
11	Bearings	350
	Total	6300

**WORKING PRINCIPLE**

The working of the KERS system is described below in details. We are manually give the pedaling energy.in that pedaling energy of potential energy is passes to pedaling sprocket into rear sprocket by use of chain drives. In that energy named as kinetic energy. Until this process is worked on normal bicycles. In this design project we are using flywheel. The driving kinetic energy is reused by flywheel and chain drives. The rear axle kinetic energy is passed to the flywheel by use of chain drives in that term we are using extra sprockets in rear wheel axle.in that extra sprocket function is connecting flywheel sprocket through chain drive. In that energy will rotate the flywheel. In that term flywheel act as a energy storing device in

that stored energy will be again reused by this chain mechanism. Inside of the flywheel is attached on bearing. In that bearing is help to reduce the wear and act as a smooth rotation producer. Total flywheel body will be attached on bicycle frame. It cannot affect to the comfortless of drivers. Stored energy will required time only relished by using clutch mechanism.in this mechanism is used for the engagement and disengagement purpose. clutch is act as a lock pin. lock pin is manually operated. Flywheel giving a rotating energy to rear axle. It will help to the extra movement of cycle wheel. for this method to generate the extra rotation of efficiency by using flywheel. The translational motion of the clutch drive pushes the clutch plate to bring it in contact with the flywheel. In this design we have connected the KERS actuator on the opposite side of the left brake lever so when clutch is actuate brake is not actuated and when the brake will be actuated the clutch will automatically disengage. The clutch drive is always in the actuated state with the help of a sprig that always keeps it rotated by nearly 150°. The rest 30° is for wear and tear compensation. The clutch plate is a continuously moving part as it is connected with the front sprocket using three keys.

The front sprocket is driven by the rear sprockets through a chain drive. The rear sprockets are a set of sprockets on which the chain can change position to get different gear ratios. These are interconnected and rotate at same RPM as the rear wheel. During charging of the flywheel, power flows as sprockets on the rear sprocket system we can have 5 different gear ratios and can manipulate them to get the required charging and discharging conditions. During charging it is preferred to use a higher gear ratio (Rear: Front) so that the flywheel can get charged within less time. But this will cause higher initial jerk while engaging.

So it is preferred to engage the clutch at the lowest gear ratio and then increase the gear ratio to the maximum.This has an additional advantage. With every increasing gear ratio the relative velocity of the flywheel as compared to the rear wheel decreases. Thus additional torque acts on the flywheel and accelerates it to even higher speed. This way the flywheel can attain its maximum desired RPM smoothly. Now the flywheel has its maximum potential energy.in that potential energy give the extra efficiency.

## DESIGN



## CONCLUSION

An overall test is conducted to test the efficiency of the bicycle. It has been found to the flywheel supplies an energy with which the cycle could move forward by 10% of the given input. Based on the input given, the efficiency varies. But only 10% can be obtained by this principle. This system when installed in vehicles would save a high amount of energy lost during the braking of the vehicle. This energy can be stored and can be reused when needed energy. It will give more efficient when compared to the conventional braking system. We would conclude that, this recovery system has to be developed further and has a wide range of research which can be conducted in the future.

## REFERENCES

- [1] Balakrishnan N, Mayilsamy K & Nedunchezian N 2015, "An investigation of the performance, combustion and emission characteristics of CI engine fueled with used vegetable oil methyl ester and producer gas", International journal of Green Energy, vol. 12, pp.506-514.P-ISSN: 1543-5075, E-ISSN: 1543-5083 (Electronic).
- [2] Sreevalsan S Menon, Sooraj M S, Sanjay Mohan, Rino Disney, Suneeth Sukumaran, (2013), Design and Analysis of Kinetic Energy Recovery System in Bicycles, International Journal of Innovative Research in Science, Engineering And Technology, (ISO 3297:2007 Certified Organization), Vol.2, Issue 8, PP: 3701-3709.

- [3] Suraj A. Sevatkar, Eknath M. Pise, Pravin S. Ghawade, Design and Fabrication on a Bicycle Used as Kinetic Energy Recovery System, International Journal of Research in Science and Engineering, Special Issue: Techno-Xtreme 16, P-ISSN:2394-8280.
- [4] U. Mugunthan, U. Nijanthan, Design and Fabrication of Mechanism for recovery of Kinetic Energy In Bicycle Using Flywheel, International Journal of Emerging Technology and Advanced Engineering, (ISSN 2250-2459, ISO 9001:2008) Certified Journal, Volume 5, Issue 5, May 2015, PP:107-110.
- [5] C. Nagarajan and M. Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.
- [6] C. Nagarajan and M. Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques' - Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
- [7] C. Nagarajan and M. Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R. University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [8] Nishad Kumbhojkar, Kunal Mohite, Anand Kulkarni, Sanket Patil, Design and Implementation of Kinetic Energy Recovery System (KERS) in Bicycle, International Journal of Mechanical Engineering and Technology (IJMET), Volume 6, Issue 4, April (2015), PP:101-108.
- [9] Mukeshkumar Prasad, Nilesh W. Nirwan, Design and Fabrication of Automatic Balancing Bicycle, International Journal of Science and Tecnology Research (IJSETR), Volume 5, Issue 2, February 2016, ISSN: 2278-7798, PP:532-536.
- [10] M.P.Mohurle, D.S. Deshmukh, P.D.Patil, Human Power Using Bicycle Mechanism as an Alternative Energy Source: a Critical Review/International Conference On Global Trends in Engineering, Technology and Management (ICGTETM-2016), ISSN:2231-5381, PP: 417-422.
- [11] Stefan Mocanu, Adrian Ungureanu, Radu Varbanescu, Bike-Powered Electricity Generator, Asia Pacific Journal of Muldisciplinary Research, Vol 3, No 1, Feb 2015.
- [12] Vilas S Bugade, Dr Y.P. Nerkar, Comparision of Brushless D.C (BLDC) and Printed Circuit D.C Motors for The Electrical Bicycle application, International Journal Of Mechanical Engineering and Technology (IJMET), ISSN:0976-6340, Volume 1, Issue 1, 2010, PP:144-156.
- [13] Mr.Sc. Mevlan Bixhaku, Prof. Dr. Malenkovska, Analysis Of Key Factor That Affect Bicycle Level of Service, International Journal of Mechanical Engineering and Technology (IJMET), volume 4, Issue 5, 2013, ISSN Print:0976-6340, PP:244-249.
- [14] Kevin Ludlum, "Optimizing Flywheel Design For Use As A Kinetic Energy Recovery System For A Bicycle", 3 June 2013.

## ENERGY EFFICIENT SOLAR DRYER FOR SAGO INDUSTRIES

*M. Vijay, S. Vimalraj, S. Vinith, K. Vishay Vincent, and P. Vijaymohan*

Department of Mechanical Engineering, Gnanamani College of Technology, Anna University, Chennai, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** India is a tropical country which has large amount of available solar radiation which can be harvested and converted to suitable from that is required by the energy utilizing process of our industries. Sago is one of the main food items that are in taken by the most people of India. The raw sago is not consumed directly instead it is processed by sago processing industries which produce processing of a consumable from of sago called starch. The sago include of drying of sago particles in open air convection method or by using electrically operated oven for sago drying.

In open air convection the area required for drying sago is more and suitable for large scale processing and the usage of electric oven requires huge amount of electricity for the effective drying of sago particles, to avoid these constraints we have designed an device known as step type solar dryer which use solar energy as its energy source and has high efficiency by reducing the total time for drying out the moisture content in sago particles. We have employed glass covers which the entry of dust particles to the sago particles thereby increase the purity of sago processing. The main advantage of this device is its efficiency in energy conversion of solar radiation it is exposed to it. We hope this device would be transformed in to an essential device in sago processing industries in near future due to its clean and green energy of operations which reduce the cost of production

**KEYWORDS:** L angle, flat, wood, glass, aluminum.

### 1 INTRODUCTION

The sago industries mostly use fire wood or other nonrenewable sources of energy sources like electricity supplying heat to sago pan. This cause an huge in processing amount for the starch production due large price of these nonrenewable source of energy and also these cause an huge in impact on environment by degrading to higher level by which an environmental agencies requires an ban on this entire industries. In order to overcome these defect of starch industries we decided to design an model of solar operated starch pan for starch production, as solar is ecofriendly source of energy and it is available globally at free of cost but it require an inevitable technique to convert it to our need energy from.

### 2 SOURCES OF SAGO

Sago is a powdery starch made from the processed pith found inside the trunks of the sago palm Metroxylon sago. The genus name Metroxylon is derived from Greek and means heartwood, while the species name sago is from a local name for the food. Sago forms a major stable food for the lowland peoples of New Guinea and the Moluccas where it is often cooked and eaten as a form of pan cake with fish. Sago looks like tapioca and both are pearly grains of starch, but tapioca is made from the root of the cassava plant. They are similar but are not identical when used in recipes.

Because sago flour made from Metroxylon is the most widely used from, sago plans grow very quickly, up to 1.5m of vertical stem growth per year, in the fresh water swamps and lowlands in the tropics.

### **3 STUDY OF SAGO AND ITS PROCESSING**

#### **3.1 OVERVIEW OF SAGO**

Sago is a starch extracted from the pith stems, Metroxylonsagu. It is a major staple food for the lowland peoples of New Guinea and the Moluccas, where it is called saksak and sago. It is traditionally cooked and eaten in various forms, such as rolled into balls, water to form a paste, or as a pancake.

Sago looks like many other starches, and both sago and tapioca are produced commercially in the form of “pearls”. Sago pearls are similar in appearance to tapioca pearls, and the two may be used interchangeably in some dishes. This similarity causes some confusion in the names of dishes made with the pearls.

Because sago flour made from Metroxylon is the most widely used from, the project discusses sago metroxylon and tapioca which are the prime form of starch sources.

#### **3.2 IMPORTANT FACTS ABOUT SAGO**

- Preparation
- Nutrition
- Uses
- Botany
- Cycad sago

Are the important facts to be studied about sago to understand the characteristics of sago particles under impact of various process of starch preparation from the sago Materials.

#### **3.3 PREPARATION**

Sago is made through the following process:

- The sago is filled with starch content.
- The trunk is split lengthwise and the pith is removed.
- The pith is crushed and need to release the starch.

The pith is crushed and strained to extract the starch from the fibrous residue.

The raw starch suspension is collected in a setting container. They are felled just before flowering, when the stems are richest in starch. One palm yield 150 to 300 kg of starch.

#### **3.4 NUTRITION**

Sago flour metroxylon is nearly pure carbohydrate and has very little protein, vitamins, or minerals. However, as sago palms are typically found in areas unsuited for other forms of agriculture, sago cultivation is often the most ecologically form of land-use, and the nutritional deficiencies of the food often be compensated for with other readily available food.

One hundred grams of dry sago yield 355 calories, including an average of 94 grams of carbohydrate, 0.2 grams of protein, 0.5 grams of dietary fiber, 10 mg of calcium, 1.2 mg of iron, and negligible amounts of fat, carotene, thiamine, and ascorbic acid. Sago can be stored for weeks or months, although it is generally eaten soon after it is processed.

#### **3.5 USES OF SAGO**

Sago starch is either baked resulting in a product analogous to bread or a pancake or mixed with boiling water to form a paste. Sago can be made into steamed pudding such as sago plum pudding, ground into a powder and used as a thickener for other dishes, or used as dense glutinous flour.

The starch is also used to treat fibre, making it easier to machine. This process is called sizing and helps to bind the fibre, give it a predictable slip for running on metal, standardize the level of hydration of the fibre, and give the textile more body. Most cloth and clothing has been sized; this leaves a residue which is removed in the first wash. In Indonesia and Malaysia,

sago is used in making noodle and white bread. Globally, its principal use is in the form of pearls. In Brunei, it is used for making popular local cuisine called the 'Ambuyat, in some of the countries in the Africa.

**3.6 PEARL SAGO**

It is a commercial product, closely resembles pearl tapioca. Both typically are small (about 2 mm diameter) dry, opaque balls. Both may be white (if very pure) or colours naturally grey, brown or black, or artificially pink, yellow, green, etc. when soaked and cooked, both becomes much larger, translucent, soft and spongy. Both are widely used in south asian cuisine, in a variety of dishes and around the world, usually in pudding. In india, pearl sago us called javvarisi, or sabudana (whole grain) and is used in a variety of dishes such as desserts boiled with sweetened milk on occasion of religious fasts. The sago palm, metroxlyon sago, is found in tropical lowland forest and fresh Water swamps across Southeast Asia and New Guinea and is the primary source of sago flour. It tolerates a wide variety of soil and may reach 30 meters in height. The palm genus Metroxlyon contains several species: two of these M. salomonense and M. amicarum, are less- important sources of sago in Melanesia and Micronesia.

Sago palms grow very quickly, up to 1.5m of vertical stem growth per year. The stems are thick and either are self-supporting or have a moderate climbing habit. The leaves are pinnate, not palmate.

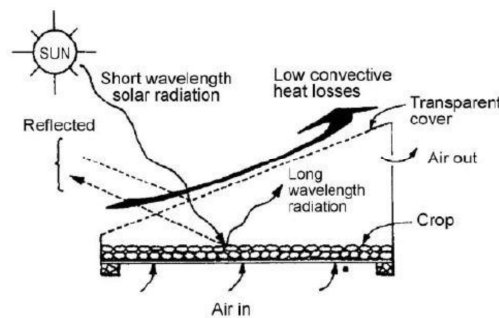
**3.7 CYCAD SAGO**

The sago cycad, *cycas revolute*, is a slow-growing wild or ornamental plant. Its common names, "sago palm" and "king sago pale", are misnomers since it is actually a cycad. Cycads are gymnosperms from the family cycadaceae; palms are angiosperms (flowering plants) from the Arecaceae. The tow taxa are completely unrelated. Interestingly, cycads are also a type of living fossil, having survived since at least the early Permian period.

The processed starch known as sago is made from this and other cycad. It is less-common food source for some peoples of the pacific and Indian Oceans. There are large biological and dietary difference between the two types of sago.

Unlike Metroxlyon palms (discussed above), cycads are highly poisonous: most parts of the plant contain the neurotoxins cycasin and Bmaa. Consumption of cycad seeds has been implicated in the outbreak of parkinsons’s Disease-like neurological disorder in Guam and other location in the pacific.

**CABINET TYPE OF DRYER**



**Fig 3.1: Working of Cabinet type of dryer**

**4 PROCESSING STEPS IN SAGO INDUSTRIES**

A Cold water dispersible, modified sago starch with gelling properties sprepared by pregelatinizing a sago starch that has been converted to a peak viscosity of about 400 Brabender units to about 1000 Brabender units and inhibited, the converted, inhibited starch having a brabender viscosity differential("BVD"), measured between about 80 and about 90 degree c., of from about -5 BVD to about 25 BVD, wherein the converted, inhibited, pregelatinized sago starch is capable of forming a gel having a gel strength of a least 30 grams within 5 hours from preparation.

The modified sago starch of claim tapioca wherein sago starch is reacted with at least about 0.015% of a cross linking agent.

A process for preparing, a cold water dispersible, modified sago starch having gelling properties, the process comprising units ("BU") to about 1000 BU, wherein the brabender viscosity is measured by rapidly heated to 50 degree c. and then heated further from 50 to 95 degree c. at a heating rate of 1.5 degree c. per minute.

Inhibited the converted sago starch such that the inhibited starch has a brabender viscosity differential ("BVD"), measured between about 80degree and about 90degree c of from about -35 BVD to about 25 BVD, measured at 7% solids and pregelatinizing the converted inhibited sago starch wherein the converted, inhibited, pregelatinized sago starch is capable of forming a gel having a gel strength of at least 30 grams within 5 hours from preparation.

## 5 CONVENTIONAL DRYING OF SAGO

### 5.1 NORMAL DRYING OF SAGO PARTICLES

Sago particles are gets extracted from the roots sago plant called tapioca. The conditioning of sago particles for the actual process called pre conditioning process. Then the output of preconditioning process is taken to the process called drying process in which moisture reduction of sago particles is taken place to enrich the starch content of sago.

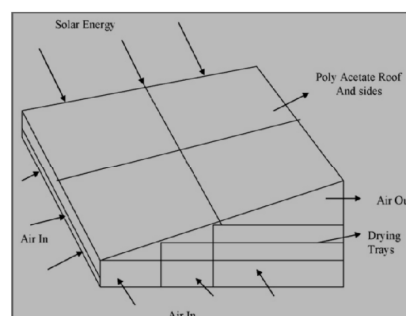
The sago particles are rich in moisture content and wet in nature due to the process of preconditioning in which the sago are treated with water do purity the content of sago in tapioca which enable effective enrichment of sago. The process of sago drying is done by open air convection method.

