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INTELLIGENT AMBULANCE FOR CITY TRAFFIC USING GSM MODEM

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ABSTRACT

The traffic congestion problems are the phenomenon which contributed huge impact to the transportation system. Ambulance Service is one of the major services which get affected by traffic jams. So many important schedules get delayed due to these Traffic jams. To solve this problem we have come up with the solution of "An Intelligent Ambulance for City Traffic Using Gsm Modem. In this, we will track the patient's health conditions with following parameters such as heart rate, Body temperature, etc. These parameters are sent to any specified cell phone using GSM Modem. Here we use an assembly programming for better accuracy using GSM modem which will trace the vehicle anywhere on the globe. According to this project, when patient's parameters exceed the normal values then the sensor will detect the signal and sends it to micro-controller. The micro-controller will send the alert message through the GSM to an Authorized mobile number, which will help in providing better facilities to the patient.

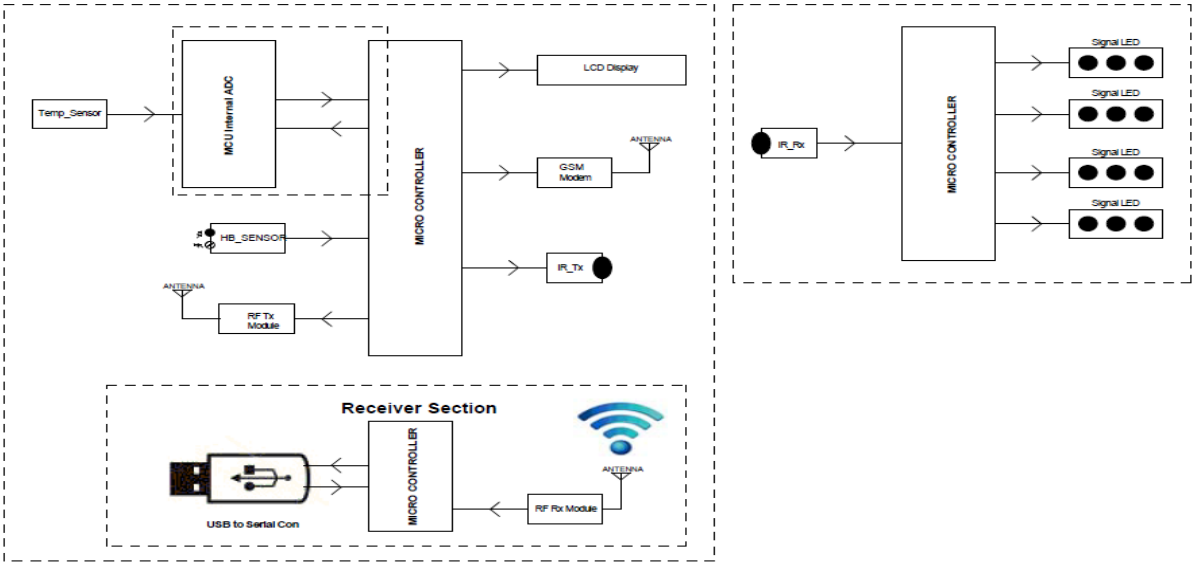
Keywords: Patient monitoring system, Gsm Technology, Heart rate Sensor, Traffic controller

I. INTRODUCTION

In this project, a wireless communication system is designed and developed for remote patient monitoring. The primary function of this system is to monitor the temperature and hear rate of a patient's body, and display the same to the doctor through RF communication.In hospitals, where patient's heart rate and body temperature needs to be constantly monitored, is usually done by a doctor or other paramedical staff by constantly observing the temperature and maintaining a record of it. It is a very tedious method. In this proposed system transmitting module continuously reads patient's body temperature and heart rate through a sensor, displays it on the LCD screen and sends it to the microcontroller which transmits the encoded serial data over the air by RF (radio frequency) through an RF module. At the receiving end, a receiver is used to receive the data, and feed it to another microcontroller which is then displayed on an LCD screen. The receiver module is kept in the doctor's chamber to continuously display the patient's body temperature and Heart Rate wirelessly.

