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REMOTE MONITORING SYSTEM USING SENSORS

A PROJECT REPORT

Submitted by

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In partial fulfillment for the award of the degree

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BONAFIDE CERTIFICATE

Certified that this project report "**REMOTE MONITORING SYSTEM USING SENSORS**" is the bonafide work of **P.ANANDALWAR, S.MAHESHKUMAR, M.R.MANOJKUMAR** who carried out the project work under my supervision.

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hereby declare that the project entitled **"REMOTE MONITORING SYSTEM USING SENSORS"**, submitted in partial fulfillment to Anna University as the project work of Bachelor of Technology (Information Technology) degree, is a record of original work done by us under the supervision and guidance of Department of Information Technology, Kumaraguru College of Technology, Coimbatore.

Place: Coimbatore

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ABSTRACT

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The need for providing security for buildings like industries, office, home etc., from remote places is increasing. Our project is also concerned with this at cheaper price by using sensors.

Remote Monitoring System Using Sensors is a system that can provide security for buildings like industries, office, home and private places, even from remote places by sending alert SMS. The design is based on stand alone embedded system board integrated with the three sensors: Human detection sensor(PIR), Gas detection sensor and Temperature sensor and GSM Modem. The signals detected from sensors are processed in the Microcontroller board and accordingly it commands the GSM Modem to send message to the concerned person. If any mischief detected by sensor, the hidden camera can then be activated to take pictures and updated in the website. On seeing the alert SMS, the person can log on to the website to see the pictures which can also be used for judiciary purpose. The relay circuit is provided for controlling devices like alarm for instant security purpose.

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LIST OF SYMBOLS AND ABBREVIATION

uC	Microcontroller
PIC	Peripheral Interface Controller
PIR	Passive Infra-Red
RS	Recommended Standard
GSM	Global Systems for Mobile
IDE	Integrated Development Environment
JVM	Java Virtual Machine
API	Java Application Interface
EEPROM	Erasable Electrically Programmable Read Only Memory
IC	Integrated Circuit
LPG	Liquified Petroleum Gas

INTRODUCTION

1. INTRODUCTION

1.1 REMOTE MONITORING

Current Scenario demands that an individual's focus be mainly directed towards his/her time management at the most effective way. Mostly people look forward for facilities that can be remotely controlled/monitored thus eliminating the need for physical presence of the person and save time from waiting, in the most economical way.

1.2 PROBLEM DEFINITION

Remote monitoring system through GSM technology is a system that can monitor the home from a remote location. Sensors are connected to an embedded system board and in which PIC microcontroller connected to the GSM modem. The user can monitor the home from anywhere at any time.

In the embedded system board, if the microcontroller receives the signals then it sends the commands to GSM modem via serial port. From the modem the alert messages transmitted to the user's mobile who is in remote places. The board has the digital input and output ports, memory, relay circuit, serial port and extra hardware resources which make it suitable for the required task.

The requisite power supply is given to the microcontroller continuously using the transformers, capacitors and voltage regulators. The embedded system board is stand alone system which is not dependent on pc. Once the sensors detects then it sends the signals to the microcontroller and from it the commands transferred through RS232 communication cable to the GSM modem. The hidden camera can capture the images and uploaded to webpage. Once user gets the information through mobile then he can view the images though internet.

1.3 OBJECTIVE

The objective of this project is to ensure the security of home even from the remote location anywhere at anytime by using standalone board. It must also enable the user to view the current images through web. The alarm raising facility is also provided through relay circuit.

LITERATURE REVIEW

2. LITERATURE REVIEW

2.1 CURRENT STATUS OF THE PROBLEM

The existing system does not provide security to home from remote places. No status checking through live images is available. There is no proof to take legal actions against theft.

2.2 PROPOSED SYSTEM AND ITS ADVANTAGES

In this system proper security is provided. In case of an emergency situation an alert SMS sent to the user. As soon as the user receives the text message, he can access the web page to get an account of events happening at origin of emergency. The advantages of this system are,

2.2.1 REMOTE MONITORING

The user can monitor their house from a remote location anywhere and at any time. Thus there is no need for anyone to guard their possession in person. Since the user can receive alerts through the SMS service, the user will always be aware as they always have their hand-held devices (mobile) with them.

2.2.3 CHECK STATUS

On sensing motion, gas leakage or fire breakout, the system apart from sending SMS also updates the images of the location in the web pages. These updated camera images in the web can enable the user to check the status by viewing live image from remote places.

2.2.4 LEGAL PROOF

The system not only helps to detect the theft but also helps to fight legal charges against the intruders. The stored images can be used for such judicial purposes.