### 5.2 OPEN AIR CONVECTION OF SAGO

The wet and moisture rich sago particles are get collected from the mixing tank by the process of wet sago picking and then transferred to the drying site of sago industry for drying purpose. Then the collected sago particles are get prepared for the drying by allocating the sago in specified lots of sago in standard weights. Then for the actual drying process the drying surface is get cleaned for dust particles for drying out moisture content in it.

The difference between the temperature of sago particles and the air initiate the heat transfer on the wet sago particles which enable the reduction in moisture content of sago. But the main problem of this open air convection is the very large time obtained b it for reduction of moisture content in the wet sago particles.

After few hours of solar exposure the sago particles are again spread to increase the exposure of solar radiation to all parts of sago particles by the use of sweeping pads and twisting handles provided to the workers. If the dryness level is found to be less than expected than the drying process is get repeated for those sago particles found less dry in inspection process which is done immediately after sago process.



*Fig.5.1 Direct solar drying (open air convection type cabinet drier)*

### 5.3 MATERIALS USED FOR FABRICATION OF SOLAR DRYER

The following materials were used for the construction of the efficient solar dryer:

- Wood
- lass
- aluminium steel (GS).

- Nails and glue
- Hinges and handle
- paint (black and grey)
- Copper tubes



Fig. 5.2 Sheet Metal Work

## 6 PROBLEMS IN CONVENTIONAL DRYING

### 6.1 PROBLEMS IN NORMAL DRYING

One of the most challenging food items to deal with is flour and sago particles. It's such an integral part of our diet, which it invades virtually every meal and snack we eat. When you can no longer eat foods that contain wheat flours, everything you put into your mouth becomes a potential food hazard. Fortunately, the manufacturing sector is becoming sensitive to those people who are wheat gluten and a broader variety of food products are becoming available.

The concise oxford dictionary says “any fine powder” as one of the definition of the word “flour”. The other definition it offers is “a meal or powder obtained by grinding and usually sifting cereals, especially wheat”. In synonymous fortunately, there are a wide variety of other alternatives for extraction of starch from those sources like palm and tapioca

### 6.2 PROBLEMS IN OPEN AIR CONVECTION

It requires large amount area for drying of sago drying in the open area which should be maintained continuously for the entire operational life of the sago drying. The large time is obtained by the convectional open air drying which reduce the chance of expansion of sago industries and remain in same mode of operation as small scale industries Needed the development huge amount of investment is needed for expansion.

The conventional open air drying also has the risk of mixing of sago particles with the impurities likes dust and sand particles and also has the danger of exposing itself to the rain and rain water stagnation which directly affect the total output of sago industries.

### 6.3 DESIGN OF BEARING

Type of bearing: deep Groove ball bearing

ISI NO	BEARING OF BASIC DESIGN NO (skf)	D (mm)	D1 (mm)	D (mm)	D2 (mm)	B (mm)	R (mm)	R1 (mm)
17BC03	6303	17	23	47	41	14	1.5	1

## 7 DESIGN OF SOLAR TYPE SOLAR SAGO DRIER

### 7.1 SPECIFICATION OF STEP TYPE SAGO DRIER

#### 7.1.1 FUNCTION

Drying of sago particle

**7.1.2 SPECIFICATION**

Collector area : 0.9144\* 0.6096 m  
 Type and model : step type sago dryer  
 Number of trays : 2 in single step  
 Insulation (bottom) : Glass wool, 2mm. Thick  
 Motive power : Natural convection

**7.1.3 GENERAL INFORMATION**

Step type solar dryer has a collector area of about 0.5574. m2. This multi track step type dryer can hold 2 aluminums trays at a time. The absorber is 20 gauges GI sheet, black painted at the top with bottom insulation. The drier is covered at the top with single layer of 4mm thick plain glass kept at air gap of 7.62mm. At the rear side of the collector, an chimney of 1000mm height are provided. Holes provided at the bottom of the collector just below the first step allow the entry of atmospheric air into the dryer.

**7.1.4 COST OF THE UNIT**

RS.8000/-

**7.1.5 SALIENT FEATURES**

Solar drier takes 7 hours for drying 10kg of sago particles, while conventional sun drying takes 11 hours. Thus there is a saving of 4 hours which is 36% when compared to conventional drying.

**Basic capacity:**

Static (C0) = 630kgf  
 Dynamic (c) = 1060kgf  
 Maximum permissible speed = 13000rpm

**Design of simply supported beam:**

Length of the beam = 24inch = 609.6mm

**Calculation of bending moment:**

$$M_{max} = WL^2/8$$

$$= (0.724*609.62^2)/8$$

$$M_{max} = 33630.9 \text{ Nmm}^2$$

**Calculation of reaction:**

$$\text{Reaction at one end, } R_a = WL/2$$

$$= (0724*6096^2)/8$$

$$M_{max} = 33630.9 \text{ Nmm}^2$$

**Calculation of reaction:**

$$\text{Reaction at one end, } R_a = WL^2$$

$$= (0.724*609.6)/2$$

$$= 220.67N$$

$$\text{Reaction at another end, } R_v = WL/2$$

$$= (0.724*609.6)/2$$

**Calculation of moment of inertia:**

$$I = \frac{\pi}{64} * d^4 = \frac{\pi}{64} * (16^4)$$

$$= 3215.36 \text{ mm}^4$$

**Calculation of maximum deflection:**

$$Y_{\text{max}} = \frac{5}{384} * \frac{WL^4}{EI}$$

$$(E = 2.1 * 10^5 \text{ N/mm}^2)$$

$$= \frac{5}{384} * (0.724 * 609.6^4)$$

$$2.1 * 10^5 * 3215.36$$

$$Y_{\text{max}} = 155.474 \text{ N/mm}^2$$

**Specification of stand:**

Length of frame	= 36inch
Breadth of frame	= 24inch
Angle of rotation	= 110 angle

**8 EXPERIMENTAL PROCEDURE OF SOLAR DRYING OF SAGO**

We have done the efficiency experiment on the step type solar drier to be used for the sago materials to dry inside of solar drier in the following steps and the values are noted on the observation table.

**8.1 STEPS**

Analysing the sun rays position the tilting mechanism of solar drier is get adjusted to absorb maximum solar and tilting mechanism is get bolted as fixed position. Check out the temperature on the drier surface and inside of insulation box before loading sago materials. Note down the atmospheric are analysed for its wet temperature before loading and tabulated in the table.

The sago particles are getting loaded on the aluminum trays provided on the solar drier. Solar drier is get closed and exposed to solar radiation directly though glass provided at the top the solar drier

If the desired dryness is achieved on the sago particles the corresponding temperature and the time taken are get noted down on the table.

**9 OBSERVATION****9.1 DRYNESS**

The wet precipitated from of wet sago particles are get heated to disintegrate into powdery sago particles by losing wetness to the atmosphere inside the dryer which is perfectly made to increase the solar convection there by reducing the wetness in a quick time interval compare to conventional drying.

**9.2 TIME TAKEN**

In this stop watch is used for measuring the time taken for drying of sago particles inside the solar drier. Stop watch is started when the sago particles are getting loaded inside the solar drier for drying. During unloading of sago particles after dryness test the stop watch is get stopped and relative time indicated on the stop watch is note down on the table.

## **10 ADVANTAGES**

### **10.1 ADVANTAGES OF SOLAR SAGO DRYER**

- The usage of solar sago dryer were obtained as following
- It uses of solar energy as its source of energy which is present almost everywhere and abundant and available at free of cost.
- It required very less area for drying as compared to the open air convection method there by reducing the total area required for expansion of existing plant which aims at expansion of industry.
- The total time obtained by step type solar sago dryer is very less than the time utilized for normal conventional method which increases the production rate of the sago industry.
- The step type solar dryer is preventing the passage of dust particles along with other impurities to be mixed with sago particles.
- The tilting mechanism present with step type of sago dryer enables all day solar exposure to the sago particles which increase the efficiency of solar dryers available for sago drying.

### **REFERENCES**

- [1] W. Senadeera, I.S. Kalugalage, "Performance Evaluation of an affordable solar dryer for drying of crops"
- [2] M. Mohanraj, P. Chandrasekar, 2008, "Drying of Copra in a forced convection solar drier"
- [3] B.K. Bala, M.R.A. Mondol, B.K. Biswas, B.L. Das Chowdury, S. Janjai, 2002, "Solar drying of pineapples using solar tunnel drier.
- [4] Arnold R, Elepano, Karen T. Satairapan, 2001, "A Solar – Biomass dryer for pineapple".
- [5] W. Radajewski, D. Gaydon, 1990, "In – Storage Solar Crop Drying Systems".
- [6] ITC (1998). Institute of Technology Cambodia. Final Report on Solar Drying, submitted to AIT in the framework of the ITC/AIT collaborative project, „Renewable Energy Technologies in Asia: A Regional Research and Dissemination Programme“, funded by the Swedish International Development Cooperation Agency (Sida), August 1998.
- [7] Whitfield D.E., Solar Dryer Systems and the Internet: Important Resources to Improve Food Preparation, 2000, Proceedings of International Conference on Solar Cooking, Kimberly, South Africa.
- [8] Nandi P., Solar Thermal Energy Utilization in Food Processing Industry in India.
- [9] Ayensu A., Dehydration of Food Crops Using Solar Dryer with Convective Heat Flow, 2000, Research of Department of Physics, University of Cape Coast, Ghana.
- [10] Olaleye D.O., The Design and Construction of a Solar Incubator, 2008, Project Report, submitted to Department of Mechanical Engineering, University of Agriculture.

## FABRICATION OF SUGARCANE BUD REMOVAL MACHINE WITH ADVANCEMENTS

*R. Abarna, M. Dhayanethi, A.S. Elango, M. Elango, and R. Hari Prasanth*

Mechanical Engineering, Gnanamani College of Technology, Namakkal, Anna University: Chennai 600 025, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** While marketing and promoting the sugarcane bud chipper, that in sugarcane farming, many drudgery related issues have remained unaddressed. It observed that farmers prefer to plant sugarcane directly in the field manually, which is a cumbersome and time consuming process. Once the problem got identified, It started working on the solution. It is about the bud chipper which cuts the sugarcane buds in smaller size for the plantation purpose, where these buds are smaller in size compared with the earlier plantation method.

**KEYWORDS:** Chipper, buds, cumbersome.

### 1 INTRODUCTION

#### 1.1 SUGAR CANE BUD CHIPPER

The current method of deploying sugarcane sets proved laborious, time consuming and costly, a farmer, faced acute difficulties in cultivation and alternative method of planting individual saplings did not help. It was hampered by lack of availability of saplings in large numbers. The farmer wondered whether the sugarcane buds, instead of being planted, could be sown like potatoes on the fields. That we discussed this idea with an expert .Based on the encouraging feedback we received to give it a try, we started working on the idea and developed a simple device, called sugarcane bud chipper, is floor mounted and equipped with a knife with a semicircular edge to surgically cut out the buds in a high impact operation, with clean finish and practically no damage to the cane. "Using this device a person can remove nearly 100 buds in an hour,"

Handling capacity the machine can also chop the cane into small pieces, is flexible, and can handle various sugarcane sizes and diameters. Traditional hand-held cutting tools create a strain on the hands and thumb, cause wastage, and damage with slanting cuts, and are incapable of dealing with hard plant grafting. Machine details The bud-chipper consists of a surface plate, holding stand, reciprocating assembly, actuating lever with adjustable screws, connector, U shaped cutting knife bolted with a spring stopper projecting downward into a matching groove, supporting studs and motor for generating thrust. "The unit allows the user to be comfortably seated on the ground and continuously feed the cane with the left hand, while running of motor to cut the sugarcane. Clean cut the semicircular cutting blade delivers a clean and complete cut in a two-step notch and cut operation. The high impact cutting action with outstretched arm and high shoulder slinging action generates the desired fast impact force for clean cutting," explains the farmer. The machine requires only power to run it, weighs a few kilograms making transport easy, the scope of this equipment lies beyond just removing buds from the sugarcane. It can be used more broadly as grafting equipment wherein buds of large plants can also be removed. "Experimenting with various cutting shapes, we finally developed a U-shaped cutting profile for cutting the bud in one swift movement of the blade without damaging the rest of the cane stalk. Table top version while toying with the idea of a table top version instead of existing floor based version, we realized that the design would become more compact to feed the cane at the exact height, for better performances.

## 1.2 NEED FOR BUD CHIPPER

The need for sugar cane bud chipper is only for the farmers, where they are using an full size of sugarcanes in the field for the plantation purpose, while using this sugar cane bud chipper we can cut it down in to small pieces, compact in size it can also used for plantation from this we save the wastage of remaining portion of the sugar cane.



*Figure. 1. traditional method*



*Figure. 2. bud cutting method*

## 2 METHODOLOGY AND OBJECTIVE

### 2.1 METHODOLOGY

- 1) Change Manual Method in to Automatic– By using appropriate capacity of single phase motor, gearbox which will reduce wastage and increase productivity as it will reduce strain on hands of worker and more emphasis on safety of operator.
- 2) New cutting technology –The research work in this domain was studied and new methods were developed to achieve desired goal.
- 3) Single phase operation –The power supplied to machine is single phase so to make it easy to operate at any location.
- 4) Safety–Highest priority is given to safety of the operator.

## 2.2 OBJECTIVE

To modify the design of bud chipping machine which can allow the farmer to cut the sugarcane bud in a form which can be utilized as a planting for agricultural of sugarcane. With ease and thus reducing the manual work of farmer and increases the production.

## 3 CLASSIFICATION OF METHODS

### 3.1 MOTORIZED METHOD

Electric motor is an electrical machine that is used to convert electrical energy into mechanical energy. For smaller loads as in household applications. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives in variable-speed service. Where the motor mounted on the table, where out valve is with the gear assembly, In that it is the easiest method when compared with manual method.

### 3.2 HAND PRESS METHOD

This method is made up of manual hand press method, where it is an time consuming process, and very difficult to cut the bus from the sugarcane, we need to give an high pressure to cut the bud. it consist of handle connected with the blade through the spring for the thrust giving purpose.

### 3.3 PEDAL PRESS METHOD

This type of machine is as same as the hand press method ,instead of handle we attached the foot pedal ,consist of a long rod or chain connected with the spring shaft attached with the blade ,by pressing the foot pedal the spring acts it cuts the sugarcane bud.

### 3.4 HYDRAULIC METHOD

Instead of motor we can also use an hydraulic motor ,where it was costly compared with all type of machines, it is very hard to be used by the farmer people, thus it have an less efficiency compared to all type of machine.

## 4 COMPONENTS

### 4.1 SINGLE PHASE MOTOR

Electric motor is an electrical machine that is used to convert electrical energy into mechanical energy, for smaller loads as in household applications. Although traditionally used in fixed-speed service, induction motors are increasingly being used with variable-frequency drives in variable-speed service.

### 4.2 FLY WHEEL

Flywheel is used to reduce speed of shaft and to control the rotation motion. Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft. This means that the output shaft of a flywheel rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque. Some of the simplest gearboxes merely change the physical rotational direction of power transmission .A flywheel designed using a worm and worm-wheel is considerably smaller than one made from plain spur gear, and has its drive axes at 90° to each other. With a single start worm, for each 360° turn of the worm, the worm-gear advances only one tooth of the gear.

### 4.3 RECIPROCATING CHAMBER

It is the shaft or a chamber is connected with the flywheel through the connecting rod thus it was moving up and down to cut the sugar cane ,the blade attachment was fitted with the reciprocating chamber.

**4.4 U- SHAPED BLADE**

This is the main section of the sugarcane bud cutting machine. The chipper is used to cut the sugarcane bud and to get the same size of sugarcane bud. Because of cutter the wastage of sugarcane reduces and safety of farmer increases. It was made up of stainless steel and it was in curved shape for the compact cut.