II. METHODOLOGY

Block diagram



The block diagram consist of three units

Hospital unit

In this setup, GSM is used as source of information to hospital from ambulance. GSM is duplex unit and capable of transferring data as well as voice. Parameters of patient measured in ambulance are received by GSM receiver with delay . These parameters should be displayed on screen,so GSM has accompanied with computer having V.B. program , which is compatible for storing and displaying received data in appropriate form which is very user friendly. In this,we are using stack for storing received data. After every15sec interval, data get updated and displayed on monitor.

Traffic signal unit

As here in our project we'll be dealing with 2 main chowks, i.e. each consisting of 4 lanes. Each lane would be having three signals (red, yellow & green), hence it becomes mandatory to provide a control over selection of appropriate lane and its corresponding signal. Here we provide the driver with a remote control with 8 buttons, each set for different lanes, and we have common codes for the control of signals. Whenever a particular lane is selected, a 13 bit data is sent to the receiver section. Out of these 13 bits, 1 bit (MSB) is a redundant bit, next 8 bits are the address bits, and rest 4 bits are the data bits. These 4 bits decide whether the signal has to be made GREEN or not.

Ambulance unit

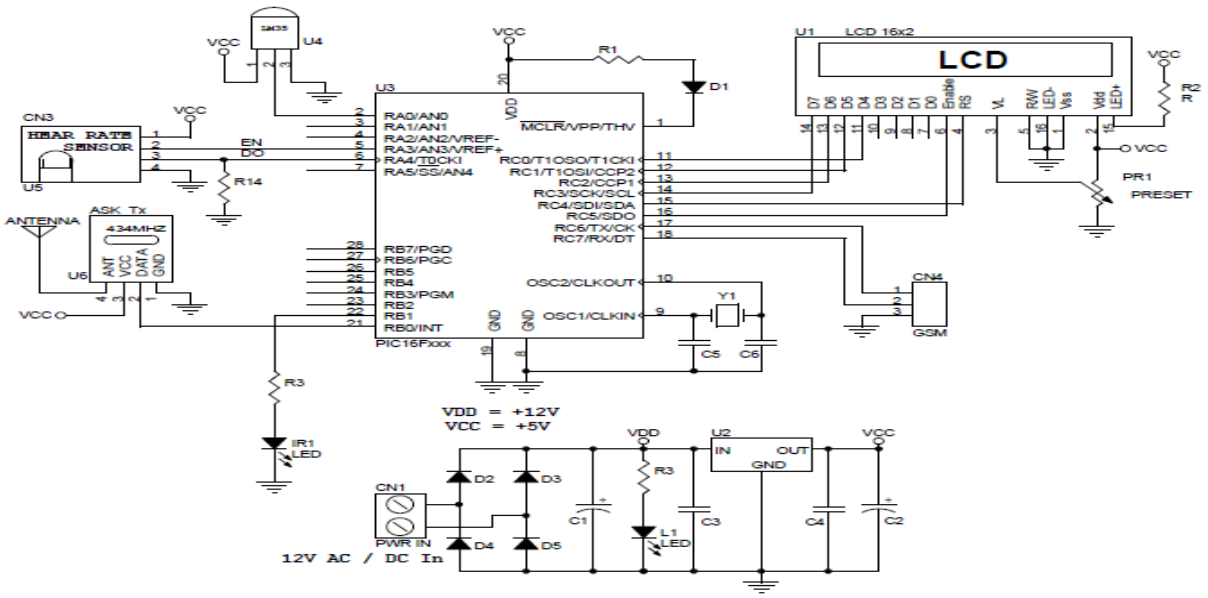
It is consist of 3 parts as patient's parameters, PIC microcontroller and LCD. Patient's parameter: we are going to measure 4 parameters of patients. P|IC is the heart of the ambulance unit

PIC microcontroller performs three tasks:

- It Reads data from sensors
- Translates in text message
- Sending 4bit code to traffic signal unit

III. MODELING AND ANALYSIS

CIRCUIT DIAGRAM



Specifications & Features:

- Wireless Real time Communication
- Using GSM Communication
- 16x2 Line LCD modules to display the information.