2.3 BLOCK DIAGRAM:

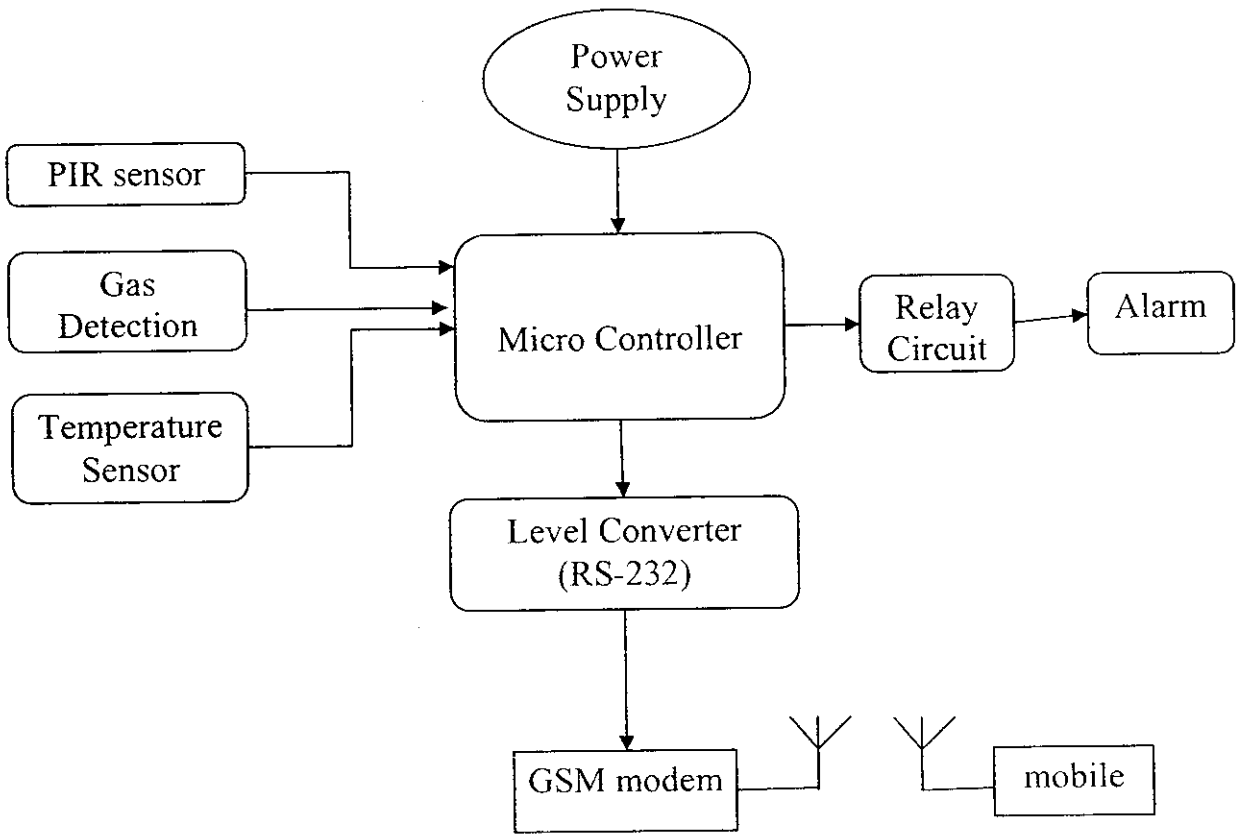

Fig 2.3.1 Block Diagram of the System

2.4 CIRCUIT DIAGRAM

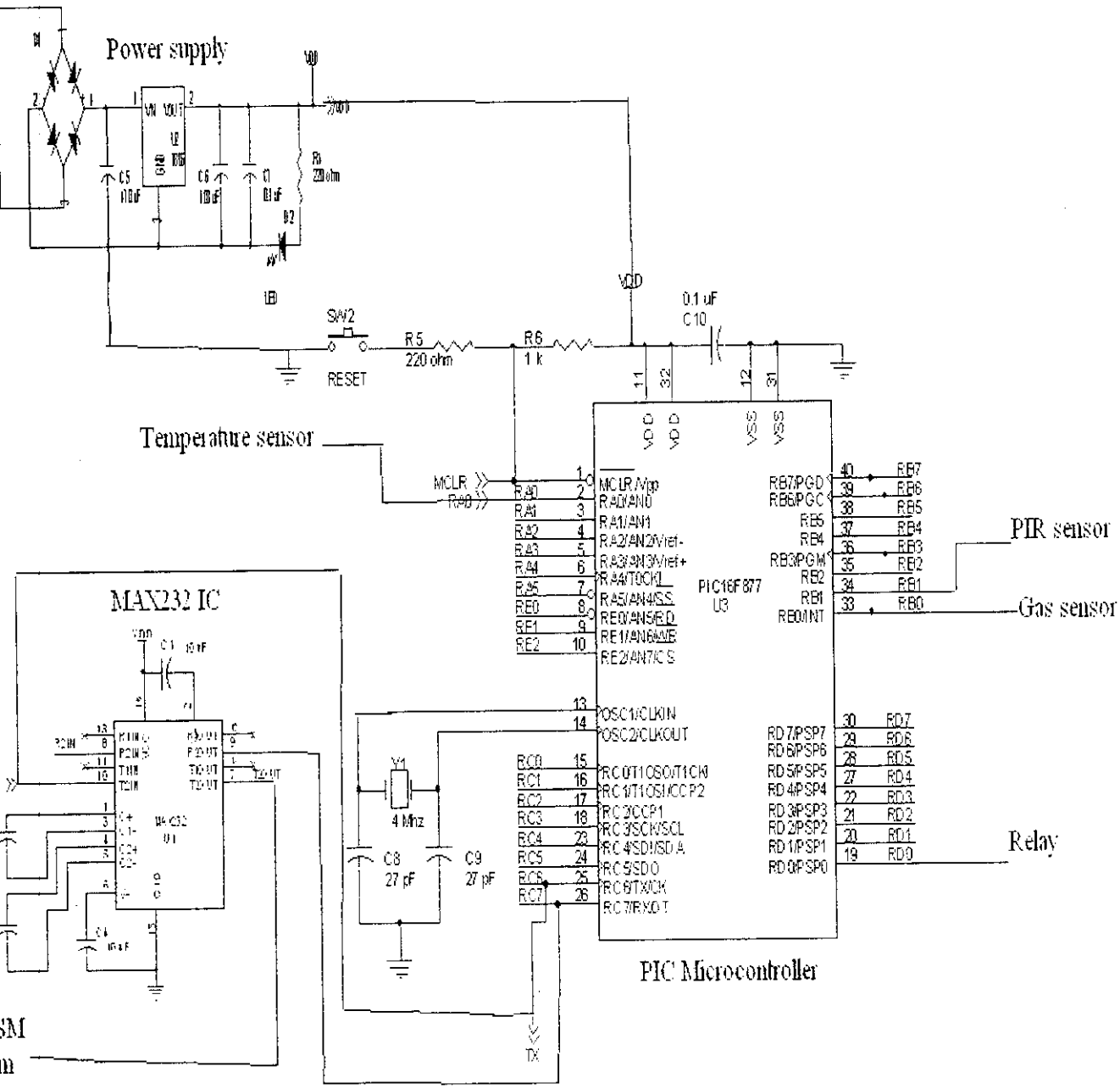

Fig 2.4.1 Circuit Diagram of the System

2.5 HARDWARE REQUIREMENTS:

- PIC Microcontroller
- PIC Evaluation Board
- PIR Sensor
- Gas Sensor
- Temperature Sensor
- Relay Circuit
- Transformers
- Camera
- RS232 Cable
- GSM Modem

2.6 SOFTWARE REQUIREMENTS:

Operating System	Windows XP
Language	Embedded C, Java, HTML
Application Software	TOMCAT
Tools	MPLAB Compiler

Table 2.6.1 Software Requirements

.7 SOFTWARE OVERVIEW

7.1 MPLAB IDE:

MPLAB Integrated Development Environment (IDE) is a free, ntegrated toolset for the development of embedded applications employing Microchip's PIC® and dsPIC® microcontrollers. MPLAB IDE runs as a 32-bit pplication on MS Windows®, is easy to use and includes a host of free software omponents for fast application development and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving etween tools is a snap, and upgrading from the free software simulator to ardware debug and programming tools is done in a flash because MPLAB IDE as the same user interface for all tools.

To Write assembly code, build and assemble our project with MPLAB's wizards, then to test our code with the built-in simulator and debugger. When ready to test the own application, select one of low-cost ebugger/programmers to program a device and analyze hardware.

MPLAB IDE FEATURES:

Flexible customizable programmer's text editor

Free components

Fully integrated debugging with right mouse click menus for reakpoints, trace and editor functions. Tabbed editor option or separate source vindows.

Recordable Macros

Context sensitive color highlighting for assembly, C and BASIC code readability. Mouse over variable to instantly evaluate the contents of variables and registers. Set breakpoints and trace points directly in editor to instantly make changes and evaluate their effects. Graphical project manager Version control support for MS Source Safe, CVS, PVCS, Subversion

Programmer's text editor

MPLAB SIM, high speed software simulator for PIC and dsPIC devices with peripheral simulation, complex stimulus injection and register logging Full featured debugger. MPASM™ and MPLINK for PIC MCUs and dsPIC DSC devices. HI-TECH C PRO for PIC10/12/16 MCU Families running in lite mode CCS PCB C Compiler.

- Labcenter Electronic's Proteus VSM spice simulator. Many Powerful Plug-Ins including
  - ? AN851 Boot loader programmer
  - ? AN901 BLDC Motor Control Interface
  - ? AN908 ACIM Tuning Interface
  - ? KeeLoq support
  - ? Data Monitor and Control

- Simple, powerful source level debugging
- Built in support for hardware and add-on components

7.2 JAVA

NTRODUCTION TO JAVA

Java is an object-oriented programming language developed by Sun Microsystems, a company best known for its high-end UNIX/LINUX workstations. Modeled after C++, the java language is designed to be small, simple and portable across platforms and operating systems, both at source and the binary level, which means that java program scan run on any machine that has java virtual machine installed. There are two types of java programs. They are java applets and java applications.