**4.5 CONNECTION RODS**

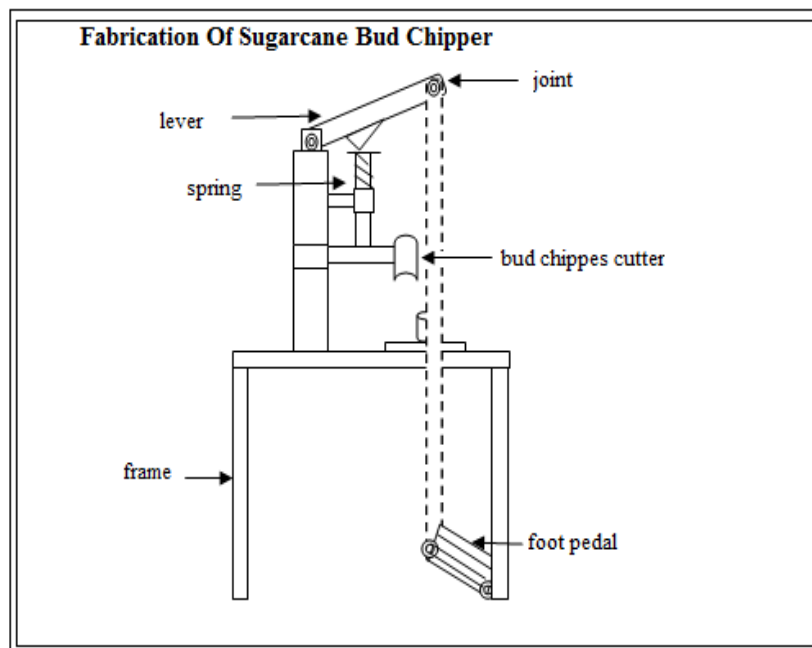
The connection rods are used to connect the fly wheel and the reciprocating arrangement, one end of the connecting rod or shaft connected to the flywheel another end was connected to the reciprocating chamber, when the flywheel rotates it act as a slider crank mechanism for the movement of upside down.

**4.6 SUPPORTING FRAME**

The whole arrangement was done on the supporting frame, it was made up of the rods by attaching them up into a table or a frame, and it is very easy to done a machining an process on that frame.

**4.7 SUPPORTING PLATE**

It is the thick plate made of steel, where it was mounted on the supporting frame as a flat surface area on that we pointed a blade setting and motor setting arrangement.



*Figure 3. cutting process pedal type*

**5 WORKING**

- A challenged by an engineer to make a machine that can remove buds from the sugarcane for the plantation purpose so as to minimize losses as well as time, money and seeds, with this implement.
- By pressing the food pedal, the unit removes the bud from the node of the sugarcane, which is then used for planting. It was hampered by lack of availability of saplings in large numbers. The farmer wondered whether the sugarcane buds, instead of being planted, could be sown like potatoes on the fields. The device consists of platform, hemi sphere chipping knife, sphere chipping knife, linkage system and handle, it is used to chip out the bud from sugarcane for sowing purpose and for tissue culture

- Novelty of the unit lies in foot lever operated hemi sphere chipping knife which provides gentle cutting of bud without extra loss of sugarcane during sowing. This ultimately gives higher income to the farmer by utilizing the remaining portion of the chipped canes which can be used for making sugar and also for any other purpose. This can also be using the electronic machine and hydraulic machine, This will save time instead of manual working or pedal working type machine, but their cost is high.
- In which we are using an electric motor in this chipper, because compared with the manual type of cutter this process is very easy to cut the buds from the sugarcane and it is very fast compared with the manual type.
- The hydraulic type of machine is so costly, where the farmers are not able to buy that type of costly machines.
- Where these consist of a hemispherical blade having a radius of 2.5 cm, in which the sugarcane buds are having ability for the plantation purpose.
- These are planted firstly in the plant bags after the certain period of time they seen a small growth of the leaves, after that the planted these sugar canes in the field.

## 6 ADVANTAGES

- Simple in construction.
- Initial cost is low.
- Easy to maintain.
- Less man power.
- Save large amount of sugarcane bud from waste by plant in farm.
- Sugarcane bud cutting operation is very fast as compare to traditional system of sugarcane planting.
- Saved sugarcanes are used for fodder, pasturage for animals or for the sugarcane industry.

## 7 APPLICATIONS

- These chippers are used by the formers.
- These are also used in sugar factories for the separation of buds.

## 8 CONCLUSION

The sugarcane bud cutting machine is very useful to small scale farmers to planting sugarcane bud. Also time is saved by this process as compare to the traditional system of sugarcane bud plant. Extra piece of sugarcane bud waste in small scale farm that can be saved by using sugarcane bud cutting machine that can be used as a fodder for animals.

## ACKNOWLEDGEMENT

### “GRATITUDE IS A GOLDEN OPPORTUNITY TO ACKNOWLEDGE SOMEONE”

At this pleasing moment of having successfully completed our project. We wish to convey our sincere thanks and gratitude to our beloved chairman **Dr. T. ARANGANNAL** and chairperson **Smt. P. MALALEENA**, Gnanamani Educational institutions, Namakkal for giving an opportunity to do and complete this project.

We would like to express our sincere gratitude to our chief executive officer **Dr. K. VIVEKANANDAN** and chief administrative officer **Dr. P. PREMKUMAR**, Gnanamani Educational institutions, Namakkal for providing us with indefinable support.

We would like to express our deep sense of gratitude and profound thanks to **Dr. B. SANJAY GANDHI**, Principal, Gnanamani College of Technology, Namakkal for creating beautiful atmosphere in the college, which inspired us to take over this project.

We take this opportunity to convey our heartiest thanks to **Dr. N. BALAKRISHNAN**, Head of the Department, Department of Mechanical Engineering, Gnanamani College of Technology, Namakkal, for his much valuable support, unfledged attention and direction which keep this project on track.

We wish to extent my sincere thanks to **Mr. S. PRAVEEN KUMAR**, Assistant Professor, Department of Mechanical Engineering, Gnanamani college of technology, Namakkal, Project coordinator and my beloved faculty giving their valuable suggestion and ideas during the project reviews.

With deep sense of gratitude, we extended our earnest and sincere thanks to our guide **Ms. R. ABARNA**, Assistant professor, Department of Mechanical Engineering, Gnanamani College of Technology, Namakkal, for her guidance and specially entrusting us with our project work.

**REFERENCES**

- [1] Balakrishnan, N, Mayilsamy, K & Nedunchezian, N 2015, 'An investigation of the performance, combustion and emission characteristics of CI engine fueled with used vegetable oil methyl ester and producer gas', International Journal of Green Energy, vol.12, pp. 506-514. P-ISSN: 1543-5075, E-ISSN:
- [2] [Design and Development of Sugar Cane Bud Chipping Machine] (Ningappa H Kuri, Prof. Reddy Naik.J) International journal of research in aeronautical and mechanical engineering ISSN(online): 2321-3051 vol.3 issue 12, december 2015 pgs: 97-110
- [3] [Sugarcane bud cutting machine] ( Suraj S. Magdum, Shubham C. Pawar, Pankaj B. Gavali) 2<sup>nd</sup> international conference on "latest innovations in science, engineering and management" 9<sup>th</sup> oct 2016 ISBN:978-93-86171-09-2.pgs:255-229.
- [4] [Design and Fabrication of Semi automated Sugarcane Bud Chipper] (Abel Roy J, Gat Vaibhav D, Patil Harshavardhan, Upadhye Dhiraj D, Students Under the guidance of Kiran P. Asst. Professor) FIESTA-16 A National Level Conference and Technical Fest on 30th April 2016.
- [5] [Design And Modification Of Sugarcane Bud Scooping Machine ] ( Sanjay Patil Sir, Nikhil Nangare, Aditya Waghmare, Mayur Zope, Meet Thakker) International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume:03 Issue:04 April-2016 www.irjet.netp-ISSN: 2395-0072.
- [6] [Indian Journal of Sugarcane Technology] ISSN 0970-3233 volume 26, june 2011.
- [7] [The concept of sustainable sugarcane production: Global, African and South African perceptions ] ( Mandla S. Mnsi and Cliff S. Dlamini) Vol. 7(31), pp. 4337-4343, 14 August, 2012.
- [8] [Sugarcane shoot formation in an improved temporary immersion system] (Maritza Escalona, Claude Teisson, Patricia Espinosa & Carlos Borroto) pgs: 197–200, vol 54, 1998.
- [9] Dr. N. Balakrishnan. [effect of compression ratio on compression ignition engine performance with bio diesel, producer gas and mixed gas mode.] journal of renewable and sustainable energy vol 16, Issue 2, 2014, ISSN:-02310301-02310313.
- [10] Mr. R. Suresh kumar. [ Analysis of hollow torsion bar made of e-glass fiber reinforced composite material] International journal of research and scientific innovation, vol 3, Issue 5, may 2016, 130-133.
- [11] Mrs. R. Abarna. [solar powered water lifter using giant wheel method] International research journal of engineering and technology, vol 3, Issue 4, Apr 2016.

## Fabrication and testing of Nature fibre Reinforced Hybrid Composites Banana / Bamboo

*M. Silambarasan, C. Dhanapal, and N. Srinivasan*

<sup>1</sup>Assistant Professor, Kavery Engineering college, India

<sup>2</sup>Assistant Professor, Salem college of technology, India

<sup>3</sup>Assistant Professor, Muthayammal College of engineering, India

---

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Hybrid composites possess unique features that can be used to meet different design requirements with respect to strength, stiffness and flexural behaviour. A key parameter in hybrid composite structures arrangement design strongly affects the variety of properties such as tensile and compressive strength based on high performance resin. In this study Natural and synthetic fibres are combined in the same matrix (unsaturated polyester) to make Banana/Bamboo fibre hybrid composites using poly urethane resin. The banana natural fibre is treated with NaOH. The fabrication of hybrid composite is to be done using Hand lay-up method. The fabricated hybrid composite is to be tested and their properties are to be studied. Additionally making banana nano fibre are using chemical treatment like pre-treatment (17.5% NaOH), acid hydrolysis (1M HCl) and alkali treatment (2% NaOH) followed by hybrid composite was fabricated. The fabricated hybrid composite is to be tested and their properties are to be studied.

**KEYWORDS:** Hybrid composite, poly urethane, banana fibre, bamboo fibre, Impact strength, Compressive strength, tensile strength.

### 1 INTRODUCTION

Composites are one of the most advanced and adaptable engineering materials known to men. Progresses in the field of materials science and technology have given birth to these fascinating and wonderful materials. Composites are heterogeneous in nature, created by the assembly of two or more components with fillers or reinforcing fibres and a compactable matrix. The matrix may be metallic, ceramic or polymeric in origin. It gives the composites their shape, surface appearance, environmental tolerance and overall durability while the fibrous reinforcement carries most of the structural loads thus giving macroscopic stiffness and strength .

#### 1.1 OVERVIEW OF COMPOSITE MATERIAL

For the past several years, public attention has gone on natural fibers as a resource due to the fast growth. Now a day, natural fibres are widely used as reinforcements both in partially and totally biodegradable Natural fiber Composites. Natural fibers are an alternative resource to synthetic fibres as reinforcement for polymeric materials for the manufacture of cheap, renewable and environmentally friendly composites. Waste plastic has caused unbearable stress to environment in recent years. Environmental awareness, new rules and legislations are forcing industries to seek new materials which are more environmentally friendly.

Plant fibers from agricultural crops are renewable materials which have potential for creating green products and replacing synthetic materials which are currently being used such as glass fiber, carbon fiber and plastic fibers. The combinations of bio-fiber and bio-polymer could be the products of fully biodegradable composites. Among others, natural

fibers (e.g., flax, jute or sisal) reinforced materials have important significance for reduction of density in automobile construction components due to its higher specific stiffness and specific tensile strength.

A composite is a structural material that consists of two or more combined constituents that are combined at a macroscopic level and are not soluble in each other. One constituent is called reinforcing phase and one in which it is embedded is called the matrix. The reinforcing phase material may be in the form of fibers, particles or flake. The matrix phase materials are generally continuous. Examples of naturally found composites include wood, where the lignin matrix is reinforced with cellulose fibers and bones in which the bone-salt plates made of calcium and phosphate ions reinforce soft collagen. The roles of matrix in composite materials are to give shape to the composite part, protect the reinforcements to the environment, transfer loads to reinforcements and toughness of material, together with reinforcements. The aims of reinforcements in composites are to get strength, stiffness and other mechanical properties, dominate other properties as coefficient of thermal extension, conductivity and thermal transport. As a comparison between composites and metals, the composites materials are some advantages as:

- Light weight High specific stiffness and strength
- Easy moldable to complex forms
- Easy bondable
- Good dumping
- Low electrical conductivity and thermal expansion
- Good fatigue resistance

The high strength to weight ratio and non-corrosive characteristics of these materials like fibre-re- in forced plastics can be utilised to build innovative structures, which are, desirable and economical. The roles of matrix in composite materials are to give shape to the composite part, protect the reinforcements to the environment, transfer loads to reinforcements and toughness of material, together with reinforcements. The aims of reinforcements in composites are to get strength, stiffness and other mechanical properties, dominate other properties as coefficient of thermal extension, conductivity and thermal transport. As a comparison between composites and metals, the composites materials have some advantages as:

1. A higher performance for a given weight leads to fuel savings. Excellent strength-to weight and stiffness-to-weight ratios can be achieved by composite materials. This is usually expressed as strength divided by density and stiffness (modulus) divided by density. These are so-called "specific" strength and "specific" modulus characteristics.
2. Laminate patterns and ply buildup in a part can be tailored to give the required mechanical properties in various directions. Low electrical conductivity and thermal expansion
3. It is easier to achieve smooth aerodynamic profiles for drag reduction. Complex double-curvature parts with a smooth surface finish can be made in one manufacturing operation.
4. Part count is reduced.
5. Production cost is reduced. Composites may be made by a wide range of processes.
6. Composites offer excellent resistance to corrosion, chemical attack, and outdoor weathering; however, some chemical are damaging to composites (e.g., paint stripper), and new types of paint and stripper are being developed to deal with this.

The composites materials have some disadvantages as,

1. Composites are more brittle than wrought metals and thus are more easily damaged. Cast metals also tend to be brittle.
2. If rivets have been used and must be removed, this presents problems of removal without causing further damage.
3. Repair at the original cure temperature requires tooling and pressure.
4. Long development time

All of these have made those composites to change more and more the metals, in specials in aircrafts, automotives, marines, constructions, etc.

## **1.2 CLASSIFICATION**

Composites are classified by geometry of the reinforcement-particulate, flake, fibres, filled, whiskers and directionally solidified eutectics or by the type of matrix-polymer, metal, ceramic and carbon. Polymer matrix material is classified as thermo sets and thermoplastics. Again thermo sets and thermoplastics are divided by epoxy, phenolic polyamide resin, polyester and polyethylene, polystyrene, polyamides, nylons and polypropylene respectively.

### 1.2.1 PARTICULATE REINFORCED COMPOSITES

A composite whose reinforcement is a particle with all the dimensions roughly equal are called particulate reinforced composites. Particulate fillers are employed to improve high temperature performance, reduce friction, increase wear resistance and to reduce shrinkage. The particles will also share the load with the matrix, but to a lesser extent than a fibre. A particulate reinforcement will therefore improve stiffness but will not generally strengthen.

### 1.2.2 FIBRE REINFORCED COMPOSITES

Fibre reinforced composites contain reinforcements having lengths higher than cross sectional dimension. Fibrous reinforcement represents physical rather than a chemical means of changing a material to suit various engineering applications

### 1.2.3 HYBRID COMPOSITES

Composite materials incorporated with two or more different types of fillers especially fibres in a single matrix are commonly known as hybrid composites. Hybridisation is commonly used for improving the properties and for lowering the cost of conventional composites. There are different types of hybrid composites classified according to the way in which the component materials are incorporated. Hybrids are designated as i) sandwich type ii) interply iii) intraply and iv) intimately mixed. In sandwich hybrids, one material is sandwiched between layers of another, whereas in interply, alternate layers of two or more materials are stacked in regular manner. Rows of two or more constituents are arranged in a regular or random manner in interply hybrids while in intimately mixed type, these constituents are mixed as much as possible so that no concentration of either type is present in the composite material.

### 1.2.4 LAMINATES

A laminate is fabricated by stacking a number of laminae in the thickness direction. Generally three layers are arranged alternatively for better bonding between reinforcement and the polymer matrix, for example plywood and paper.