- Digital / Optical Hear Rate Sensor Interfacing (No need any circuit calibration)
- Heart rate Sampling Time = > 20 (15) seconds
- Temperature range = –55°C to +150°C
- 0.5°C accuracy @ +25°C

On board led indicator for
1] Power supply
2] RF Receive Data
3] Heart Pulse

- Microcontroller based design for greater flexibility
- Operating voltage – 9 to 12V DC
- Operating current – 500ma (Aprox)
- Diode protection for reverse polarity connection of DC supply to the PCB
- Onboard regulator for regulated supply to the kit

CIRCUIT EXPLANATION

- The whole setup consists of PIC, Heart Beat Sensor, Temperature sensor, GSM Modem and GPS .The Systems consist of PIC microcontroller. The micro controller cannot process the analog voltages as it is a digital device; so we use inbuilt ADC to convert the raw output of sensor to digital voltage. This digital voltage is feed to controller. The PIC continuously monitors the Temperature and heart beat value then display on LCD screen. We are also using serial communication to make connection to hospital using GSM and to android OS using GPS navigation system. Hence the overall system is used for giving valuable and beneficiary service to the patient from an accidental area or any other emergency situations.

Heart rate Detection working

Heart rate is the number of heartbeats per unit of time and is usually expressed in beats per minute (bpm). In adults, a normal heart beats about 60 to 100 times a minute during resting condition. The resting heart rate is directly related to the health and fitness of a person and hence is important to know. You can measure heart rate at any spot on the body where you can feel a pulse with your fingers. The most common places are wrist and neck. You can count the number of pulses within a certain interval (say 15 sec), and easily determine the heart rate in bpm.

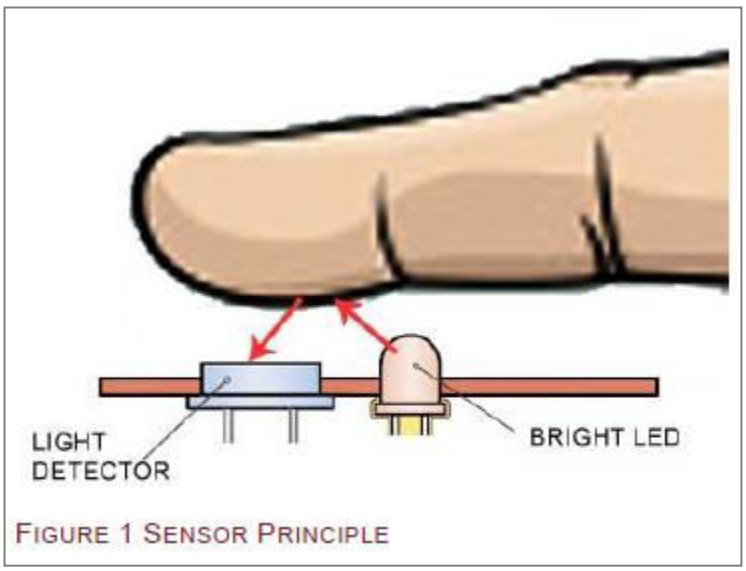


FIGURE 1 SENSOR PRINCIPLE

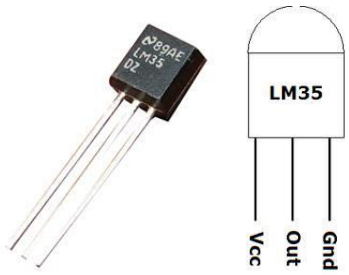
A heart rate measurement system that uses optical sensors to measure the alteration in blood volume at fingertip with each heart beat. The sensor unit consists of an infrared light-emitting-diode (IR LED) and a photodiode, placed side by side as shown below. The IR diode transmits an infrared light into the fingertip (placed over the sensor unit), and the photodiode senses the portion of the light that is reflected back. The intensity of reflected light depends upon the blood volume inside the fingertip. So, each heart beat slightly alters the amount of reflected infrared light that can be detected by the photodiode. With a proper signal conditioning, this little change in the amplitude of the reflected light can be converted into a pulse. The pulses can be later counted by the microcontroller to determine the heart rate.