Java is a platform independent at both the source level and the binary level; platform independence means that a program can run on any computer system. Java programs can run on any system for which a Java Virtual Machine has been installed. Unlike other programming languages when java programs are compiled byte codes are generated which is a special set of machine instructions that are not specific to any one-processor or computer system.

Unlike most object-oriented languages, Java includes a set of input and output capabilities and other utility functions. Then basic libraries are part of standard environment, which includes simple libraries from networking, common Internet protocols and user interface toolkit functions. Because the libraries are written in Java, they are portable across platforms as all Java applications are.Apart from these features, Java has the following features:

Features :

1. Simple

2. Object-oriented
3. Distributed
4. Robust
5. Secure
6. Architecture neutral
7. Portable
8. Interpreted
9. High performance
10. Multithreaded
11. Dynamic

- **Java is simple.**

What it means by simple is being small and familiar. Sun designed Java as closely to C++ as possible in order to make the system more comprehensible, but removed many rarely used, poorly understood, confusing features of C++. These primarily include operator overloading, multiple inheritance and extensive automatic coercions. The most important simplification is that Java does not use pointers and implements garbage collection so that we don't need to worry about dangling pointers, invalid pointer references and memory leaks and memory management.

- **Java is secure.**

Java is intended to be used in networked environments. Toward that end, Java implements several security mechanisms to protect us against malicious code that might try to invade your file system. Java provides a firewall between a networked application and our computer.

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The Java Platform :

A platform is the hardware or software environment in which a program runs. Most platforms can be described as a combination of the operating system and hardware. The Java platform differs from most other platforms in that it's software only platform that runs on top of other hardware-based platforms.

The Java platform has two components:

1. The Java Virtual Machine(JVM).
2. The Java Application Programming Interface(Java API).

The Java API is a large collection of ready-made software components that provides many useful capabilities, such as GUI, the Java API is grouped into libraries of related classes and interfaces; these libraries are known as packages.

The native code is the code that after we compile it, the compiled code runs on a specific hardware platform. As a platform-independent environment, the Java platform can be bit slower than native code. However, smart compilers, well-tuned interpreters, and just-in-time byte code compilers can bring performance close to that of native code without threatening portability.

2.7.3 TOMCAT APACHE:

Apache Tomcat is a servlet container developed by the Apache Software Foundation (ASF). Tomcat implements the Java Servlet and the JavaServer Pages (JSP) specifications from Sun Microsystems, and provides a "pure Java" HTTP web server environment for Java code to run.

Components

Tomcat version 5.x was released with Jasper (a redesigned JSP engine), Catalina (a redesigned servlet container) and Coyote (an HTTP connector).

Catalina

Catalina is Tomcat's servlet container. Catalina implements Sun Microsystems' specifications for servlet and Java Server Pages (JSP). The architect for Catalina was Craig McClanahan.

Coyote

Coyote is Tomcat's HTTP Connector component that supports the HTTP 1.1 protocol for the web server or application container. Coyote listens for incoming connections on a specific TCP port on the server.

Jasper

Jasper is Tomcat's JSP Engine. Tomcat 5.x uses Jasper 2, which is an implementation of the Sun Microsystems's JavaServer Pages 2.0 specification. Jasper parses JSP files to compile them into Java code as servlets .

DETAILS OF THE METHODOLOGY

3. DETAILS OF METHODOLOGY EMPLOYED:

The various modules involved in our project are

- Hardware Assembly
- Embedding Software
- Port Communication
- Camera Integration
- GSM Modem Integration

3.1 HARDWARE ASSEMBLY:

MICROCONTROLLER

A microcontroller is a computer-on-chip. It is a type of microprocessor emphasizing high integration, low power consumption, self-sufficiency and cost effectiveness, in contrast to a general purpose microprocessor. In addition to the usual arithmetic and logic elements of a general purpose microprocessor, the microcontroller typically integrates additional elements such as read-write memory for data storage, read-only memory, such as flash for code storage, EEPROM for permanent data storage, peripheral devices, and input/output interfaces. They consume relatively little power (milli watts) and will generally have the ability to sleep while waiting for an interesting peripheral event such as a button press to wake them up again to do something. Power consumption while sleeping may be just nano watts, making them ideal for low power and long lasting battery applications. By reducing the size, cost, and power consumption compared to a design using a separate microprocessor, memory, and input/output devices,

nicrocontrollers make it economical to electronically control many more processes.

PIC MICROCONTROLLER

- PIC: Programmable Interface Controller/Peripheral Interrupt Controller
- PIC is Microchip product
- PIC is a Microcontroller which is something special.
- PIC includes features for entire analog as well as digital form of operations
- PIC microcontroller is a enhanced flash microcontroller
- PIC microcontroller mostly compatible with previous versions
- It available in all packages for customers usage
- PIC microcontroller available 28/40/44 pins
- PIC is a high performance RISC CPU