### 1.2.5 SHORT FIBRE- RUBBER COMPOSITES

The term 'short fibre' means that the fibres in the composites have a critical length which is neither too high to allow individual fibres to entangle with each other, nor too low for the fibres to lose their fibrous characteristics. A short fibre composite signifies that the two main constituents, i.e., the short fibres and the rubber matrix remain recognizable in the designed material. When used properly, a degree of reinforcement can be generated from short fibres, which is sufficient for many applications. Short fibre reinforced rubber composites were developed to fill the gap between the long fibre reinforced and particulate filled rubber composites. That is mainly to achieve the high performance of the fibre coupled with easy processability and elasticity of the rubber.

## 1.3 NATURAL FIBRES COMPOSITES

Natural fibres have become popular reinforcement material for fibre reinforced polymer composite developments. These reinforcement can replace the conventional fibre, such as glass as an alternative material. It is divided into several categories they are as follows,

### 1.3.1 ANIMAL FIBRE

Animal fibre generally comprise proteins; examples mohair, wool, silk, alpaca, angora. Animal hair (wool or hair) are the fibres taken from animals or hairy mammals. e.g. Sheep's wool, goat hair (cashmere, mohair), alpaca hair, horse hair, etc. Silk fibres the fibres collected from dried saliva of bugs or insects during the preparation of cocoons. Examples include silk from silk worms. Avian fibres are the fibres from birds, e.g. feathers and feather fibre.

### 1.3.2 MINERAL FIBRE

Mineral fibres are naturally occurring fibre or slightly modified fibre procured from minerals. These can be categorized into the following categories: Asbestos is the only naturally occurring mineral fibre. Variations are serpentine and

amphiboles, anthophyllite. Ceramic fibres includes glass fibres (Glass wood and Quartz), aluminium oxide, silicon carbide, and boron carbide. Metal fibres include aluminium fibres.

### **1.3.3 PLANT FIBRE**

Plant fibres are generally comprised mainly of cellulose: examples include cotton, jute, flax, ramie, sisal and hemp. Cellulose fibres serve in the manufacture of paper and cloth. This fibre can be further categorized into following as Seed fibre are the fibres collected from the seed and seed case e.g. cotton and kapok. Leaf fibre are the fibres collected from the leaves e.g. sisal and agave.

Therefore, these fibres are used for durable yarn, fabric, packaging, and paper. Some examples are flax, jute, banana, hemp, and soybean. Fruit fibres are the fibres are collected from the fruit of the plant, e.g. bamboo (sugarcane) fibre. Stalk fibre are the fibres are actually the stalks of the plant. E.g. straws of wheat, rice, barley, and other crops including bamboo and grass. Already the ancient Egyptians used clay that was reinforced by straw to build walls. In the beginning of the 20th century wood- or cotton fibre reinforced phenol- or melamine formaldehyde resins were fabricated and used in electrical applications for their non-conductive and heat-resistant properties.

At present day natural fibre composites are mainly found in automotive and building industry and then mostly in applications where load bearing capacity and dimensional stability under moist and high thermal conditions are of second order importance. For example, flax fibre reinforced polyolefin are extensively used today in the automotive industry, but the fibre acts mainly as filler material in non-structural interior panels. Natural fibre composites used for structural purposes do exist, but then usually with synthetic thermoset matrices which of course limit the environmental benefits.

Natural fibres are generally ligno-cellulosic in nature, consisting of helically wound cellulose micro fibrils in a matrix of lignin and hemicelluloses.

Natural fibres such as jute, sisal, pineapple, abaca and bamboo have been studied as a reinforcement and filler in composites. Growing attention is nowadays being paid to bamboo fibre due to its availability. The bamboo is available in large quantities as residue from sugarcane production in many areas, which is yielding the coarse bamboo fibre. Bamboo is a ligno-cellulosic natural fibre.

1. Stem fibres (jute, bamboo, banana etc.)
2. Leaf fibres (sisal, pineapple, screw pine etc.)
3. Fruit fibres (cotton, coir, oil palm etc.)

Properties of plant fibres depend mainly on the nature of the plant, locality in which it is grown, age of the plant, and the extraction method used. For example, coir is a hard and tough multicellular fibre with a central portion called "lacuna". Sisal is an important leaf fibre and is very strong. Pineapple leaf fibre is soft and has high cellulose content. Oil palm fibres are hard and tough, and show similarity to coir fibres in cellular structure. The elementary unit of a cellulose macromolecule is anhydro-d-glucose, which contains three alcohol hydroxyls (-OH) (Bledzki et al., 1996). These hydroxyls form hydrogen bonds inside the macromolecule itself (intramolecular) and between other cellulose macromolecules (intermolecular) as well as with hydroxyl groups from the air. Therefore, all plant fibres are of a hydrophilic nature; their moisture content reaches 8-13%. In addition to cellulose, plant fibres contain different natural substances. The most important of them is lignin. The distinct cells of hard plant fibres are bonded together by lignin, acting as a cementing material. The lignin content of plant fibres influences its structure, properties and morphology. An important characteristic of vegetable fibre is their degree of polymerization.

### **1.3.4 ADVANTAGES OF NATURAL FIBRE**

- Natural fibres, as reinforcement, have recently attracted the attention of researchers because of their advantages over other established materials. They are environmentally friendly, fully biodegradable, abundantly available, renewable and cheap and have low density.
- The abrasive nature of fibre is much lower which leads to advantages in regard to technical process and recycling process of the composite materials in general. Natural fibre-reinforced plastics, by using biodegradable polymers as matrices, are the most environmental friendly materials, which can be composed at the end of their life cycle.
- Natural fibre composites are used in place of glass mostly in non-structural applications. Although natural fibres and their composites are environmental friendly and renewable (unlike traditional sources of energy, i.e., coal, oil and gas), these have several bottlenecks.

- These have poor wettability, incompatibility with some polymeric matrices and high moisture absorption. Composite materials made with the use of unmodified plant fibres frequently exhibit unsatisfactory mechanical properties.
- To overcome this, in many cases, a surface treatment or compatibilizing agents need to be used prior to composite fabrication. Mechanical properties of natural fibres are much lower than those of glass fibres but their specific properties, especially stiffness, are comparable to the glass fibres.

### 1.3.5 DISADVANTAGES OF COMPOSITES

- High cost of fabrication of composites
- Mechanical characterization of a composite structure is more complex than a metal structure.
- Repair of composites is not a simple process compared to that for metals
- Composites do not have a high combination of strength and
- Fracture toughness compared to metals

## 2 OBJECTIVES

- To develop a new class of natural fibre based composites to explore the potential of bamboo fibre.
- To study the effect of fibre length on mechanical behavior of banana and bamboo fibre reinforced polyurethane based composites.
- To study the properties of the polyurethane resin and compare those properties with the other resins.
- Selection of bamboo and banana fibre with better mechanical characteristics that give better fibre properties.
- Chemical treatment of bamboo fibres to improve its stiffness.
- Evaluation of mechanical properties such as: tensile and compressive strength.
- Identification of different failure types.
- Compare those properties of the composite with the banana and coir composite material

## 3 MATERIALS AND METHODS

In this work materials such as banana, bamboo fibres and polyurethane resin with its hardener are utilized directly for hybrid composite preparation whereas bamboo fibre is extracted from bamboo culms

### 3.1 BANANA FIBRES

Banana fiber, a ligno-cellulosic fiber, obtained from the pseudo-stem of banana plant (*Musa sepientum*), is a bast fiber with relatively good mechanical properties. All varieties of banana plants have fibres in abundance. Banana fiber at present is a waste product of banana cultivation and either not properly utilized or partially done so. The extraction of fiber from the pseudostem is not a common practice and much of the stem is not used for production of fibers.



*Fig.3.1 Banana Fibre*

### **3.1.1 BANANA FIBRE COLLECTION PROCESS**

In banana plantations, after the fruits are harvested, the trunks or stems will be discarded. These wastes provide obtainable sources of fibres, which leads to the reduction of other natural and synthetic fibre production that requires extra energy, fertilizer, and chemical. Figure 4.2 shows the banana stem.



*Fig.3.2 Banana stem*

The properties of banana fibre are good absorbent, highly breathable, quickly dry with high tensile strength.

### **3.1.2 BANANA FIBRE EXTRACTION MACHINE**

The banana fibre is extracted by means of crushing the banana stem with the help of the fibre extraction machine. This machine gives the continue fibre that produces the good mechanical properties in the fibre. Figure 4.3 shows the banana fibre extraction machine.



*Fig.3.3 Banana fibre extraction machine*

### **3.1.3 CHARACTERISTICS OF BANANA FIBRE**

Banana fibre is the best natural fibre. It has its own physical and chemical characteristics and many other properties that make it a fine quality fibre.

- Appearance of banana fibre is similar to that of bamboo fibre and ramie fibre, but its fineness and spin ability is better than the two.
- The chemical composition of banana fibre is cellulose, hemicellulose, and lignin.
- It is highly strong fibre.
- It has smaller elongation.
- It has somewhat shiny appearance depending upon the extraction & spinning process.
- It is light weight.
- It has strong moisture absorption quality. It absorbs as well as releases moisture very fast.
- It is bio- degradable and has no negative effect on environment and thus can be categorized as eco-friendly fibre.

### 3.2 BAMBOO FIBRE

Bamboo is a naturally occurring composite material which grows abundantly in most of the tropical countries. It is considered a composite material because it consists of cellulose fibres imbedded in a lignin matrix. Cellulose fibres are aligned along the length of the bamboo providing maximum tensile flexural strength and rigidity in that direction.

There are several differences between bamboo and wood. In bamboo, there are no rays or knots, which give bamboo a far more evenly distributed stresses throughout its length. Bamboo is a hollow tube, sometimes with thin walls, and consequently it is more difficult to join bamboo than pieces of wood. Bamboo does not contain the same chemical extractives as wood, and can therefore be glued very well.

#### 3.2.1 STRUCTURE AND PROPERTIES OF BAMBOO FIBRE

Bamboos are giant grasses and not trees as commonly believed. They belong to the family of the Bambusoideae. The bamboo column, in general, is a cylindrical shell, which is divided by transversal diaphragms at the nodes.



*Fig3.5 Bamboo fibre*

Bamboo shells are orthotropic materials with high strength in the direction parallel to the fibers and low strength perpendicular to the fibers respectively. Bamboo is a composite material, consisting of long and parallel cellulose fibers embedded in a ligneous matrix



*Fig. 3.6 An Extracted Bamboo fibre*

The bamboo fibre has been extracted by, the bamboo stem is cut into small sticks and then dipped into water by four or five days. Then those sticks are taken out and are hammered. The extracted bamboo fibre is shown in the figure 3.6.

### 3.3 NATURAL FIBRE PREPARATION

Here banana and bamboo fibre is used for fabricate the natural fibre composites. First the natural fibres are cleaned in the distilled water. The cleaned natural fibres are dried in the sun light. The dried natural fibres are again cleaned by chemical cleaning process. In chemical cleaning process the 80% sodium hydroxide is mixed with 20% distilled water.

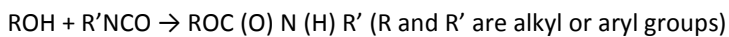


Fig3.7 Drying Of Fibre

The dried natural fibres dipped in the diluted sodium hydroxide solution. Its again dried in sun light .The dried natural fibres are cut in the length of 100 mm

### 3.4 POLYURETHANE RESIN

Polyurethane is a synthetic material that is used in various applications in nearly every field imaginable. It is renowned for its durability and flexibility and can be produced in a number of different forms based on what it will be used for. Everything from airplane wings to tires can be made with polyurethane.



This combining process, sometimes called condensation, typically requires the presence of a catalyst. More complicated monomers are also used.

#### 3.4.1 POLY URETHANE STRUCTURE

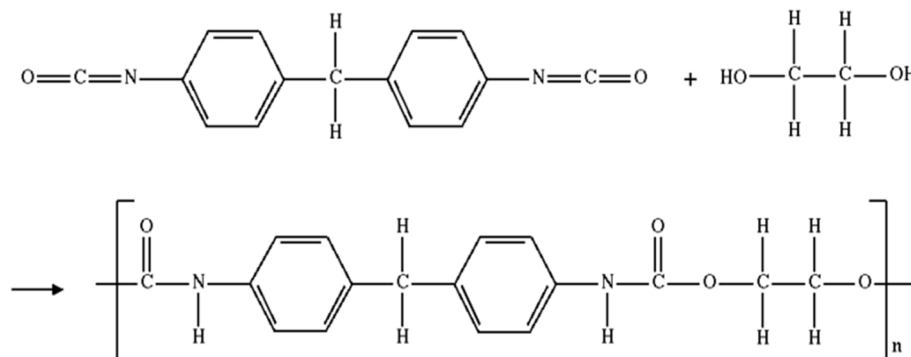


Fig. 4.8 Structure of Polyurethane

#### 3.4.2 IDENTIFICATION

Polyurethane is identified as a polymer, which is basically a string of smaller molecules known as monomers. In this case, it is a string of urethane. An entire polyurethane chain consists of nitrogen, carbon and oxygen atoms double-bonded to a hydroxyl group, which is also known as an alcohol and is a bonded molecule of oxygen and hydrogen. When various other elements are added to this basic chain, the polyurethane changes, sometimes becoming a rubbery solid, liquid or even a foam.

#### 3.4.3 FEATURES

Polyurethane can be manufactured synthetically to have a number of different features, depending on the specific molecules that are added to its basic string of urethane molecules. Some of the more sought-after features of polyurethane are its elasticity and durability. This makes it popular for use with tires and other rubber devices that need to be strong and

bendable. Polyurethane can also be made into a squishy, foam-like substance or a substance similar to glue, with the same bonding ability.

#### 3.4.4 FUNCTION

Polyurethane is used in so many different fields and in so many different forms that it is one of the most used synthetic materials. Look around your house, and you will be able to find many things that are made of polyurethane. Much of the firmer rubber used for various reasons is polyurethane, and because as an adhesive it is water and heat resistant, it's used in outdoor and exceptionally hot areas. It is also used in walls as extra padding, and in foam form for soundproofing.

#### 3.4.5 BENEFITS

One of the major benefits of polyurethane is its resistance to heat and flames. Using the substance means that it will offer protection from this, which makes it particularly beneficial in the home and in making important substances and materials. It is often used as a coat for wood, plastic or other substances because of this protective property.

### 3.5 MOULDING METHODS

Moulding is the process of manufacturing by shaping liquid or pliable raw material using a rigid frame called a mould or matrix. This itself may have been made using a pattern or model of the final object.

For many moulding methods, it is convenient to refer to one mould piece as a "lower" mould and another mould piece as an "upper" mould. Lower and upper refer to the different faces of the moulded panel, not the mould's configuration in space. In this convention, there is always a lower mould, and sometimes an upper mould. Part construction begins by applying materials to the lower mould. Lower mould and upper mould are more generalized descriptors than more common and specific terms such as male side, female side, a-side, b-side, tool side, bowl, hat, mandrel, etc.

The moulded product is often referred to as a panel. For certain geometries and material combinations, it can be referred to as a casting. For certain continuous processes, it can be referred to as a profile. Applied with a pressure roller, a spray device or manually.

#### 3.5.1 TYPES OF MOULDING

- Blow moulding
- Compaction plus sintering
- Compression moulding
- Expandable bead moulding
- Extrusion moulding
- Foam moulding
- Injection moulding
- Laminating
- Matched mold
- Matrix moulding
- Plastic moulding
- Pressure plug assist moulding
- Rotational moulding (or Rotomoulding)
- Transfer moulding

Here we are using hand-layup method,

#### 3.5.2 HAND LAY-UP PROCESS

Hand lay-up is a simple method for composite production. A mould must be used for hand lay-up parts unless the composite is to be joined directly to another structure. The mould can be as simple as a flat sheet or have infinite curves and edges. For some shapes, moulds must be joined in sections so they can be taken apart for part removal after curing. Before lay-up, the mould is prepared with a release agent to insure that the part will not adhere to the mold. Reinforcement fibres can be cut and laid in the mould. It is up to the designer to organize the type, amount and direction of the fibres being used.



*Fig 3.9 Working process of fibres a) applying of resin in the tray b) mixing of fibres with the resin c) adding layer of resin*

Resin must then be catalyzed and added to the fibres. A brush, roller or squeegee can be used to impregnate the fibres with the resin.

### 3.6 FABRICATION

The manufacturing of natural fibre reinforced composite of banana and bamboo fibre with polyurethane includes the basic steps of fibre collection, alkalizations of fibres and the final processing of composite plate preparation.

#### 3.6.1 MATERIALS

The raw material used in this study was banana and bamboo fibre. These fibres have diameters of approximately 100-300  $\mu\text{m}$  and lengths of 20-30cm.