Heart rate Sensor Interface With MCU

The output from the heart beat Sensor goes to the T0CKI (RA4 – Pin 6) input of PIC MCU.Once the start the heart pulse counting Process, the microcontroller enable the Hear rate Sensor Module unit for 15 sec. During this interval, the number of pulses arriving at the T0CKI input is counted. The actual heart rate would be 4 times the count value, and the resolution of measurement would be 4. You can see the rate Sensor Module (enable / disable) is controlled through RA3 (pin 7) pin of PIC MCU. The sensor module is not activated continuously. Instead, it is turned on for 15 sec only

Temperature Sensor (Detection)

LM35 is an analog sensor that converts the surrounding temperature to a proportional analog voltage. The output from the sensor is connected to one of the ADC channel inputs of the PIC microcontroller to derive the equivalent temperature value in digital format. The computed temperature is displayed in a 16×2 character LCD, in both °C scales.



- The LM35 series of temperature sensors are produced by National Semiconductor Corporation and are rated to operate over a -55 °C to 150°C temperature range. These sensors do not require any external calibration and the output voltage is proportional to the temperature. The scale factor for temperature to voltage conversion is 10 mV per °C.

- **Micro Controller Analog (ADC) Interface**
  The temperature sensor LM35 senses the temperature and converts it into an electrical signal, which is applied to the microcontroller. The analogue signal is converted into digital format (8 or 10 bit number) by the inbuilt analogue-to digital converter (ADC) of the micro controller. The sensed values of the temperature are displayed on the 16x2-line LCD. Port-A pins 2 (RA0) is programmed as analogue inputs.
- **MCU Clock**
  A 4 MHz crystal provides accurate timing and an easily divisible clock source for the internal hardware timers. This high frequency clock source is used to control the sequencing of CPU instruction.

- **LCD INTERFACE**
  The dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4 or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver. A single HD44780U can display up to two 8-character lines (16 x 2).
  Data transfer between the MCU and the LCD module will occur in the 4-bit mode. The R/W pin (5) of the LCD module is permanently grounded as there won't be any data read from the LCD module. MCU port pin RC0 ~ RC3 (Pin no 11 to 14) serves the 4-bit data lines (D4-D7, pins 11-14) of the LCD module. Control lines, RS and E, are connected to RC4 and RC5. Thus, altogether 6 I/O pins of the microcontrollers are used by the LCD module. The contrast adjustment is done with a 20K preset (potentiometer) as shown below. If your LCD module has backlight LED, use a 22Ω resistance in series with the pin 15 or 16 to limit the current through the LED. The detail of the circuit diagram is shown below.

GSM Module INTERFACE (RS232)

The RS232, also more commonly known as the serial, specifications specifies that logic '1' is represented by +12.5V and a logic '0' is represented by -12.5V. This obviously presents many problems for micro controller that are running at +5V. That is where the level converter comes into play; it converter -12.5V to 0V and 12.5V into 5V, standard TLL logic levels. This makes interfacing with the micro controller extremely easy.

Power supply

The power supply circuit. It's based on 3 terminal voltage regulators, which provide the required regulated +5V.Power is deliver initially from standard 12V AC/DC adapter or 12V_500ma Transformer. This is fed to bridge rectifier (D2, 3, 4, 5) the output of which is then filtered using 1000uf electrolytic capacitor and fed to U2 (voltage regulator). U2 +5V output powers the micro controller and other logic circuitry. LED L1 and its associate 1K current limiting resistors provide power indication

PART EXPLANATION

- **Micro controller PIC16Fxxx**
- PIC (Peripheral interface controller) is the IC while was enveloped to control the peripheral device, dispersing the function of the main CPU. PIC has the calculation function and the memory like the CPU and is controlled by the software. However the throughput, the memory capacity isn't big. It depends on kind of PIC but the maximum operation clock frequency is about 20MHZ and the memory capacity to write the program is about 1K to 4K words. The clock frequency is related with the speed to read the program and to execute the instruction. Only at the clock frequency, the throughput cannot be judged. It changes with the architecture in the processing parts for same architecture; the one with the higher clock frequency is higher about the throughput. The point, which the PIC convenient for is that the calculation part, the memory, the input/output part and so on, are incorporated into one piece of the IC. The efficiency, the function is limited but can compose the control unit only by the PIC even if it doesn't combine the various IC's so, the circuit can be compactly made. More information please refer Data sheet 0f PIC 16Fxx