Pin Diagram

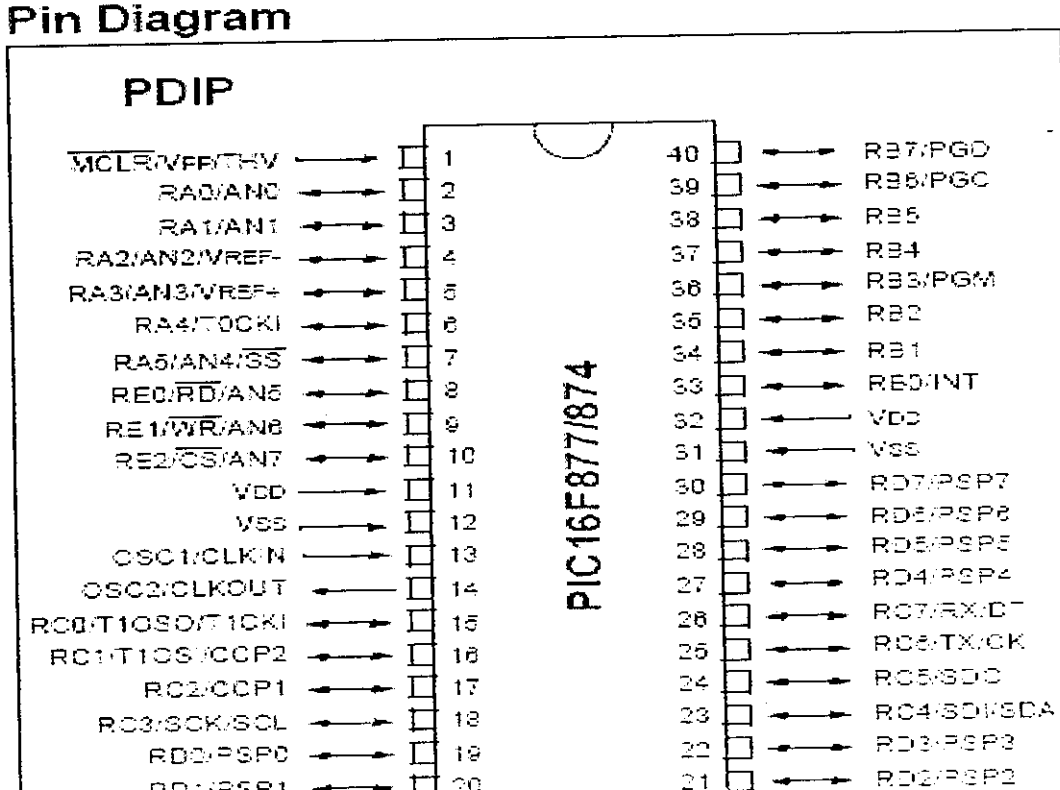


Fig 3.1.1 Pin Diagram of PIC 16F877

WER SUPPLY

Block Diagram

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

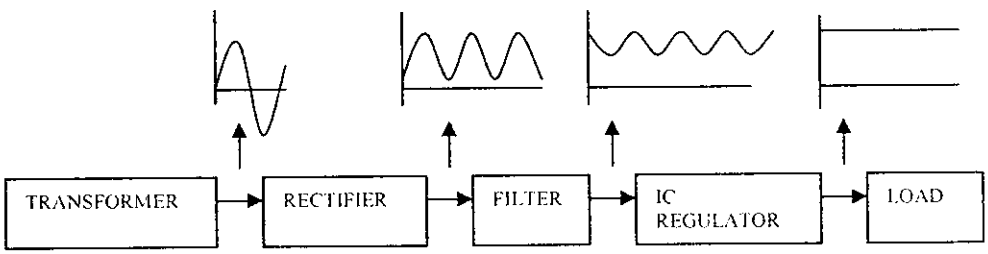


Fig 3.1.2 Block Diagram of Power supply

Working principle

Transformer

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC, rest of the circuits will give only RMS output.

Bridge rectifier

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.

Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4.

One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit.

IC voltage regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground.

The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

- For ICs, microcontroller, LCD --------- 5 volts
- For alarm circuit, op-amp, relay circuits ---------- 12 volts

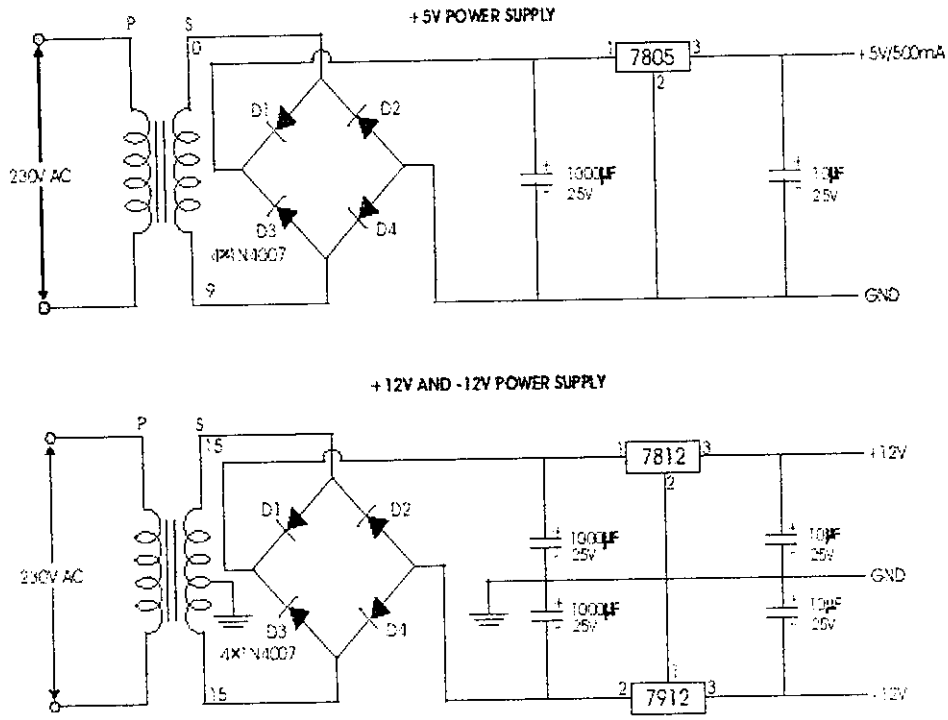


Fig 3.1.3 Circuit Diagram of Power Supply

RELAY

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

ULN2803A IC which uses 7 Darlington Transistor Array to amplify the input current coming from the port. This 16-pin IC is capable to take TTL input and the output load may have high voltage up to 50V

A solid state relay (SSR) is a solid state electronic component that provides a similar function to an electromechanical relay but does not have any moving components, increasing long-term reliability. With early SSR's, the tradeoff came from the fact that every transistor has a small voltage drop across it. This voltage drop limited the amount of current a given SSR could handle. As transistors improved, higher current SSR's, able to handle 100 to 1,200 amps, have become commercially available.

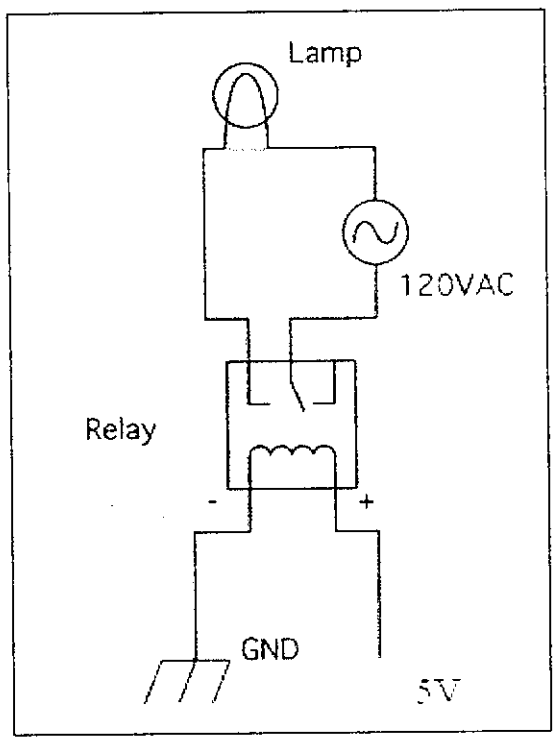


Fig 3.1.4 Relay Circuit Diagram

.2 SENSOR INTEGRATION:

PIR SENSOR:

Passive Infrareds sensors (PIRs) are electronic devices which are used in some security alarm systems to detect motion of an infrared emitting source, usually a human body. The pyro-electric sensor is made of a crystalline material that generates a surface electric charge when exposed to heat in the form of infrared radiation.

When the amount of radiation striking the crystal changes, the amount of charge also changes and can then be measured with a sensitive FET device built into the sensor. This radiation (energy) is invisible to the human eye but can be detected by electronic devices designed for such a purpose

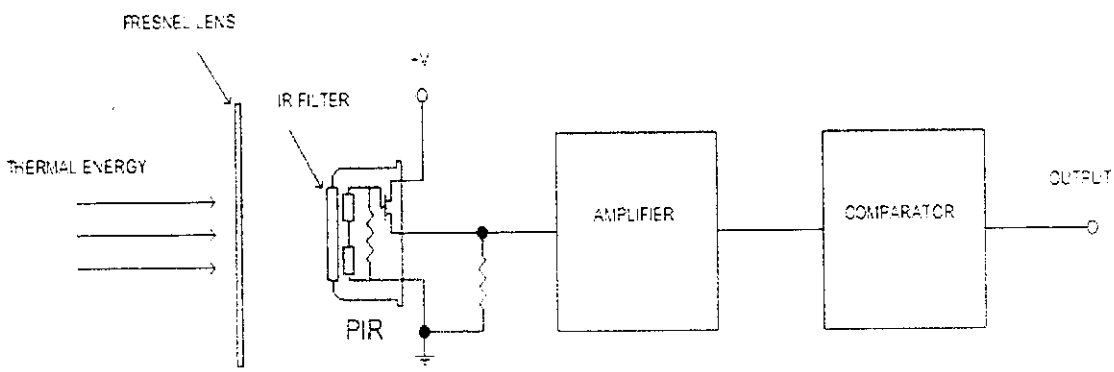


Fig 3.2.1 Block Diagram of PIR

Pin Configuration

The PIR325 sensor has two sensing elements connected in a voltage bucking configuration. This arrangement cancels signals caused by vibration,

emperature changes and sunlight. A body passing in front of the sensor will ctivate first one and then the other element whereas other sources will affect both lements simultaneously and be cancelled.