*Fig. 3.10 Bamboo and Banana Fibres*

Reagent grade chemicals were used for fibre surface modifications namely, sodium hydroxide, hydrochloric acid.

#### 3.6.2 ALKALIZATION OF NATURAL FIBRES

Alkalization is a common pre-processing technique used on base natural fibre to remove hemicelluloses, fats and waxes that may reduce the interfacial strength when processed into composite form. It is of great interest to understand the effect this has on the base fibre mechanical properties, as whilst it may ultimately increase the resultant composite strength through increasing fibre matrix adhesion, the strength of the fibre itself may reduce. Due to this, to allow fuller understanding of the process effects on mechanical properties it is thought tensile testing of alkalized fibre under the same conditions considered previously is extremely beneficial.



**Fig3.11 Bamboofibre**

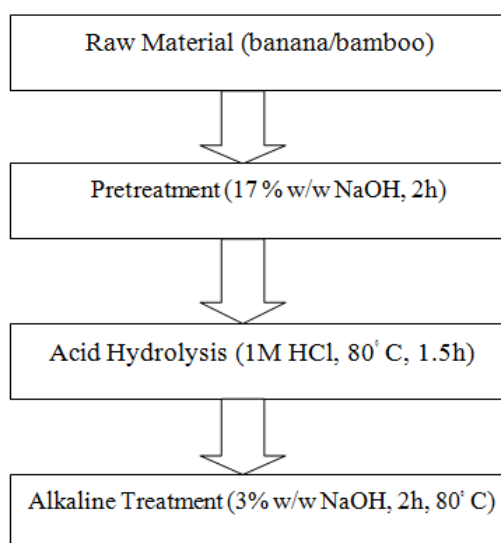


**Fig3.12 Banana fibre**

Alkalization aims to remove hemicelluloses from natural fibre, which often results in a change in fibre surface energy in a polar or dispersive manner. Hemicelluloses, which is thought to consist principally of xylan, polyuronide and hexosan has been shown to be very sensitive to caustic soda. The caustic soda (sodium hydroxide) is said to exert only minimal influence on the lignin in the fibres and the high strength alpha-cellulose. There are various alkali solutions that can be used including hydrogen peroxide ( $H_2O_2$ ) and sodium hydroxide (NaOH). Hydrogen peroxide is used much less frequently due to the dangers associated with its use.

### 3.6.3 INDIVIDUALIZATION PROCESS

The individualization process of nanofibres is a multi-step process, shown in Figure 4.13 Chemical treatments are applied onto the fibres to individualize nano fibres. The chemical treatments include pre-treatment, acid hydrolysis and alkaline treatment.



**Fig 3.13 Process of chemical treatment**

### 3.6.4 CHEMICAL TREATMENTS

The main objective of the chemical treatments is to remove the starch, hemi-cellulose and lignin/pectins surrounding cellulose. Generally, the first step for all of the fibre surface treatments is mercerization (pre-treatment process), which changes the crystal structure of cellulose (Gassan and Bledki 1997). The essence of mercerizing fibre is that in the swelling of Cellulose fibres due to exposure to alkalis.

The natural crystalline structure of the cellulose relaxes under an appropriate tension and the dimensions can be set by the conditions (Shimbun 1985).



**Fig3.14 NaOH**



**Fig3.14 Reaction of fibre with NaOH**

Cellulose fibres were soaked in a sodium hydroxide solution of 17.5 % w/w at room temperature for 2 h, enabling chemical molecules to penetrate through the crystalline region of the cellulose.



**Fig3.15 Colouring Agent**

For giving attraction for the product the colouring agent is used, it gives the good colour to the product.

Acid hydrolysis with 1 M hydrochloric acid followed by alkaline treatment with 2 % w/w sodium hydroxide was applied to remove the undesired components.

#### Fibre Composition

Banana and bamboo fibre thickness ratio	: 1:1
Weight of banana fibre	: 13g
Weight of bamboo fibre	: 13g
Weight of poly urethane	: 85g

Table 3.2 shows the size of banana and bamboo fibre composite

**Table 3.2**

<b>LENGTH</b>	<b>200mm</b>
<b>WIDTH</b>	<b>60.70mm</b>
<b>THINKNESS</b>	<b>4.16mm</b>

The main objective is to determine the material properties (Flexural modulus, flexural rigidity, Hardness number, % gain of water, density, Impact Strength) of natural FIBRE reinforced composite material by conducting the following respective tests.

1. Tensile test
2. Compressive test

Fig 3.15, 3.16 shows the final composites of banana and bamboo fibre with the thickness ratio of 1:1



**Fig 3.15 Final composite for tensile testing**



**Fig 3.16 Final composite for compressive testing**

The fabricated natural fibre composite is shown in the figure, For tensile testing the size of the composite is 200x60x3 and for the compressive test the size of the composite is 40x40x3

## 4 EXPERIMENTAL TEST

### 4.1 INTRODUCTION

The experiment was conducted at constant strain rate values in static condition for tensile and compressive under constant room temperature. The testing laboratory is held at Chennai. In that laboratory they followed the ASTM Standard.

#### 4.1.1 ASTM STANDARD

For the tensile testing of natural fibre, the closest applicable standard used was ASTM D 3822-01 the 'Standard for Tensile Properties of Single Fibres'. This ASTM standard is typically used to quantify the mechanical properties of textile fibres and threads, which are often from a natural source, such as flax or cotton. This provides a good guideline as it is on the correct testing scale with the fibres being fine in cross-section.



The testing was done in the kidao laboratories, Chennai.

#### 4.1.2 TESTING EQUIPMENT

As well as using the ASTM standard for the testing procedures for the fibres themselves, the ASTM standard for the specification of testing equipment also has to be met. This was found to be ASTM D 76-99 the 'Standard Specification for Testing Machines for fibres'. The Lloyd LRX testing machine shown in Figure5.1 meets these requirements.



Fig4.1 Experimental tensile and compressive test

#### 4.1.3 EXPERIMENTAL EVOLUTION

In this chapter, the banana/bamboo with poly urethane resin is fully characterized experimentally and the results are presented. The results of static experiments for measuring the strength under tension and compression. The experimental determination of the mechanical properties of banana/ bamboo fibre under static loading conditions has always been a key issue in the research on composite materials. With the rise of huge variety of composites, the need for an efficient and reliable way of measuring these properties has become more important. The experiments, if conducted properly, generally reveal both strengths and stiffness characteristics of the material.

#### 4.1.4 TEST PROCEDURES

Tests are performed using Tensile and compressive Testing Machine. A personal computer is connected to the testing machine for data acquisition. Displacement and load are monitored for static experiments. The strain is measured by using strain gages.

#### 4.1.5 DETERMINATION OF THE TENSILE AND COMPRESSIVE PROPERTIES OF BANANA/BAMBOO FIBRE HYBRID COMPOSITE

The tensile specimen is placed in the testing machine, taking care to align the longitudinal axis of the specimen and pulled at a cross-head speed of 0.5 mm/min. The specimens are loaded step by step up to failure under uni-axial tensile loading. A continuous record of load and deflection is obtained by a digital data acquisition system. Axial and transverse strains are obtained by means of a pair of two-stain gauge rosettes bonded in the gage section of the specimen.

The compressive specimen is placed in the testing machine, taking care to align the longitudinal axis of the specimen and pushed at a cross-head speed of 0.5 mm/min. The specimens are loaded step by step up to failure under uni-axial loading. A continuous record of load and deflection is obtained by a digital data acquisition system. Axial and transverse strains are obtained by means of a pair of two-stain gauge rosettes bonded in the gauge section of the specimen.

## 5 RESULTS AND DISCUSSIONS

In the following subsections, the experimental results of loaded composite materials are presented. The general behaviour of the all composite mentioned above was obtained from the load/displacement record from the testing machine.

Because the appropriate value of banana/bamboo fibre strength depends upon the failure load. The failure loads in deterministic sense were measured and were presented below.

#### Formula For Tensile And Compressive Strength

Tensile strength: Tensile load /Area

Compressive strength: Compressive load / Area

#### Breaking load of Tensile and Compressive

Table 6.1 shows the breaking load of tensile and compressive properties of banana and bamboo fibre composites.

Table 5.1

MATERIAL	BREAKING LOAD	
	TESILE LOAD N/mm <sup>2</sup>	COMPRESSIVE LOAD KN
BANANA/BAMBOO FIBRE	3840	250
ISOLATION OF BANANA/BAMBOO FIBRE	4320	380

#### Tensile and Compressive strength

Tensile strength =17.11N/mm<sup>2</sup>

Compressive strength =1504.8N

Area =60.70\*4.16 mm<sup>2</sup>

=252.51mm<sup>2</sup>

**5.1 COMPARISON OF MECHANICAL PROPERTIES OF BANANA/BAMBOO AND BANANA/COIR COMPOSITES**

**5.1.1 BEFORE ALKALI TREATMENT**

*Table 5.2*

BANANA/ BAMBOO		BANANA /COIR	
TensileLoad (N)	Compressive Load(KN)	TensileLoad(N)	Compressive Load(KN)
3840	250	3600	220

The test result of banana/bamboo and banana/coir before alkali treatment has been analyzed, and the values are tabulated in table 5.2 the bamboo/banana combination provides the higher results.

**5.1.2 AFTER ALKALI TREATMENT**

*Table 5.3*

BANANA/ BAMBOO		BANANA /COIR	
Tensile Load (N)	Compressive Load(KN)	Tensile Load (N)	Compressive Load(KN)
4320	380	3720	380

The test result of banana/bamboo and banana/coir after alkali treatment has been analyzed, and the values are tabulated in table 6.3 the bamboo/banana combination provides the higher results.

**6 CONCLUSION**

**6.1 CONCLUSION OF THE PROJECT**

In this project, polyurethane banana/bamboo fibre hybrid composite was fabricated by hand lay-up method. And the composite material was machined according to the dimension and tested. The experimentally results are obtained for the polyurethane banana/bamboo fibre hybrid composite. The test result has been compared with the banana and coir composite material. The combination of banana and bamboo composite has the highest value of tensile and compressive properties.

**6.2 FUTURE SCOPE OF THIS PROJECT**

Thus a considerable amount of work has been done on natural fibres for use in composites. There is scope for further research to completely characterise the banana and bamboo fibres and facilitate proper applications in natural fibre reinforced composites. In terms of practical interest, the bamboo fibre composites can be regarded as valid alternatives to replace some conventional fibres such as coir fibre. In future the combination of banana and bamboo fibre composites with and without alkalization should be developed and characterized so as to arrive at a series of composites which may find use in several areas such as marine, structural, consumer articles and industrial applications.

**REFERENCES**

- [1] Olesen PO and Plackett DV, Perspectives on the Performance of Natural Plant Fibres in <http://www.ienica.net>, IENICA EVENTS, Natural Fibres
- [2] Performance Forum, Copenhagen,
- [3] Bismarck A, Mishra S, and Lampke T, Natural Fibres, Biopolymers and Biocomposites, CRC Press, Boca Raton, FL (2005).
- [4] Syed Altaf Hussian, V. Pandurangadu. Mechanical properties of green coconut fibre reinforced HDPE polymer composite.3(11),2011,9075-5462.
- [5] Syed Altaf Hussian, V. Pandurangadu, Mechanical properties of short bamboo fibre reinforced polyester composites filled with alumina articulate,2(3),2012,2250-3498.

- [6] RavindraMangal, N.S. Saxena, M.s. Sreekala, S.Thomas, Composites Science and Technology, 66(2006), 2719-2725.
- [7] E. Trujillo, L. Osorio (2010), Characterization of Polymer Composite Materials Based On Bamboo Fibres.
- [8] Kalaprasad G, Pradeep P, Mathew G, Composite Science &Technology, 60(2000) 2967.
- [9] C. Nagarajan and M. Madheswaran – ‘Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller’- International Journal of Engineering Science and Technology (IJEST), Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [10] C. Nagarajan and M. Madheswaran - ‘Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis’- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
- [11] C. Nagarajan and M. Madheswaran - ‘Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis’- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.

## DESIGN OF SOLAR STILLS ON WATER DISTILLATION

*S. Manikandan, G. Mohanraj, M. Nandhakumar, P. Neelamanikandan, and M. Selvaraj*

Department of Mechanical Engineering, Gnanamani College of Technology,  
Namakkal 637 018, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** Distillation is a process of separating the component substances from a brackish water by separate evaporation and condensation. There is almost no water left on earth that is safe to drink without purification after 20-25 years every day. Only less than 1% water is available for the society for direct use, out of which the maximum fraction has been polluted due to non-manageable industrial development. In this project we have decided uses in non-conventional energy source for the distillation of water. A solar still is a device which can solve the problem of portable water without using the high grade energy. The process of energy get from the sun. Because of this, purpose the solar still is built up with convert the impure water into pure water using the renewable solar energy. The incoming solar radiation from the sun is heating the water.

**KEYWORDS:** solar stills, water, distillation.

### INTRODUCTION

Solar distillation is a tried and true technology. There is an important need for clean, pure drinking water in many developing countries. Often some few years water sources are brackish or contain harmful bacteria and therefore cannot used for drinking. In my project energy input, as heat, solar radiation can be the source of energy. Only 1% of earth's water is in a fresh, liquid state and remaining water are polluted. This bottom surface used blackened material to improve absorption of sunrays. The water initially to heat up and the moisture the glass cover increases. The condensed water can get from using trickles down the inclined glass cover to an interior collection to a storage bottle.

### NEEDS SERVEDBY SOLAR STILL

Solar distillation is a cost-effective means of providing clean water fir direct and indirect human consumption [four basic human needs (i.e. drinking, cooking, washing, and bathing), industrial uses and green house cultivation).

1. It will improve health standards by removing impurities from water supplies.
2. It shall help complement the existing fresh water in locations where the quality/quantity of supply is deteriorating.
3. Where sea water is available, it can reduce the dependence on rain fall.
4. Solar stills, operating on sea or brackish water, shall ensure supplies of water during a time of drought

### ABOUT SOLAR ENERGY

The sun radiates the energy uniformly in all direction in the form of electromagnetic waves. When absorbed by body, it increases its temperature. It is a clean, inexhaustible, abundantly and universally available renewable energy. Solar energy has the greatest potential of all the sources of renewable energy and if only a small amount of this form of energy could be used, it will be one of the most important supplies of energy, especially when other sources in the country have depleted. This solution is solar water distillation. It is not a new process, but it has not received the attention that it deserves. Perhaps

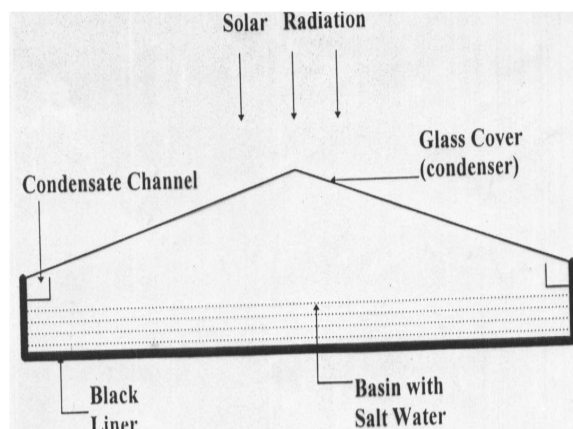
this is because it is such a low-tech and flexible solution to water problems. Nearly anyone is capable of building a still and providing themselves with completely pure water from very questionable sources.  $3.8 \times 10^{24}$  joules of solar radiation is absorbed by earth and atmosphere per year. Solar power where sun hits atmosphere is 1017 watts and the total demand is 1013 watts. Therefore, the sun gives us 1000 times more power than we need. If we can use 5% of this energy, it will be 50 times what the world will require. The energy radiated by the sun on a bright sunny day is 4 to 7 KWh per m.

### SOLAR STILL OPERATION

Water to be cleaned is poured into the still to partially fill the basin. The glass cover allows the solar radiation to pass into the still, which is mostly absorbed by the blackened base. This interior surface uses a blackened material to improve absorption of the sunrays. The water begins to heat up and the moisture content of the air trapped between the water surface and the glass cover increases. The heated water vapor evaporates from the basin and condenses on the inside of the glass cover. In this process, the salts and microbes that were in the original water are left behind. Condensed water trickles down the inclined glass cover to an interior collection trough and out to a storage bottle. Feed water should be added each day that roughly exceeds the distillate production to provide proper flushing of the basin water and to clean out excess salts left behind during the evaporation process. If the still produced 3 litres of water, 9 litres of make-up water should be added, of which 6 litres leaves the still as excess to flush the basin.