- **Light emitting Diode (LED)**

- A light-emitting diode (LED), is an electronic light source. Luminescence from an electrically stimulated crystal had been observed as early as 1907. The LED was introduced as a practical electronic component in 1962. All early devices emitted low-intensity red light, but modern LEDs are available across the visible, ultraviolet and infra red wavelengths, with very high brightness. LEDs are based on the semiconductor diode. When the diode is forward biased (switched on), electrons are able to recombine with holes and energy is released in the form of light. This effect is called electroluminescence and the color of the light is determined by the energy gap of the semiconductor. The LED is usually small in area (less than 1 mm2) with integrated optical components to shape its radiation pattern and assist in reflection. LEDs present many advantages over traditional light sources including lower energy consumption, longer lifetime, improved robustness, smaller size and faster switching. However, they are relatively expensive and require more precise current and heat management than traditional light sources.

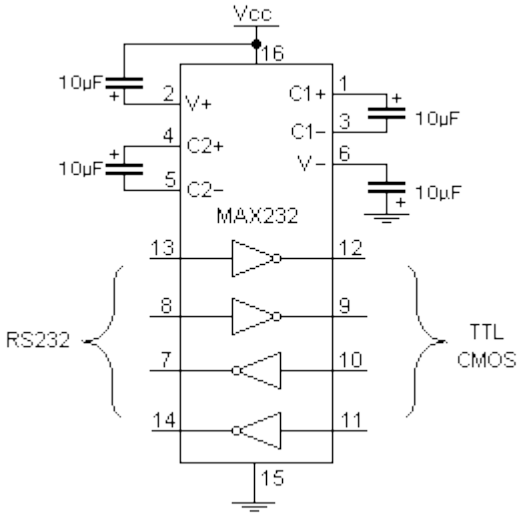
- **GSM Modem**

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging. This GSM modem is a highly flexible plug and play quad band GSM modem for

direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

- **GSM Module INTERFACE (RS232)**

The RS232, also more commonly known as the serial, specifications specifies that logic '1' is represented by +12.5V and a logic '0' is represented by -12.5V. This obviously presents many problems for micro controller that are running at +5V. That is where the level converter comes into play; it converter -12.5V to 0V and 12.5V into 5V, standard TLL logic levels. This makes interfacing with the micro controller extremely easy.



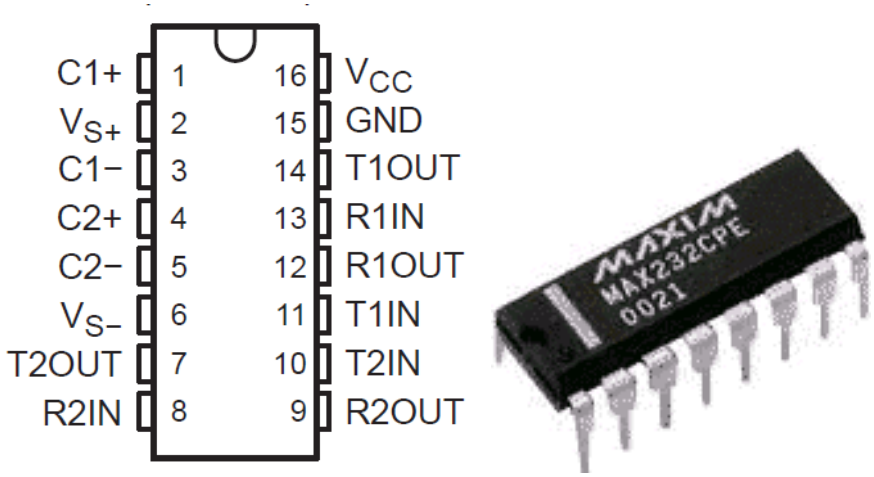
- The schematic shows the simplicity of the design by using one of IC's level converters. It includes a Charge Pump, which generates +10V and -10V from a single 5v supply. This IC.also includes two receivers and two transmitters in the same package. This is handy in many cases when you only want to use the Transmit and Receive data Lines. You don't need to use two chips, one for the receive line and one for the,