The radiation source must pass across the sensor in a horizontal direction vhen sensor pins 1 and 2 are on a horizontal plane so that the elements are equentially exposed to the IR source. A focusing device is usually used in front of the sensor.

GAS SENSOR:

Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, and cigarette smoke.

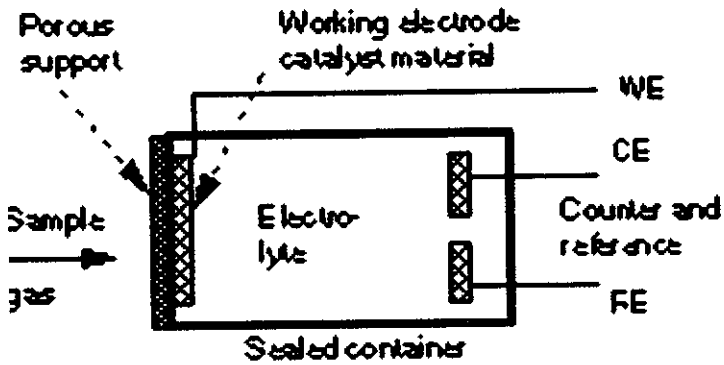


Fig 3.2.2 Working of Gas Sensor

Features:

- High Sensitivity
- Detection Range: 100 - 10,000 ppm iso-butane propane

- Fast Response Time: <10s
- Heater Voltage: 5.0V
- Dimensions: 18mm Diameter, 17mm High excluding pins, Pins - 6mm High

TEMPERATURE SENSOR:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature

Features:

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guaranteeable (at +25°C)
- Rated for full - 55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from4 to 30 volts
- Less than 60 μA current drain
- Low self-heating, 0.08°C in still air

LM35 sensor:

You can measure temperature more accurately than a using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

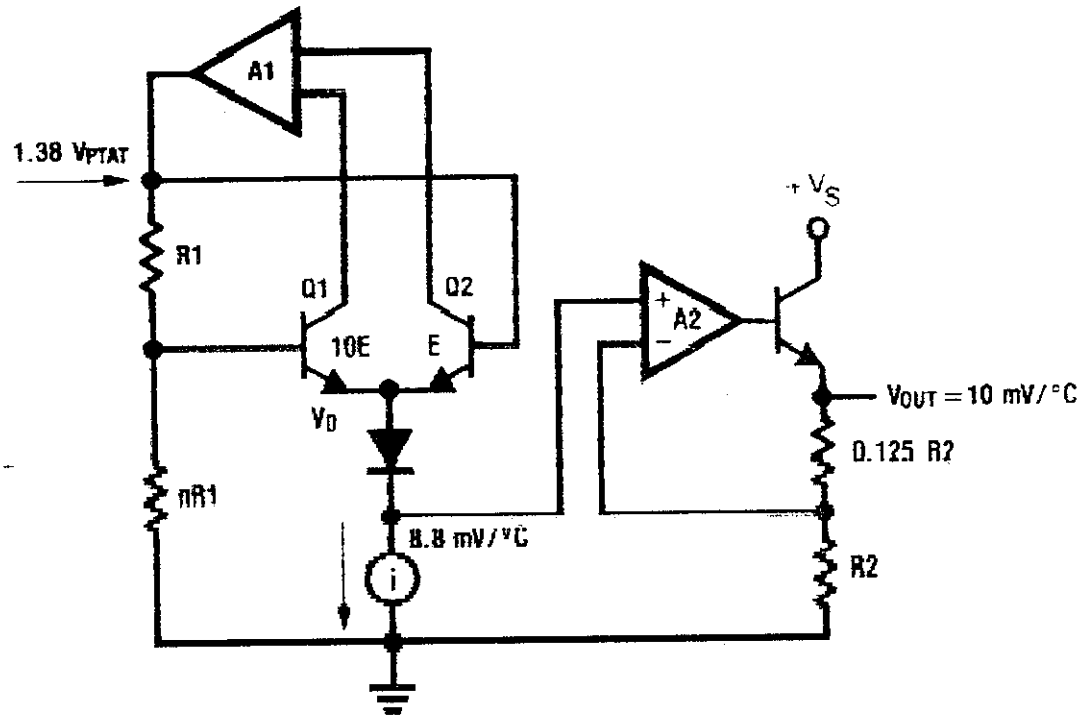


Fig 3.2.3 Circuit Diagram of LM35 Sensor

3.3 PORT COMMUNICATION:

RS 232 SERIAL COMMUNICATION:

Serial communication is basically the transmission or reception of data one bit at a time. Today's computers generally address data in bytes or some multiple thereof. A byte contains 8 bits. A bit is basically either a logical 1 or zero. Every character on this page is actually expressed internally as one byte. The serial port is used to convert each byte to a stream of ones and zeroes as well as to convert streams of ones and zeroes to bytes. The serial port contains a electronic chip called a Universal Asynchronous Receiver/Transmitter (UART) that actually does the conversion.

The serial port has many pins. We will discuss the transmit and receive pin first. Electrically speaking, whenever the serial port sends a logical one (1) a negative voltage is effected on the transmit pin. Whenever the serial port sends a logical zero (0) a positive voltage is effected. When no data is being sent, the serial port's transmit pin's voltage is negative (1) and is said to be in a MARK state. Note that the serial port can also be forced to keep the transmit pin at a positive voltage (0) and is said to be the SPACE or BREAK state. (The terms MARK and SPACE are also used to simply denote a negative voltage (1) or a positive voltage(0) at the transmit pin respectively).

When transmitting a byte, the UART (serial port) first sends a START BIT which is a positive voltage (0), followed by the data (general 8 bits, but could be 5, 6, 7, or 8 bits) followed by one or two STOP BITs which is a negative(1) voltage. The sequence is repeated for each byte sent. The diagram of a what a byte transmission would look like.

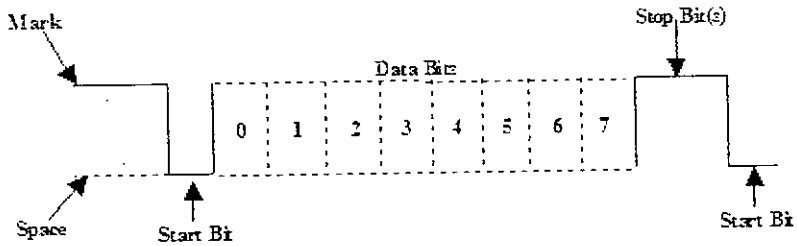


Fig 3.3.1 Data bits of Serial Communication

At this point you may want to know what is the duration of a bit. In other words, how long does the signal stay in a particular state to define a bit. The answer is simple. It is dependent on the baud rate. The baud rate is the number of times the signal can switch states in one second. Therefore, if the line is operating at 9600 baud, the line can switch states 9,600 times per second. This means each bit has the duration of 1/9600 of a second or about 100 μsec.