### TYPES OF SOLAR STILLS

- Single Effect Basin Solar Still
- Tilted Tray Solar Still
- Multi basin Stepped Solar Still
- Regeneration Inclined Step Solar Still
- Wick Type Solar Still
- Multiple Effect Diffusion Solar Still
- Chimney Type Solar Still
- Multi-Tray Multiple Effect Solar Still
- Double Basin Solar Still
- Humidification Dehumidification Distiller
- Multistage Flash Distiller
- Solar – Assisted wiped film Multistage Flash Distiller



### METHODOLOGY

The design methodology of the project involves designing an asymmetrical solar still as per the output requirements. An asymmetrical design is chosen as it has higher output efficiency. The solar still is designed for an estimated output of around 3 to 5 liters, which is the average requirement for our application. In addition to it, an external reflector has been fabricated to increase the output efficiency.

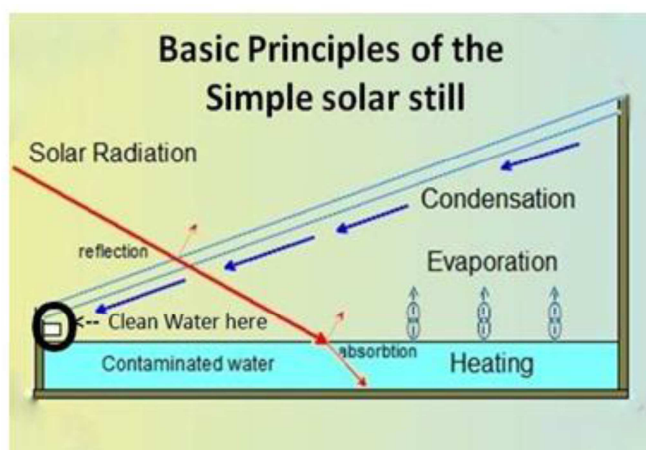
### MATERIAL FOR SOLAR STILLS

1. **GLAZING**:- Should have high transmittance for solar radiation, opaque to thermal radiation, resistance to abrasion, long life, low cost, high wettability for water, lightweight, easy to handle and apply, and universal availability. Materials used are: glass or treated plastic.
2. **LINER**: - Should absorb more solar radiation, should be durable, should be water tight, easily cleanable, low cost, and should be able to withstand temperature around 100°C. Materials used are: asphalt matt, black butyl rubber, black polyethylene etc.
3. **SEALANT**: - Should remain resilient at very low temperatures, low cost, durable and easily applicable. Materials used are: putty, tars, tapes silicon, and sealant.
4. **BASIN TRAY**:-Should have long life, high resistance to corrosion and low cost. Materials used are: wood, galvanized iron, steel, aluminum, asbestos cement, masonry bricks, concrete, etc.
5. **CONDENSATE CHANNEL**:-Materials used are: aluminum, galvanized iron, concrete, plastic material, etc.

### BASIC REQUIREMENTS OF A GOOD SOLAR STILLS

1. Be easily assembled in the field.
2. Be constructed with locally available materials.
3. Be light weight for ease of handling and transportation.
4. Have an effective life of 10 to 20 years.
5. No requirement of any external power source.
6. Can also serve as a rainfall catchment surface.

### OPERATION TECHNIQUE



Water to be cleaned is poured into the still to fill at certain amount of the basin. The glass cover allows the solar radiation to pass through and it reaches the bottom of the still which is mostly absorbed by the base because the surface is coated with black colour material to increase the sun heat absorption. The water begins to heat up and the moisture content of the air trapped between the water surface and the glass cover. Due to heating water gets evaporated from the basin and

condenses on the inside of the cover of the glass. In this process, the impurities that present in the initial water are settled in the base itself and only Condensed water trickles in the inclined glass cover towards downward direction to collection trough and it is stored in the bottle. Every day the basin of the solar still must be cleaned to remove the settled salt contents and impurities. By removing these only we can absorb more amount of heat energy without wastage.

## CONCLUSION

Distillation of water using solar still basin is the most economical method to get portable drinking water. Salt, bacteria and other impurities are contaminated which are to be removed completely in the distillation process. The solar stills are best technology for living beings and environment because they do not need electricity for processing, no running water is required, lifetime is more and easy to maintain. In the experiment it has found that the black coated solar still is more effective when compared with the white coated solar still

## REFERENCES

- [1] Arjun vyas, Nitin bodar, Design of solar distillation system, vol-29, April 2011.
- [2] C Tenthani, A Madhlopa and C.Z Kimambo, Improved solar still for water purification (2012).
- [3] R Shah, M patel, K shah, Effect of various parameters on different types of solar still vol-2, may 2013.
- [4] L AL-Hayek and o.o Bardran, The effect of using different designs of solar stills on water distillation, desalination, 169 (2004).
- [5] S Nandha kumar, P.P. Shantharaman, fabrication of solar water distillation system, vol-2, April 2015.
- [6] Osondu L.C, Eze N.N, Ukwuani s.t, Performance evaluation of a solar still, vol-4, sep2015.
- [7] Akash BA, Mohsen MS, Osta O and Elayan Y, "Experimental evaluation of a single-basin solar still using different absorbing materials", renewable energy- 14, 1998,307-310
- [8] M.K. Phadatare and S.K. Verma, RETRACTED: Development in solar still: A review, Renewable Sustainable Energy Reviews, in press.
- [9] S. Nijmeh, S. Odeh and B. Akash, Experimental and theoretical study of a single-basin solar sill in Jordan, Int Comm. Heat Mass Transfer, 32(2005) 565–572.

## ANALYZING MECHANICAL PROPERTIES OF FRICTION STIR WELDED JOINTS OF SIMILAR AND DISSIMILAR ALUMINIUM ALLOYS

V. Yogesh<sup>1</sup>, P. Yasharkumar<sup>2</sup>, S. Sathish Kumar<sup>2</sup>, V. Vishnu<sup>2</sup>, and S. Srinivasan<sup>2</sup>

<sup>1</sup>Assistant Professor, Muthayammal College of Engineering, Rasipuram, Namakkal, Tamilnadu, India

<sup>2</sup>UG Scholar, Muthayammal College of Engineering, Rasipuram, Namakkal, Tamilnadu, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** The structural application demands reduction in both the weight and as well as cost of the fabrication and production of materials. Aluminium alloys are the best choice for the reduction of weight, cost and replacing steels in many applications and Friction Stir Welding (FSW) process efficient and cost effective process. FSW is solid state welding process in which material is not melted during welding process so it overcomes many welding defects compared to conventional fusion welding process which is initially used for low melting materials. This process is initially developed for low melting materials like Aluminium, Magnesium, and Zinc but now process is useful for high melting materials like steel and also for composites materials. The present study describes the effect of FSW process involving butt joining of similar Aluminium alloy combinations of AA6351 with AA6351 and dissimilar Aluminium alloy combinations of AA6351 with AA5083 on the tensile, hardness and impact behavior.

**KEYWORDS:** Friction Stir Welding, Tensile, Hardness, Impact strength, Aluminium alloy AA6351 and AA5083.

### 1 INTRODUCTION

Friction Stir Welding (FSW) is a solid state welding process developed and patented by The Welding Institute (TWI) in 1991. It is emerged as a novel welding technique to be used in high strength alloys that were difficult to join with conventional welding techniques [1]. The process were initially developed for aluminium alloys [2-10], but since then FSW was found suitable for joining other materials like magnesium [11, 12], steel [13,14], titanium [15], copper [16,17] and also composites [18]. Instead of a conventional welding torch, friction stir welding uses a non-consumable rotating tool with a specially designed pin and shoulder is inserted into the abutting edged of the two parts to be welded and traversed along the line of the joint as shown in Fig.1. The pin and shoulder of tool can be modified in number of ways to influence material flow and microstructural formation.



Fig.1. Friction Stir Welding Experimental Setup

## 2 EXPERIMENTAL PROCEDURE

### 2.1 MATERIAL

The materials used for this investigation are aluminium alloys AA6351 and AA5083 of size 100 X 50 X 5 mm. The standard chemical composition and base materials used for this experiment chemical composition are listed in table no.1 and 2 respectively. A vertical CNC milling machine is converted in to friction stir welding machine for welding process. Mechanical properties of aluminium alloy AA6351 and AA5083 are represented in table 3.

**Table 1. STANDARD CHEMICAL COMPOSITION (ALUMINIUM ALLOY AA6351)**

Element	Standard
Si	0.8
Fe	0.5
Cu	0.1
Mn	0.4
MG	0.4
Zn	0.2
Ti	0.2
Al	Balance

**Table 2. STANDARD CHEMICAL COMPOSITION (ALUMINIUM ALLOY AA5083)**

Element	Standard
Si	0.2
Fe	0.35
Cu	0.15
Mn	0.15
MG	5
Zn	0.25
Ti	0.1
Al	Balance

**Table 3. MECHANICAL PROPERTIES OF ALUMINIUM ALLOY AA6351 AND AA5083**

Aluminium alloy	AA5083	AA635
Hardness Brinell	97	85
Hardness Rockwell A	43	39
Hardness Rockwell B	62	55
Yield Strength Mpa	283	250
Tensile Strength Mpa	310	320
Elongation at break	14	10

**Workpiece Specification:** Plate Length=100mm, Plate Width=50mm, Plate Thickness=5mm. Raw material was cut into the specified dimensions, then machined at the sides in order to make them flat to ensure accurate face-to-face contact at weld joint as shown in Figure2.

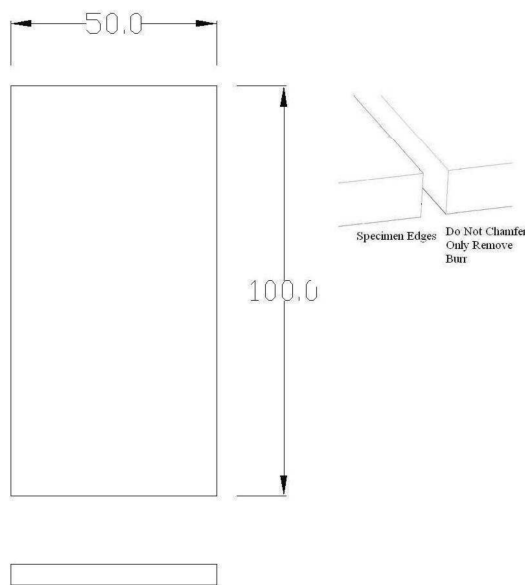


Figure 2: Workpiece Dimensions

## 2.2 TOOL MATERIAL

In this study FSW specimens are prepared at 30mm/min feed rate and at 1200 rpm spindle speed. The plate size of aluminium alloys are same and having 100 mm length, 50 mm width and 5 mm thickness. HSS material is used to manufacture the tools.

**Tool dimensions:** Shoulder Diameter- 20mm, Pin Diameter- 5mm.

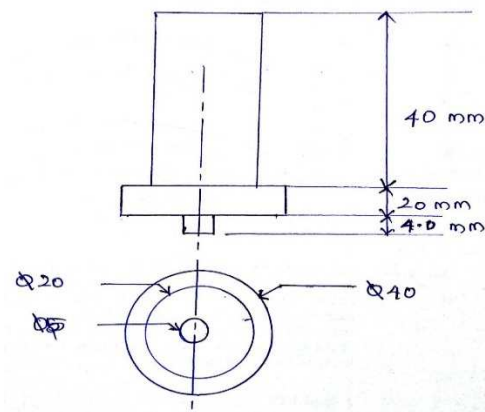


Figure 3: Tool Dimensions

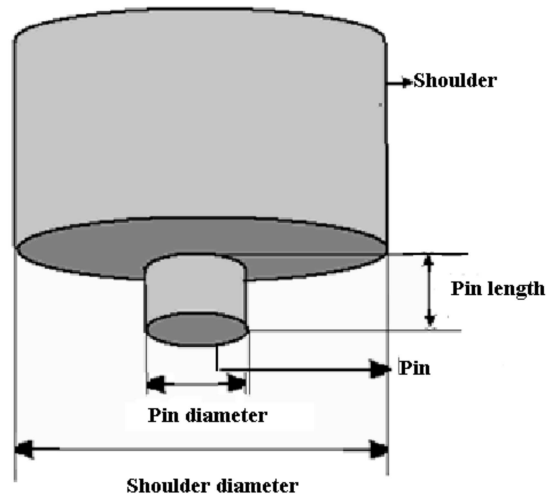


Figure 4: Tool Geometry

### 2.3 WELDING PROCEDURE

Aluminium alloys of AA6351 and AA5083 were chosen for in this experimental work. Similar aluminium alloy combinations of AA6351 with AA6351 and dissimilar combinations of AA6351 with AA5083 friction stir welded in this experiment. Specially designed tool was used in this friction stir welding process. The tool material used in this work was high speed steel (HSS) with cylindrical shaped probe without threads. The FSW tool was subjected to heat treatment process to improve hardness, the hardness of tool after heat treatment process is 55 HRC. A vertical CNC milling machine is converted in to friction stir welding machine to carry out welding process. The two plates are partitioned in the fixture which is prepared for fabricating FSW joint by using mechanical clamps so that the plates will not separate during welding process. Two aluminium alloy plates of size 150X60X5 mm were perfectly clamped in CNC milling machine bed on a backup plate. The axial force of 3.5 KN is applied during welding process. The FSW tool is inserted into the tool holder. Tool is plunged into the joint in the downward direction with a feed rate of 30 mm/min in clockwise direction. Higher tool rotation generates temperature because of higher frictional heating and results more intense stirring of mixing material.

### 2.4 TENSILE TESTING

The tensile tests were conducted to determine the tensile properties of similar aluminium alloys of AA6351 with AA6351 and dissimilar aluminium alloy of AA6351 with AA5083 friction stir weldments at rotational speed of the tool (1200 rpm) in a Universal Testing Machine (UTM) as per ASTM standards.

### 2.5 HARDNESS TESTING

Rockwell hardness tests were performed to determine hardness of FSW weldments of similar alloy combinations and dissimilar alloy combinations at rotational speed of the tool i.e., from 1200 rpm.

### 2.6 IMPACT TESTING

The Charpy impact test was performed to determine the impact energy of similar aluminium alloys combinations of AA6351 with AA6351 and dissimilar aluminium alloy combinations of AA6351 with AA5083 friction stir weldments at rotational speed of the tool (1200 rpm) as per ASTM standards.

## 3 RESULTS AND DISCUSSIONS

### 3.1 TENSILE TEST

Tensile tests were performed to determine the tensile properties (yield strength, tensile strength and percentage elongation) of the aluminium alloy similar alloy combination of AA6351 with AA6351 and aluminium alloy dissimilar

combination of AA6351 with AA5083. The effect of rotational speed of the tool on tensile properties (yield strength, tensile strength and percentage elongation) of friction stir welded aluminium alloy AA6351 with AA6351 and aluminium alloy AA6351 with AA5083. It seen from these figures that at lower rotational speed of the tool (1000 rpm), lower tensile properties of the FSW welded joint were observed. When rotational speed increased from 1000 rpm onwards tensile properties were also increased and reaches maximum at 1300 rpm. If the rotational speed is increased more than 1300 rpm, a reverse trend has been observed i.e. the tensile properties of the welded joint has decreased. The optimum values observed at rotational speed of 1300 rpm were observed for both the cases.