Pin	Signal	Pin	Signal
1	Data Carrier Detect	6	Data Set Ready
2	Received Data	7	Request To Send
3	Transmitted Data	8	Clear To Send
4	Data Terminal Reedy	9	Ring Indicator
5	Signal Ground		

- The communication between the micro controller and the GSM Module requires an RS-232 interface which serves to convert the CMOS TTL output voltage of the micro controller (0-5 volt) into a voltage of+/- 12 volt. The converter uses the MAX232 (U3) converter IC. The connection of MAX232 to the GSM uses the RS232 data cable.

- **MAX232**

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors.



- **LM35 temperature sensor**

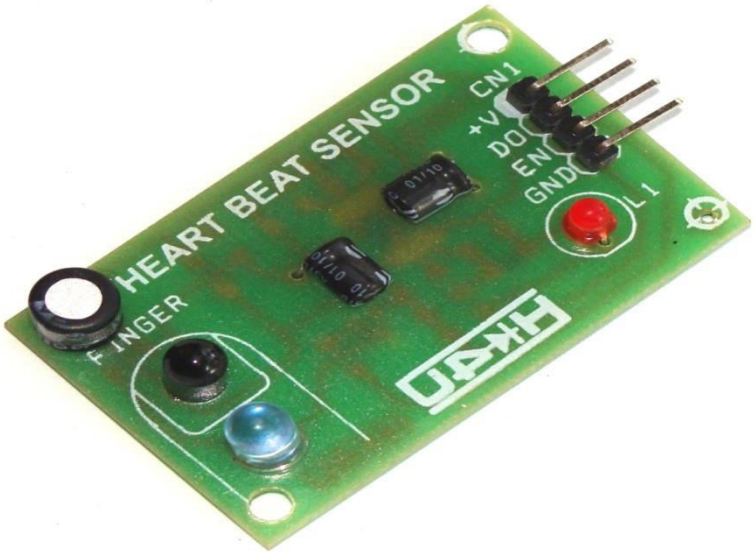
  The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large Constant voltage from its output to obtain convenient Centigrade scaling. The LM35 is low output impedance, linear output, and precise inherent calibrations make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies .As it draws only 60 UA from its supply, it has very low self-heating, less than 0.1c in still air. TheLM35 is rated to operate over a –55c to +150C temperature range.

- **Crystal oscillator**

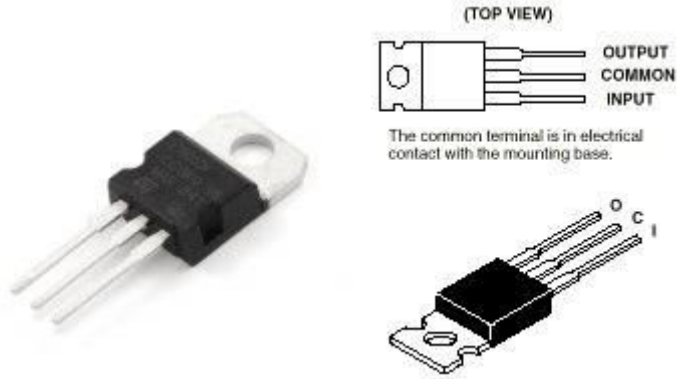
  A crystal oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters/receivers.