When transmitting a character there are other characteristics other than the baud rate that must be known or that must be setup. These characteristics define the entire interpretation of the data stream.

Half duplex serial communication needs at a minimum two wires, signal ground and the data line. Full duplex serial communication needs at a minimum three wires, signal ground, transmit data line, and receive data line. The RS232 specification governs the physical and electrical characteristics of serial communications. This specification defines several additional signals that are asserted (set to logical 1) for information and control beyond the data signals and ground.

USE OF RS232:

When we look at the connector pinout of the RS232 port, we see two pins which are certainly used for flow control. These two pins are RTS, request to send and CTS, clear to send. With DTE/DCE communication (i.e. a computer communicating with a modem device) RTS is an output on the DTE and input on the DCE. CTS is the answering signal comming from the DCE.

Before sending a character, the DTE asks permission by setting its RTS output. No information will be sent until the DCE grants permission by using the CTS line. If the DCE cannot handle new requests, the CTS signal will go low. A simple but useful mechanism allowing flow control in one direction. The assumption is, that the DTE can always handle incomming information faster than the DCE can send it. In the past, this was true. Modem speeds of 300 baud were common and 1200 baud was seen as a high speed connection.

For further control of the information flow, both devices have the ability to signal their status to the other side. For this purpose, the DTR data terminal ready and DSR data set ready signals are present. The DTE uses the DTR signal to signal that it is ready to accept information, whereas the DCE uses the DSR signal for the same purpose. Using these signals involves not a small protocol of requesting and answering as with the RTS/CTS handshaking. These signals are in one direction only.

The last flow control signal present in DTE/DCE communication is the CD carrier detect. It is not used directly for flow control, but mainly an indication of the ability of the modem device to communicate with its counter part. This signal indicates the existence of a communication link between two modem devices.

MAX 232 :

MAX-232 is primary used for people building electronics with an RS-232 interface. Serial RS-232 communication works with voltages (-15V ... -3V for high) and +3V ... +15V for low) which are not compatible with normal computer logic voltages. To receive serial data from an RS-232 interface the voltage has to be reduced, and the low and high voltage level inverted. In the other direction (sending data from some logic over RS-232) the low logic voltage has to be "bumped up", and a negative voltage has to be generated, too.

RS-232	TTL	Logic
-15V ... -3V	<-> +2V ... +5V	<-> high
+3V ... +15V	<-> 0V ... +0.8V	<-> low

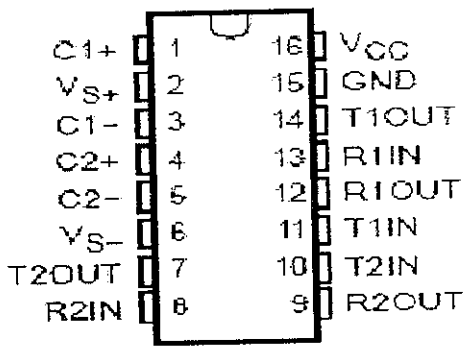


Fig 3.3.2 Pin Diagram Of Max 232

RS232 COMMUNICATION

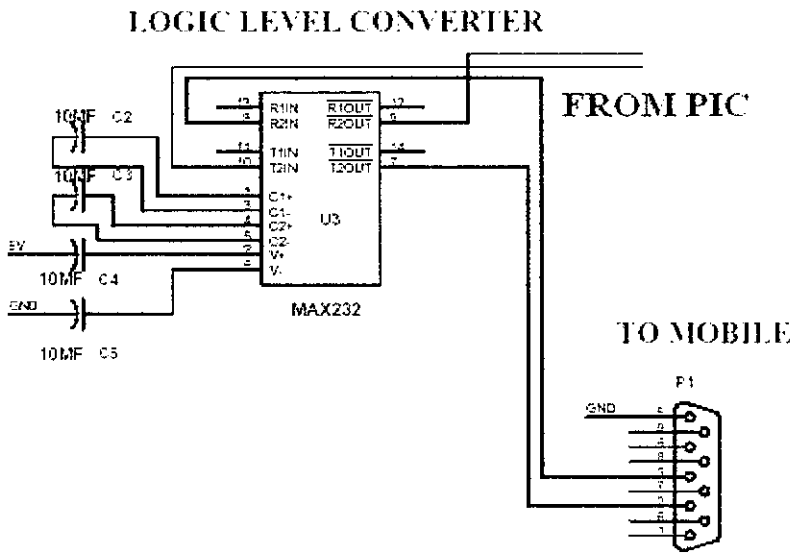


Fig 3.3.3 Circuit Diagram Of Serial Communication

In telecommunications, RS-232 is a standard for serial binary data interconnection between a DTE (Data terminal equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports.

Details of character format and transmission bit rate are controlled by the serial port hardware, often a single integrated circuit called a UART that converts data from parallel to serial form. A typical serial port includes specialized driver and receiver integrated circuits to convert between internal logic levels and RS-232 compatible signal levels.

Circuit Working Description

In this circuit the MAX 232 IC used as level logic converter. The MAX232 is a dual driver/receiver that includes a capacive voltage generator to supply EIA 232 voltage levels from a single 5v supply..

UNCTION TABLES

EACH DRIVER

INPUT TIN	OUTPUT TOUT
L	H
H	L

EACH RECEIVER

INPUT RIN	OUTPUT ROUT
L	H
H	L

H=high level, L=low level

Table 3.3.1 Function Table for MAX232 IC

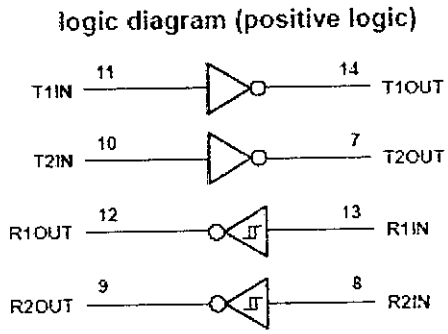


Fig 3.3.4 logic diagram of MAX232

In this circuit the microcontroller transmitter pin is connected in the MAX232 T2IN pin which converts input 5v TTL/CMOS level to RS232 level. Then T2OUT pin is connected to reviver pin of 9 pin D type serial connector which is directly connected to PC.

In PC the transmitting data is given to R2IN of MAX232 through transmitting pin of 9 pin D type connector which converts the RS232 level to 5v TTL/CMOS level. The R2OUT pin is connected to receiver pin of the microcontroller. Likewise the data is transmitted and received between the microcontroller and PC or other device vice versa.

GSM TECHNOLOGY

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz.

GSM MODEM

A GSM modem is a wireless modem that works with a 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 while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

GSM OPERATIONS

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

PERFORMANCE EVALUATION

4. PERFORMANCE EVALUATION:

4.1 TASK TESTING:

The first step in the testing of codes employed using MPLAB and Java is to test each task independently. In our project each task such as sensor signal integration, hardware simulation, camera image processing and uploading is done separately. Task testing uncovers errors in logic and function but not timing or behavior.

4.2 BEHAVIORAL TESTING

Each of the events is tested individually and the behavior of the executable system is examined to detect errors that occur as a consequence of processing associated with these events. The behavior of the software is examined to detect behavior errors. The three sensors are tested individually with the PIC Microcontroller and the serial port communication is tested with the hyper-terminal of computer

4.3 INTERTASK TESTING

Once errors in individual tasks and in system behavior have been isolated, testing shifts to time-related errors. Asynchronous tasks that are known to communicate with one another are tested with different data rates and processing load to determine if inter-task synchronization errors will occur.