The mechanical properties of the aluminium alloy combinations (AA6351- AA5083 and AA6351-AA6351) are given below,

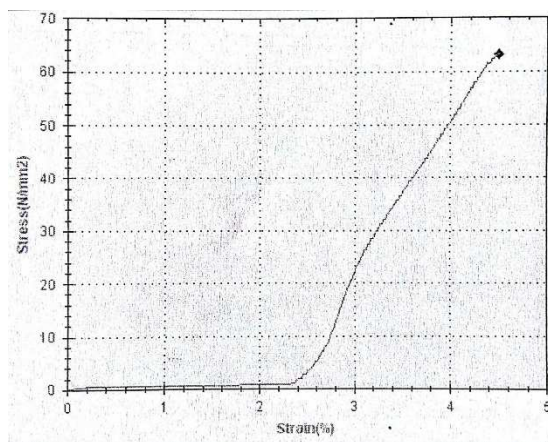
**Table 4. CHARPY IMPACT TEST**

Sample ID	Thick X Width X Length (mm)	Charpy Impact Energy, Joules
AA5083-AA6351	5 X 10 X 55	6
AA6351-AA6351	5 X 10 X 55	4

**Table 5. ROCKWELL HARDNESS TEST**

Sample ID	Observed value, HRA			Average, HRA
	1	2	3	
AA5083-AA6351	10	9	10	10
AA6351-AA6351	9	8	8	8

**TENSILE PROPERTIES OF AA5083 WITH AA6351**



**Figure 5: Stress-Strain relationship**

## TENSILE PROPERTIES OF AA6351 WITH AA6351

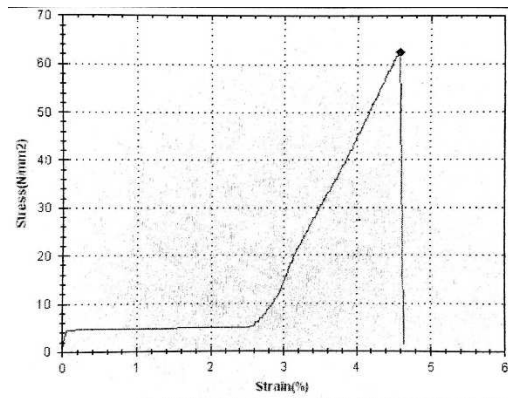


Figure 6: Stress-Strain relationship

The tensile properties and fracture locations of the welded joints are dependent on process parameters like rotational speed, welding speed and axial force of the tool, tool tilt angle etc. The lower rotational speed results lower defects like crack and pinholes in friction stir processed zone and resulted lower tensile values. On the other hand when the rotational speed increases (1400 rpm and 1500 rpm), the heat input also increases which results poor tensile properties due to rise in temperature, which increases grain growth, higher rotational speed solidification and coarsening of strengthening precipitates at the weld zone area and lowering of dislocation density [19].

#### 4 CONCLUSION

The friction stir welding is very recent trends in metal joining processes especially for aluminum alloys. It is found that many research works are done on the aluminum alloys. Dissimilar aluminium alloy of AA6351 with AA5083 combinations has the better mechanical properties as compared to similar aluminium alloy of AA6351 with AA6351 combinations because the cylindrical tool profile, process parameters (tool rotational speed, axial downward force and feed rate) and proper mixing of material at weld location is not taking place of different melting points of AA6351 (melting point at solid state is 554 °C and at liquid state is 649 °C) and AA5083 (melting point at solid state is 591°C and at liquid state is 638°C).

#### REFERENCES

- [1] W. Thomas, E. Nicholas, J. Needham, M. Murch, P. Templesmith, C.
- [2] Dawes, 1995, Patent-Friction stir butt welding, I.P.N.PCT/GB92/02203, Editor, GB Patent No. 9125978.8, US Patent No.5.460.317. (1991).
- [3] Yeong-Maw Hwang , Zong-Wei Kang , Yuang – Cherng Chiou , Hung – Hsiou Hsu, “Experimental study on temperature distributions within the workpiece during friction stir welding of aluminium alloys”, International journal of machine tools & manufacture, vol. 48, pp.778- 787, 2008.
- [4] Hua-Bin Chen, Keng Yan, Tao Lin, Shan-Ben Chen, Cheng-Yu Jiang, Yong Zhao, “The investigation of typical welding defects for 5456 aluminium alloy friction stir welds”, Material science and engineering A, vol. 433, pp. 64-69, 2006.
- [5] K. Elangovan, V. Balasubramanian, “Influences of post weld heat treatment on tensile properties of friction stir-welded AA6061 aluminium alloy joints”, Material characterization vol. 59, pp.1168- 1177, 2008.
- [6] P.M.G.P. Moreira, T. Santos, S.M.O. Tavares, V. Richter-Trummer, P. Vilaca, P.M.S.T.de Castro, “Mechanical and metallurgical characterization of friction stir welding joints of AA6061-T6 with AA6082-T6”, Materials and design, vol. 30, pp. 180-187, 2009.
- [7] C. Leitao, R.M.Leal, D.M. Rodrigues, A. Loureiro, P. Vilaca, “Mechanical behaviour of similar and dissimilar AA5182-H111 and AA6016-T4 thin friction stir welds, Materials and design”, vol. 30, pp. 101-108, 2009.
- [8] W. Gan, K. Okamoto, S. Hirano, K. Chung, C. Kim, R.H. Wagoner, “Properties of friction-stir welded aluminium alloys 6111 and 5083”, Journal of engineering materials and technology, vol. 130, pp. 031007- 1 – 031007-15, 2008.
- [9] Yu Zhang, Yutaka S. Sato, Hiroyuki Kokawa , Seung Hwan C. Park ,Satoshi Hirano , “Microstructural characteristics and mechanical properties of Ti-6Al-4V friction stir welds”, Material science and engineering A, vo. 485, pp. 448-455, 2008.

- [10] Z. Barlas, H.Uzum, "Microstructure and mechanical properties of friction stir butt welded dissimilar Cu/CuZn30 sheets", *Journal of achievements in materials and manufacturing engineering*, vol. 30, issue 2, pp.182-186, 2008.
- [11] Ratnesh K.Shukla, Dr. Pravin K. Shah, "Experimental investigations of copper joining by friction stir welding", *proceedings of the international conference on emerging research and advances in mechanical engineering (ERA 2009)*, Velammal engineering college, Chennai-600 066, Taminadu, India. Pp.657-660, 2009.
- [12] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - *Journal of ELECTRICAL ENGINEERING*, Vol.63 (6), pp.365-372, Dec.2012.
- [13] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques' - *Taylor & Francis, Electric Power Components and Systems*, Vol.39 (8), pp.780-793, May 2011.
- [14] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007.
- [15] L. Ceschini, I. Boromei, G. Minak, A. Morri, F. Tarterini, "Effect of friction stir welding on microstructure, tensile and fatigue properties of the AA7005/10 vol.%Al<sub>2</sub>O<sub>3</sub>p composite", *Composites science and technology*, vol. 67, pp. 605-615, 2007.
- [16] S. Lomolino, R. Tovo and J. Dos Santos, "On the fatigue behavior and design curves of friction stir butt welded Al alloys", *International journal of fatigue*, vol. 27, pp.305-316, 2005.

## Design and Fabrication of Industrial Conveyor Using Crank Mechanism

A. Vijay, N. Sivakumar, M. Prabhu, and R. Rathish

Department of Mechanical Engineering, Gnanamani College Of Technology, Namakkal, India

Copyright © 2017 ISSR Journals. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** This machine is basically works on the principle of Single Slider Crank Mechanism which is the heart of this machine and it converts rotary motion into a reciprocating motion. Here Fabricated the conveyor using crank mechanism machine, this project can be utilized in industry. This machine makes use of transfer the product from one place to another place with the help of conveyor, the conveyor rotation is based on the crank mechanism. This project deals with the industrial products are moving from one place to another place in timing by using crank mechanism.

**KEYWORDS:** Crank mechanism, inertia force balance, Material handling.

### 1 INTRODUCTION

There has been a serious demand for intermittent movement of packages in the industries right from the start. Though the continuous movement is more or less important in the same field the sporadic motion has become essential .The objective of our project is to produce a mechanism that delivers this stop and move motion using mechanical linkages. The advantage of our system over the conveyor system is that the system has a time delay between moving packages and this delay can be used to introduce any alterations in the package or move the package for any other purpose and likewise. While in conveyor system such actions cannot be performed unless programmed module is used to produce intermittent stopping of the belt which basically is costly. The prototype design requires electric motor, shafts and the frame of which the frame and platform on which the packages are moved is fabricated. All the links are being made of Aluminium which reduces the weight of the whole system including the head which has a direct contact with the boxes being moved. The system is expected to move as heavy packages as 2 to 3kgs approximately.

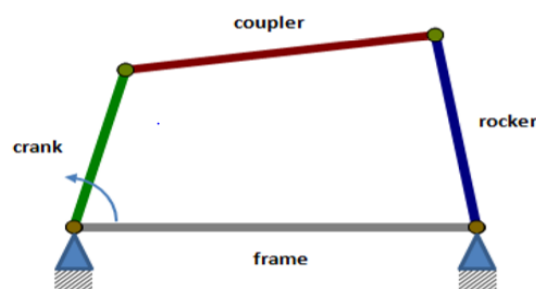


Fig.1.1 Four bar linkage

This machine is basically works on the principle of Single Slider Crank Mechanism which is the heart of this machine and it converts rotary motion into a reciprocating machine to crush the Cans/Plastic bottles

### 1.1 WORKING PRINCIPLE

In this machine can comfortable for moving the product from one place to another place with safely. The machine is placed and working process is very easy for using persons. In this machine , the control unit is control the motor drive for rotation of the crank shaft .The motor is placed and the crank shaft is attached with the motor with the help of bearing. The products are safely placed in the stored place and then motor is ON ,

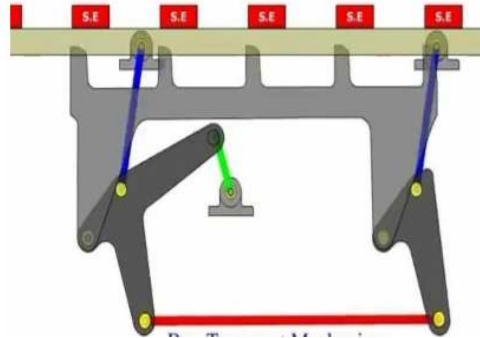


Fig.1.2 Four bar linkage

the crank is rotated and the first box is move from first place to second place in the first rotation , after that the second box is placed in the first position , the second rotation is started the first box is move from second place to third place , in the mean time the second box is move from first place to second place . In this based the boxes are move from one place to another place simultaneously .The products are safely transfer from one place to another in conveyor using crank mechanism.

## 2 EXPERIMENTAL SETUP

### 2.1 SELECTION OF MATERIALS

1. Linkages
2. Dc motor
3. Dc battery
4. Steel Frame

The design and fabrication of box shifting mechanism constructed by various components such as hylem board, dc wiper motor, dc battery, steel stand and wooden pieces. In this steel frame build by using rectangular hollow pipes and steel rods these are connected by welding operation. The hylem boards are cut by using cutting operation. The dc wiper motor fitted on the frame by using bolt and nut joint. Power supply given from the dc battery (12volts and 7amps) through copper wires.

#### 1. Linkages

A mechanical linkage is an assembly of bodies connected to manage forces and movement. The movement of a body, or link, is studied using geometry so the link is considered to be rigid. The connections between links are modeled as providing ideal movement, pure rotation or sliding for example, and are called joints.

A linkage modeled as a network of rigid links and ideal joints is called a kinematic chain. Linkages may be constructed from open chains, closed chains, or a combination of open and closed chains. Each link in a chain is connected by a joint to one or more other links. Thus, a kinematic chain can be modeled as a graph in which the links are paths and the joints are vertices, which is called a linkage graph.

The movement of an ideal joint is generally associated with a subgroup of the group of Euclidean displacements. The number of parameters in the subgroup is called the degrees of freedom (DOF) of the joint. Mechanical linkages are usually designed to transform a given input force and movement into a desired output force and movement.

The ratio of the output force to the input force is known as the mechanical of the linkage, while the ratio of the input speed to the output speed is known as the speed ratio. The speed ratio and mechanical advantage are defined so they yield the same number in an ideal linkage.

## 2. Dc motor

A windscreen wiper or windshield wiper is a device used to remove rain and debris from a windscreen or windshield. Almost all motor vehicles, including trains, watercraft and some aircraft, are equipped with such wipers, which are usually a legal requirement. A wiper generally consists of an arm, pivoting at one end and with a long rubber blade attached to the other.

The blade is swung back and forth over the glass, pushing water from its surface. The speed is normally adjustable, with several continuous speeds and often one or more "intermittent" settings. Most automobiles use two synchronized radial type arms, while many commercial vehicles use one or more pantograph arms.

## 3. Dc battery

A battery is a device that can create electricity using a chemical reaction. It converts energy stored in molecules inside the battery into electricity. They produce direct current (DC) electricity (electricity that flows in one direction, and does not switch back and forth). Using the electricity from an outlet in a house or building is cheaper and uses less energy, but a battery can provide electricity in areas that do not have electric power distribution. It is also useful for things that moved around and cords would get in the way.

## 4. Steel Frame

Steel frame is a building technique with a "skeleton frame" of vertical steel columns and horizontal I-beams, constructed in a rectangular grid to support the floors, roof and walls of a building which are all attached to the frame. The development of this technique made the construction of the skyscraper possible.



*Fig.2.1 Four bar linkage*

## 2.2 PROCEDURE

- First of all we have prepared the drawing for the machine transporter machine.
- Then we make the measurement for the bed of the box transport machine.
- We took the iron angles and cut them in the given measurements using the cutting machine.
- Then we took that pieces and weld them in the prepared shaped drawing.
- After making the welding of the iron angles bed for the machine was ready.
- Then we took the mild steel plate and then taking the measurement of box transport machine we cut the pieces in the given length.
- After cutting the plate in the given size we put it in the lathe machine for giving it the shape of shaft as shown in the figure 7, 8. We also prepared the hanger and crank using the lathe machine as per of dimension as shown in figure 9.

- After preparing the shaft, hanger and crank we take it over the drill machine to make the holes in them as the given dimension in the drawing.
- After this we had prepared the shaft which is going move the boxes to the next level with using it edges on the top of it. We cut the mild sheet plate in the given dimensions and then edges also, after cutting we make the welding to attach these edges with the plate on the given distance dimensions. Then with the help of file we rub these welding points to give them a good look.
- Now all of the things for the machine are prepared.
- On this step we took the electric motor and fix that on the bed of the machine on the given place.
- After fixing the motor we fixed the crank with it from one side and other side was attached to the shaft 1 as shown in the fig 6.
- Then we took the hanger link and attach it with the shaft 1, while the other edge of the hanger link is attached to the shaft 2, fig 7.
- Then both of the shafts were attached to the transporting shaft as shown in fig 3.
- Two other hanger links was also attached to the shafts.
- Other two hanger link and transporting shaft was attached to the top of the bed in the bearing gear.
- Out box transporting machine is ready now.
- We give the current to the electric motor and put the boxes on the top of the machine for testing it.
- It was working well and boxes are moving to the next level.

### 3 RESULT AND DISCUSSION

Four-Bar Chain: The four bar chain is the most fundamental of the plane kinematic chain. It is a much preferred mechanical device for the mechanization and control of motion due to its simplicity and versatility. Basically, it consists of four rigid links which are connected in the form of quadrilateral by four-pin joints.

When one of the links is fixed, it is known as a linkage or mechanism. Link that rotate complete revolution is called the crank, the link opposite to the fixed link is called the coupler, and the fourth link is called the lever or rocker if it oscillates or another crank, if it rotates

### 4 FUTURE SCOPE

Dynamic analysis is one of the very important phase in design the systems. A computer base modelling and simulation gives better understanding regarding rigid system parameters. There is much scope in development of an accurate mathematical model and subsequent simulations for the kinematic and dynamic analysis of the mechanical systems for the precise application in the industry.

### 5 CONCLUSION

The crank unit is defined in this paper, and the important role of the crank unit is discussed in the process of modular design and production of the Crank-group Driving Mechanism. A method achieving inertia force balancing of the Crank-group Driving Mechanism is proposed according to the special structure of the mechanism. The factors influencing mass moment of the balancing weights and its calculation method are elaborated. The study provides the theoretical basis for the modular design of the Crank-group Driving Mechanism.

### REFERENCES

- [1] A Review on Kinematic and Dynamic Analysis of Mechanism” by Shrikant R. Patel, D. S. Patel, B. D. Patel Research Scholar, Associate Professor, Assistant Professor.
- [2] Ahmah A. Shabana, Dynamics of Multi body Systems, published by press syndicate of university of Cambridge, Cambridge University Press.
- [3] A Text Book of Theory of Machines by R. S. Khurmi, J.K. Gupta.
- [4] Ali Salah Amen and Dr. Ajeet Kumar Rai, “Analysis of Electronic Chips Microchannel By Using Ansys Software” International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 5, Issue 7, 2012, pp. 47 - 56, ISSN Print: 0976-6480, ISSN Online: 0976-6499.

