MICROCONTROLLER BASED HOME SECURITY SYSTEM USING GSM MODULE

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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 aond 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), Realys.

The second system consists of relay drivers which willenabled by controller when the controller receives commands from user registered mobile phone through GSM module. These realy 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, realibility, 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 robustand 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 descried in [6] monitors everything by moving cameras. The system can increases the efficiency of monitoring and can eliminate the blind spots of fixed cameras. In this system , a mobile manipulator ids 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 sensor are controlled by a microprocessor PIC18F877A through the SMS having password.

3   HARDWARE SYSTEM DESIGN

The system consists of microcontroller, sensor, relsy, 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 inputs 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) realys. when anyone of these sensor generate output signal over the limit the controller receive the analogue signal and produce corresponsding output signal as per program burnrd into it. Loads are individually powered by external power supply(5-9v dc,230v ac) through relay drivers. Anaesthetic gads dispenser connected with relay and it will on when user send sms as "#SPRAY". Each sensor sre connected with conditioning circuit for amplification and filtering purposes. In realy circuit which 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 anto 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 get 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 flashes. Use proteius software, to simulate and verify the whole system design whether it work properly or not. Each wore connections are made with soldering kit because of it is robust and stand for long time.
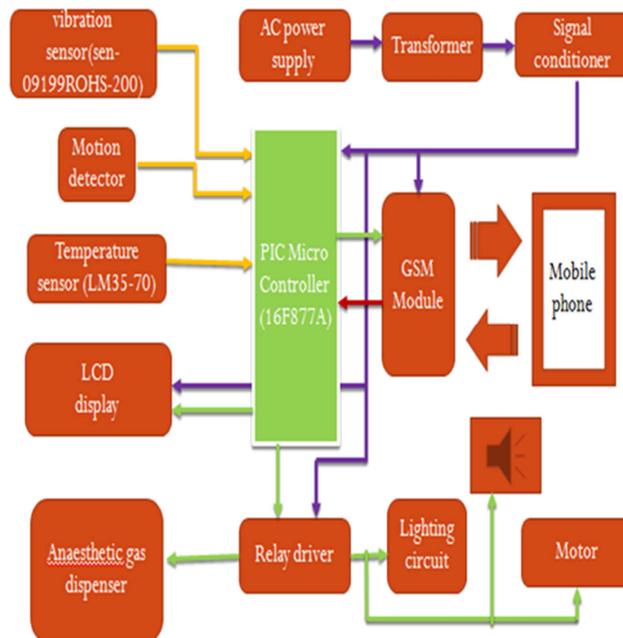

Fig.1. functional block diagram

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 periphrerals), 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.
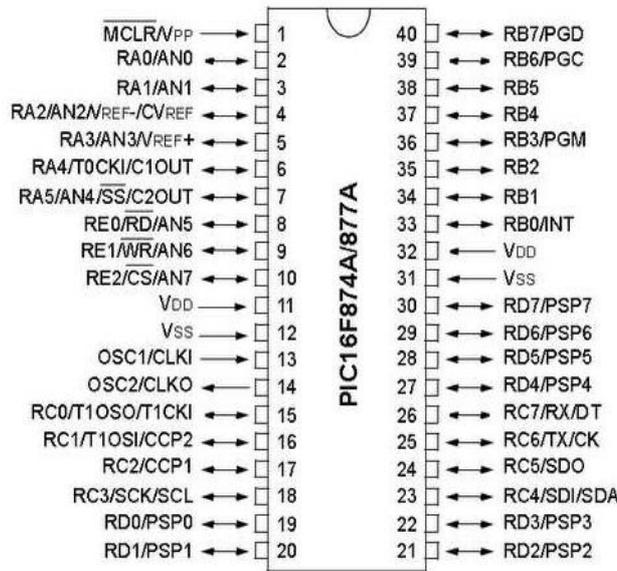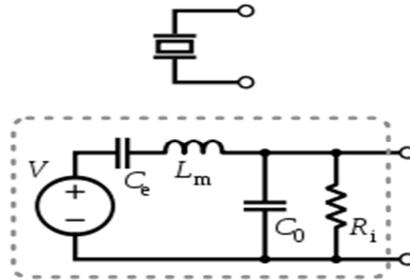

Fig.2. PIC microcontroller

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.
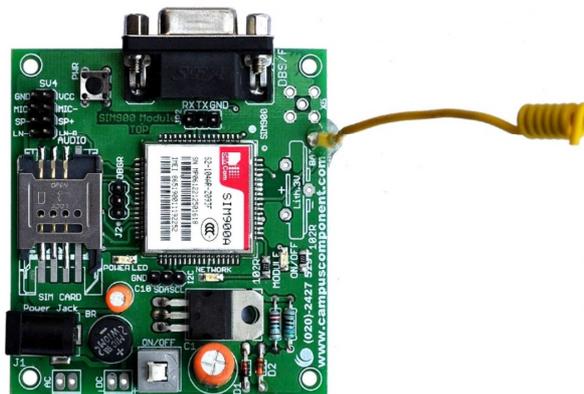
Fig.3. vibration sensor

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} Ω. When light incident on the photo cell it usally 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 amd 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 weaken 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.

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