4.4 HARDWARE TESTING

The sensor circuit, relay circuit and GSM modem are integrated with the microcontroller. The signals are tested using Multi-meter. The signal pins are soldered. The software coding is downloaded into microcontroller and working of the system is tested.

CONCLUSION

5. CONCLUSION

The proposed system is designed by integrating sensors and GSM modem with the microcontroller. The advantage of remote monitoring is very cheap hardware and remote monitoring provided with security. It is very easy to use.

Since human entry, gas leakage or fire can be detected by the single stand-alone system this project will be extremely useful in the home security. Hence the project is social and commercial.

FUTURE ENHANCEMENTS

FUTURE ENCHANCEMENT

The remote monitoring works well in a wired environment. This could be xtended to that of a wireless environment with new concepts like zigbee, where ie sensors could be detected over 10 meters. Remote Appliance control System an be integrated with this system to enable control of physical equipments such as an, bulb, etc. Features like Battery power supply, controlling device by SMS ommand can also be included without much change to the core.

APPENDICES

APPENDIX

7.1 APPENDIX 1 – SOURCE CODE:

7.1.1 PIC MICROCONTROLLER PROGRAM:

```
#include<pic.h>     //HEADER FILE INCLUSION
#include<stdio.h>
#define THRESHOLD_TEMP 25
__CONFIG(0x3f72);    //INDICATE TO WHICH TYPE OF OSCILLATOR IS
USED


/*-------------------------------------------------------------
FUNCTION DECLARATIONS
-------------------------------------------------------------*/
void serial(void);                    //FUNCTION FOR INITIALIZING SERIAL
COMMUNICATION
void message1(void);                  //FUNCTION FOR SENDING THE
MESSAGE TO GSM THROUGH SERIAL
void delay(unsigned int);             //FUNCTION TO DELAY
unsigned char read_adc(void);         //FUNCTION TO READ THE ANALOG
SIGNAL AND RETURN THE DIGITAL VALUE
```

```
*-----------------------------------------------------
VARIABLE DECLARATIONS
-----------------------------------------------------*/
bank1 unsigned char alert[]="AT+CMGS=";          //COMMAND FOR GSM
MODEM
bank1 unsigned char numb[]="9790311387";     //MOBILE NUMBER
//GSM MESSAGES
unsigned char msg1[]={"Temperature  exceeds"};
unsigned char msg2[]={"Intruder Detected"};
unsigned char msg3[]={"Gas lekage"};
unsigned char ch,i,j,v=0,c=0;b=0;
int t =0 ;



/*-----------------------------------------------------
MAIN FUNCTION STARTS
-----------------------------------------------------*/
void main()
{
TRISA=0xff;   //CONFIGURE PORT A AS INPUT
TRISD=0x00;   //CONFIGURE PORT D AS OUTPUT
TRISB=0xff;   //CONFIGURE PORT B AS OUTPUT
RBPU=0;
PORTB=0xff;   //INITIALIZE THE PORT B
PORTD=0x00;   //INITIALIZE THE PORT D
RB0=0;        //INITIALIZE THE PORT B FIRST PIN TO ZERO
```

```
D0=0;       //INITIALIZE THE PORT B FIRST PIN TO ZERO
RISC=0xc0;  //SET THE PORT C FOR SERIAL COMMUNICATION


erial();    //initialize the serial communication


vhile(1)
{
 ch=read_adc();              //read the analog temperature signal and store the
corresponding digital value in a byte
 if(ch > THRESHOLD_TEMP)//if temperature exceeds limit,then send the
message
 {
  message1();        //first send the GSM command and mobile number
  t = 0;
  while(msg1[t]!='\0')  //sending the "temperature exceeded" message
  {
   TXREG=msg1[t++];
   delay(3000);
  }
  TXREG=0x1A;
  delay(2000);
 }

 if(RB0==1)          //if Human motion detected,then send the message
 {
  message1();        //first send the GSM command and mobile number
```

```
t = 0;
while(msg2[t]!='\0') //sending the "intruder detected" message
{
 TXREG=msg2[t++];
 delay(3000);
}
TXREG=0x1A;
delay(2000);
RB0=0;
RD0=1;                //switching the relay circuit
}


if(RB1==0)          //if Gas leakage detected,then send the message
{
 message1();        //first send the GSM command and mobile number
 t = 0;
 while(msg3[t]!='\0')//sending the "Gas Leakage" message
 {
  TXREG=msg3[t++];
  delay(3000);
 }
 TXREG=0x1A;
 delay(2000);
 RD1=1;          //switching the relay circuit
 RB1=1;
}
```

```
*-------------------------------------------------------------
Function definition for readadc()
-------------------------------------------------------------*/
void serial(void)
{
      TRISC = 0xc0; //set the pin RC6 as transmitter and RC7 as receiver
      TXSTA=0x24;   // enable transmit, asynchronous mode at high baud rate
      RCSTA=0x90;   //enable serial ports RC6 and RC7
      SPBRG=64;     //baud rate generator register
}

/*-------------------------------------------------------------
Function definition for readadc()
-------------------------------------------------------------*/
unsigned char read_adc(void)
{
      unsigned char ch;
```

```
    ADCON0=0x41;    //switch on adc module and select channel 0
    ADCON1=0x02;    //analog port configuration
    ADGO=1;
    while(ADGO==1); //if analog signal detected
    ch=ADRESH;      //get the corr. digital value
    return(ch);     //return the digital value
```

```
*-------------------------------------------------------------
Function definition for message()
-------------------------------------------------------------*/
void message1()
{
      int t=0;
      while(alert[t]!='\0') //send the string message character by character
      {
      TXREG=alert[t++];   //buffer register enables serial communication
      delay(3000);
      }
TXREG = "";
delay(2000);

=0;
```

```
    while(numb[t]!='\0')
    {
    TXREG=numb[t];
    delay(3000);
    t++;
    }
XREG = '';
elay(3000);
=0;

XREG=0x0D;
elay(3000);



*-----------------------------------------------------------
unction definition for delay()
-----------------------------------------------------------*/
oid delay(unsigned int k)
{
    unsigned int a;
    for(a=0;a<k;a++);
```

.1.2 WEBCAM JAVA CODE:

```
mport josx.vision.*;
mport java.net.*;
mport java.io.*;
mport java.util.*;

mport com.gif4j.light.GifEncoder;
mport com.gif4j.light.GifFrame;
mport com.gif4j.light.GifImage;
mport java.awt.Toolkit;
mport java.awt.Image;
mport java.awt.image.BufferedImage;



ublic class rmiserver implements Runnable
{
  int qe=0;
  boolean flagupdate=false;
  boolean cset=true;
  long lastPlay = 0;
  int imagec=1;
  Thread thread;
```

```
File file;
boolean detection = false;


public static void main(String a[])
    {
        try{
            new rmiserver();
            }
        catch(Exception e){
                System.out.println(""+e);
            }
    }
public rmiserver()
 {
  file = new File("det.gif");
  thread = new Thread(this);
  Vision.setImageSize(320,240);
  Vision.flipHorizontal(true);
  Vision.addRectRegion(1, 0, 0, 320,240);
  Vision.startViewer("Robot Control");
  try{
      System.out.println("inside");
       thread.start();
      }
  catch(Exception e2)
```