- [5] "Dynamic modeling and identification of a slider-crank mechanism" by Jih-Lian Haa , Rong-Fong Fungb, Kun-Yung Chenb, Shao-Chien Hsienb.
- [6] E. Tanik, "Transmission angle in compliant slider-crank mechanism," *Mechanism and Machine Theory*, vol. 46, pp. 1623–1632, 2011.
- [7] C.Nagarajan and M.Madheswaran – 'Analysis and Implementation of LLC-T Series Parallel Resonant Converter with Fuzzy controller'- *International Journal of Engineering Science and Technology (IJEST)*, Applied Power Electronics and Intelligent Motion Control. Vol.2 (10), pp 35-43, December 2010
- [8] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, *Electrical Engineering*, Vol.93 (3), pp.167-178, September 2011.
- [9] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- *Iranian Journal of Electrical & Electronic Engineering*, Vol.8 (3), pp.259-267, September 2012.
- [10] F. Dirksena, M. Anselmanna, T.I. Zohdi, R. Lammering, "Incorporation of flexural hinge fatigue-life cycle criteria into the topological design of compliant small-scale devices," *Precision Engineering*, vol. 37, pp. 531–541, 2013.
- [11] Himanshu Chaudhary, Subir Kumar Saha "Balancing of Four Bar using maximum recursive Dynamic Algorithm", *Mechanism and machine Theory*, Science Direct (2006).
- [12] Isam Jasim Jaber and Ajeet Kumar Rai, "Design and Analysis of I.C. Engine Piston And Piston-Ring Using Catia and Ansys Software" *International Journal of Mechanical Engineering & Technology (IJMET)*, Volume 5, Issue 2, 2014, pp. 64 - 73, ISSN Print: 0976 – 6340, ISSN Online: 0976 – 6359.
- [13] "Kinematics and kinetic analysis of the slider-crank mechanism in otto linear four cylinder Z24 engine" Mohammad Ranjbarkohan, Mansour Rasekh, Abdol Hamid Hoseini, Kamran Kheiralipour and Mohamma Reza Asadi [http://en.wikipedia.org/wiki/Crank\\_\(mechanism\)](http://en.wikipedia.org/wiki/Crank_(mechanism)).
- [14] Katarina Monk ova, Peter Monka, "Kinematic analysis of quick-return mechanism in three various approaches" *technical gazette* 18, 2(2011).

## CHANGING COMPOSITE MATERIAL IN MAIN HELICOPTER ROTOR BLADE

*K. BALAJI, P. GRACEKUMAR, K. MAHIMAIPRABHU, M. MANIKANDAN, and R. RAGHUL*

Aeronautical Engineering, Karpagam Institute of Technology, India

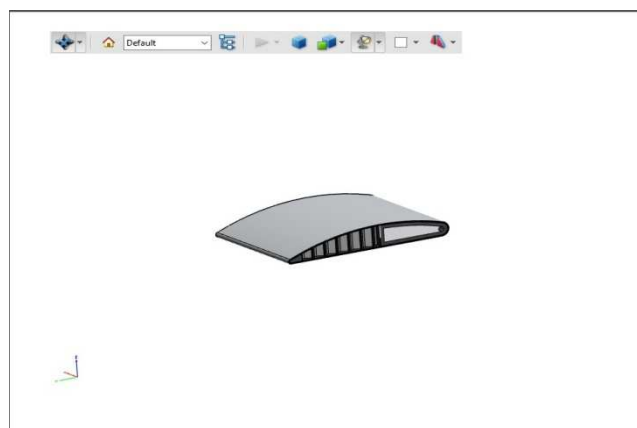
Copyright © 2017 ISSR Journals. This is an open access article distributed under the ***Creative Commons Attribution License***, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ABSTRACT:** To determine the load distribution in main helicopter rotor blade in study Computational Fluid Dynamics (CFD) and Finite Element Method (FEM) software is used. The aim of the present investigation is the development of a CFD and FEM by using CFD computation procedure capable of accurately simulating the pressure distribution test and velocity test of main helicopter blade and using FEM to simulating flow of thermal behavior test. For this purpose the complete of main rotor blade in CATIA model are used in CATIA modeling. Primary attention in this investigation is focused on defining load on main helicopter rotor blade because of metal trailing edge segments of these blade were replaced with a new segments made from honeycomb composite materials. As critical structural parts with greetings to strength here are glued joints between metal and composite segments of trailing edge are considered. For precise stress analysis of these segments, including glued joints, the finite element method is used.

**KEYWORDS:** ANSYS FLUENT, CATIA, CFD, FEM, ROTOR BLADE.

### 1 INTRODUCTION

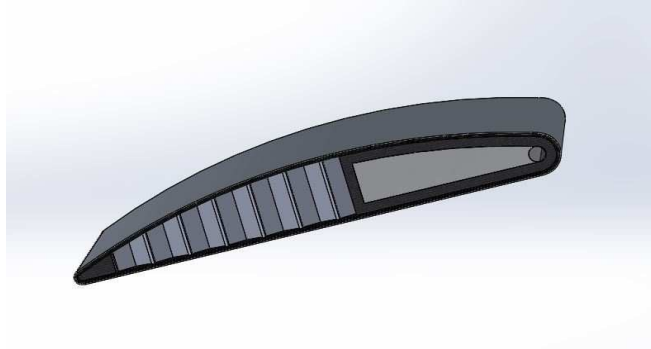
Nowadays, aerodynamic interaction between the main rotor of helicopter still remains a challenging task. The flow around a helicopter is dominated by complex aerodynamics and flow interaction phenomena. Lifting-line theory with two dimensional (2D) airfoil records as a function of angle of attack and Mach number were usually used for blade aerodynamic loads. But in such approach, experiential corrections had to be integrated because of the effects of dynamic stall, compressibility and blade interaction with trailing vortex. Today, powerful computational fluid dynamics (CFD) methods are progressively more used in the analysis of the whole helicopter avoiding experiential corrections. The additional complexity appears to result from blade dynamics and elastic deformations. The problem of main rotor analyzed in relatively ANSYS FLUENT (ANSYS FLUENT 18.0 Users Guide) commercial software is applied in obtaining influence of the fuselage on the main rotor blade sectional loads for the Mi-8 helicopter. The main rotor blades are modelled whereas rotor hub is not included.



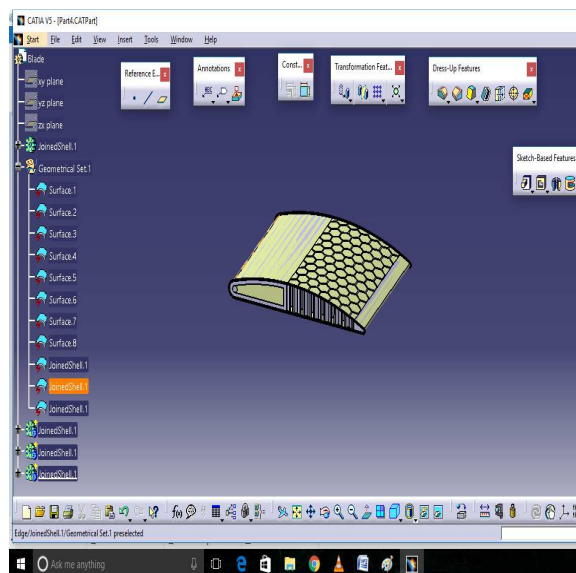
**Fig 1 Structure of main Helicopter Rotor Blade**

## 2 MODELING AND EXTRACTION OF FLOW DOMAIN

The data points of airfoil for the rotor model and the computational domain were collected. The 3D model of the main rotor blades are designed by using CATIA. Figure 2 show model of our rotor blade which can design in CATIA are decided to place on the 3D model of the main rotor blade. Figure 3 shows the 3D model of the main rotor blade along with the structure of honey comb inside of main rotor blade. The values for the generated mesh near the wall zones are maintained at too which is as per the turbulence modeling requirements. A single passage approach is modeled and numerically solved with the assumption that flow is periodic



**Fig 2 Model of Main Rotor Blade**



**Fig 3 CATIA Modelling**

## 3 MESH GENERATION

Meshing of the computational domain is made using CFD as shown in Figure 3. Thus, the discretisation of the Hybrid structured grid elements were generated. To mesh the composite material boron epoxy for analyzing the material in ansys software.

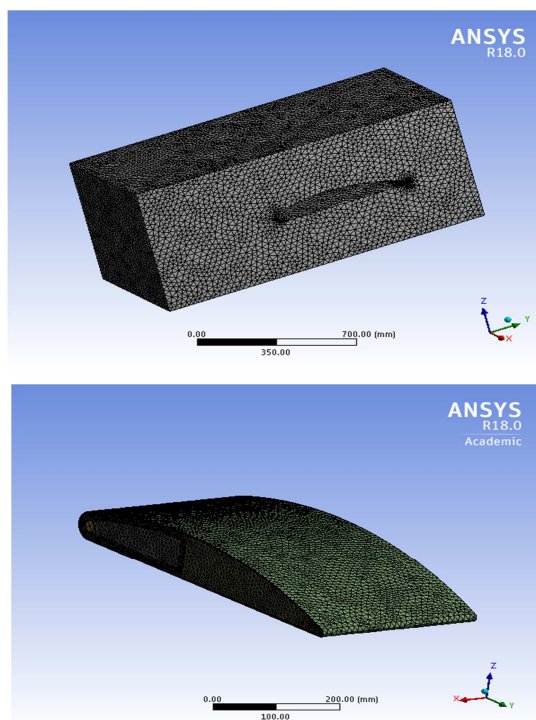


Fig 4 Meshing of Rotor Blade using Boron Epoxy

#### 4 RESULT

##### 4.1 PRESSURE

In figure5 pressure flow over the boron epoxy honeycomb composite material by using ansys software for increasing the pressure while changing composite material in helicopter main rotor blade for producing more lift in rotor blade while comparing with Nomex honeycomb composite material. In below figure pressure flows in boron epoxy honeycomb composite materials by using ansys software.

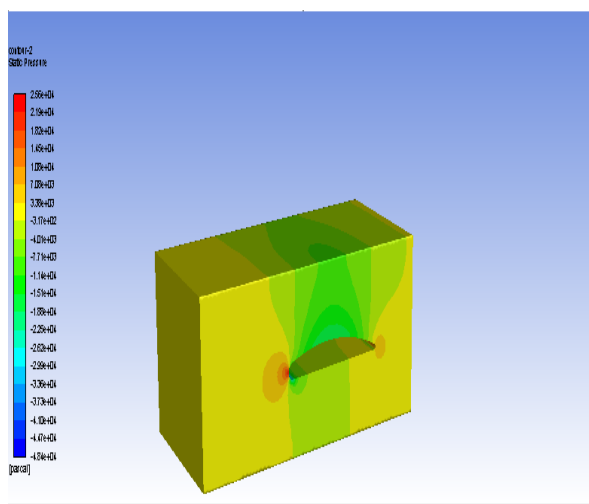
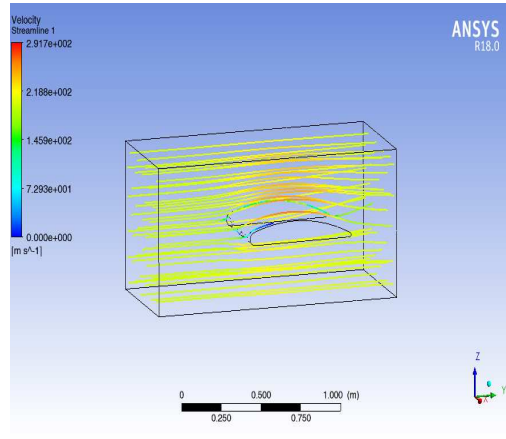


Fig 5 Pressure Flow over Rotor Blade

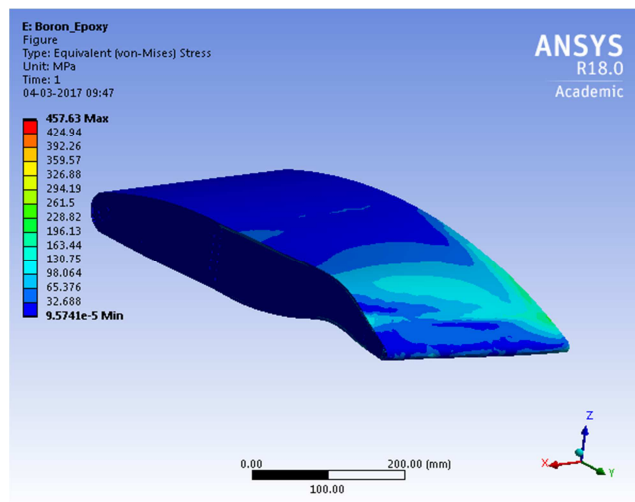
#### 4.2 VELOCITY

In figure 6 compare the velocity flow over the boron epoxy composite material by using ansys software for decreasing the velocity while changing composite material in helicopter main rotor blade for producing more lift in rotor blade. In below figure we find out the various velocity flows in composite materials by using ansys software.



**Fig 6 Velocity Distribution in Boron honeycomb**

#### 4.3 STRESS



**Fig 7 Stress applied in Boron Epoxy**

#### 4.4 SAFETY FACTOR

The below figure represents the safety factor of the boron composite respectively.

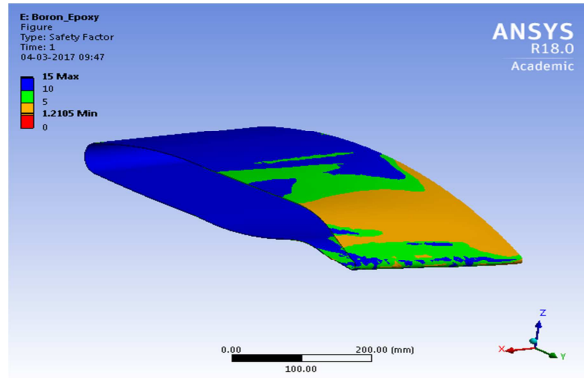


Fig 8 Safety Factor of Boron Honeycomb

5 CONCLUSION

Finally by using the software life CATIA, CFD (Computational Fluid Dynamics) and FEM. We are changing the boron composite honeycomb structure in main helicopter blade. By using the software’s we can designing the main rotor blade and we can also found pressure distribution, velocity distribution. The purpose of this paper was to study the flow and performance parameters for better understanding over the design condition.

6 ACKNOWLEDGMENT

With great pleasure and deep gratitude, authors wish and express their sincere gratitude to beloved Principal **Dr. T. Ramachandran** for providing an opportunity and necessary facilities in carrying out this work and express sincere thanks to all the staff members of Aeronautical Engineering whose assistance played a big role in this work and have been of immense value.

REFERENCES

[1] Dieterich O, Enenkl B, and Roth D. Trailing edge flaps for active rotor control: *Aeroelastic characteristics of the ADASYS rotor system*. Proc AHS 62nd Annual Forum, Phoenix, AZ, 9 - 11 May 2006.

[2] Harika S Kahveci<sup>1</sup> & Cengiz Camci<sup>2</sup> Turbomachinery Aero-Heat Transfer Laboratory The Pennsylvania State University 223 Hammond Building, University Park, PA 16802.

[3] Murray, G., Gandhi, F. and Bakis, C. 2007. "Flexible Matrix Composite Skins for One-dimensional Wing Morphing," In: Proceedings of the 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Honolulu, Hawaii, USA.

[4] Keihl, M.M., Bortolin, R.S., Sanders, B., Joshi, S. and Tidwell, Z. 2005. "Mechanical Properties of Shape Memory Polymers for Morphing Aircraft Applications," In: Proceedings of SPIE, Smart Structures and Materials 2005: Industrial and Commercial Applications of Smart Structures Technologies, pp. 143151, San Diego, CA, USA.

[5] Renaud, T., Benoit, C., Boniface, J. C., and Gardarein, P. (2003). "NavierStokes computations of a complete helicopter configuration accounting for main and tail rotor effects." 29th European Rotorcraft Forum, Friedrichshafen, Germany.

[6] Uzol, O., and Camci, C., 2001, "Aerodynamic Loss Characteristics of a Turbine Blade With Trailing Edge Coolant Ejection Part 2: External Aerodynamics, Total Pressure Losses and Predictions," ASME Journal of Turbomachinery.

[7] Gibson, L. and Ashby, M. 1997. *Cellular Solids, Structure and Properties*, 2nd edn, Cambridge University Press, New York. Reed, J.L., Hemmelgarn, C.D., Pelley, B.M. and Havens, E. 2005. "Adaptive Wing Structures," In: Proceedings of SPIE, Smart Structures and Materials 2005: Industrial and Commercial Applications of Smart Structures Technologies, pp. 132142, San Diego, CA, USA.