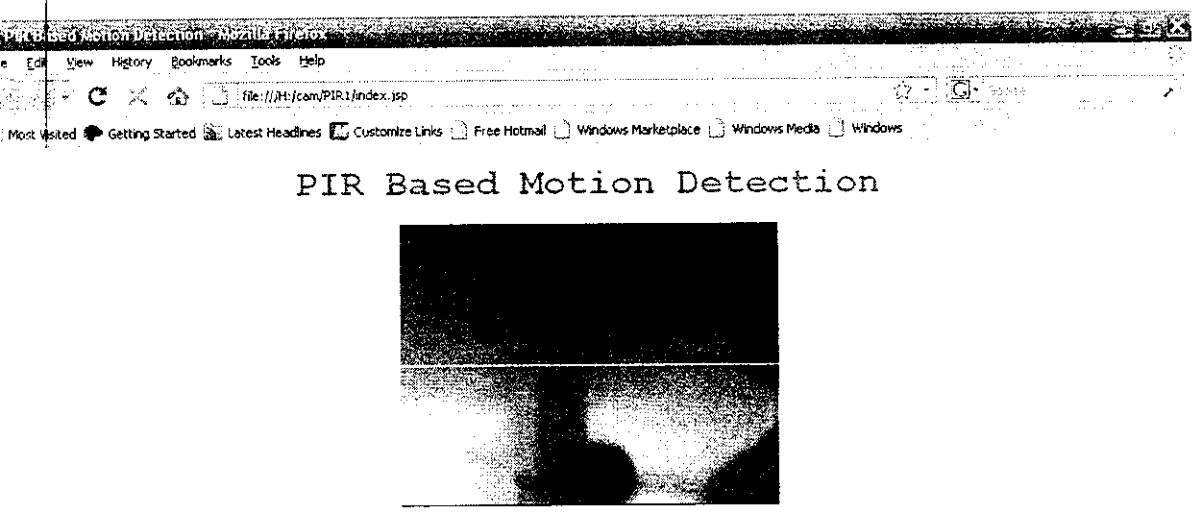
```
    {System.out.println("Server error"+e2);}
}

public void run()
{
while(true)
{
 if ((System.currentTimeMillis() - lastPlay) > 3000)
 {
 lastPlay = System.currentTimeMillis();
 System.out.println("cam start");
 josx.vision.Vision.snapshot("det.jpg");
 try {
      new Thread().sleep(2000);
      Image image = Toolkit.getDefaultToolkit().getImage("det.jpg");
      GifImage gifImage = new GifImage();
      GifFrame gifFrame = new GifFrame(image);
      gifImage.addGifFrame(gifFrame);
      GifEncoder.encode(gifImage,file );
     } catch(Exception e) {}

 System.out.println(" image captured ");
  }
 }
}
```

.1.3 HTML CODE:

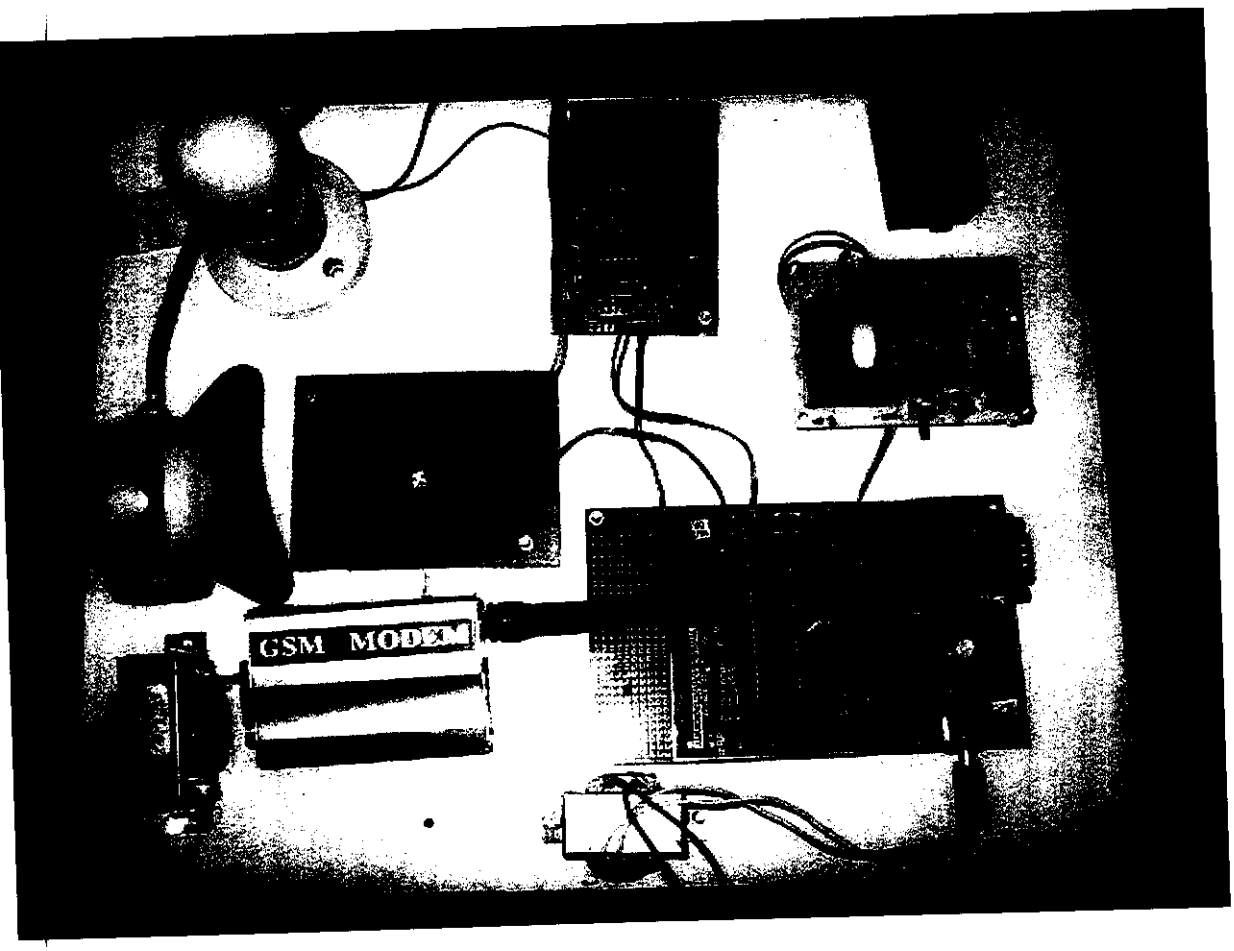
```
!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
html>
head>
title>PIR Based Motion Detection</title>
meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
meta http-equiv="refresh" content="4;<javascript:getUrl()>">
script> function getUrl() { return window.location;}</script>
/head>
body>
table width="100%" height="557" border="0" cellpadding="0" cellspacing="0">
 <tr>
  <td height="53"><div align="center"><font color="#336699" size="6"
face="Courier New, Courier, mono"><strong>PIR Based Motion
Detection</strong></font></div></td>
 </tr> <tr>
  <td height="253"><div align="center"><img src="rmi/det.gif" width="320"
height="240"></div></td>
 </tr> <tr>
  <td height="232"><div align="center"></div></td>
 </tr> <tr>
  <td height="19"> </td>
 </tr>
```

.2 APPENDIX 2 – SCREEN SHOTS:

7.2.1 IMAGE DISPLAY IN WEB PAGE:



.3 APPENDIX 3 –HARDWARE PHOTO



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REFERENCES

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