Heart rate Sensor module

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

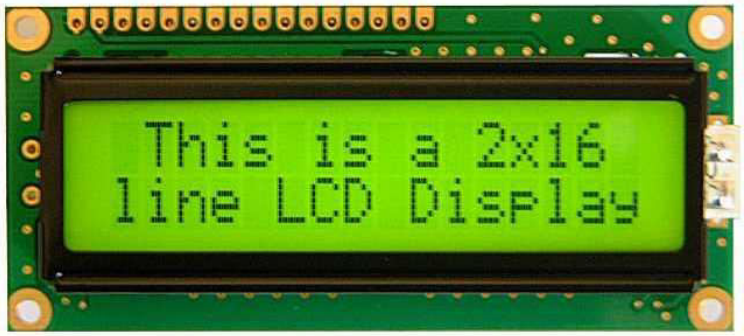


- **LM7805 (3 TERMINAL VOLTAGE REGULATER)**



This is used to make the stable voltage of +5V for circuits. The LM7805 is three terminal positive regulators are available in the TO-220 - package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, More information please refer Data sheet 0f LM7805

- **16 x 2 LCD Modules**



HD44780 based LCD displays are very popular among hobbyists because they are cheap and they can display characters. Besides they are very easy to interface with microcontrollers and most of the present day high-level compilers have in-built library routines for them. The interface requires 6 I/O lines of the microcontroller: 4 data lines and 2 control line

- **Power supply**

The power supply circuit. It's based on 3 terminal voltage regulators, which provide the required regulated +5V.Power is deliver initially from standard 12V AC/DC adapter or 12V_500ma Transformer. This is fed to bridge rectifier (D2, 3, 4, 5) the output of which is then filtered using 1000uf electrolytic capacitor and fed to U2 (voltage regulator). U2 +5V output powers the micro controller and other logic circuitry. LED L1 and its associate 1K current limiting resistors provide power indication

IV. RESULTS AND DISCUSSION

V. CONCLUSION

In conclusion, traffic light control system for emergency vehicle using radio frequency (RF) facilitate emergency vehicle to cross at the intersection of traffic light. This system implementing radio frequency (RF) as the medium for emergency vehicle communicate with traffic light system. This system can solve the problem for emergency vehicle when approaching traffic light with ease. In the future this prototype can be improved by upgrading the range of radio frequency can transmitted and applied this system to real traffic light system.

The results and discussion may be combined into a common section or obtainable separately. They may also be broken into subsets with short, revealing captions. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it. This section should be typed in character size 10pt Times New Roman.

Table 1. Comparison of displacement of all 4 cases

SN.	Model Type	Seismic Zone	Displacement
1	Model-A	4	10.044 mm
2	Model-B	4	11.335 mm
3	Model-C	4	10.248 mm
4	Model-D	4	11.364 mm
5	Model-E	4	12.16 mm
6	Model-F	4	10.99 mm
7	Model-G	4	11.29mm
8	Model-H	4	13.20mm
9	Model-I	4	9.2mm

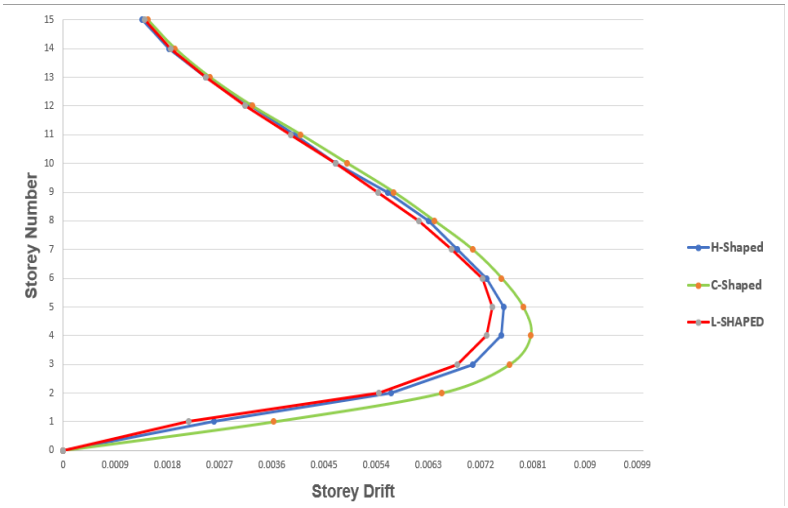


Figure2: Name of Graph (Font size-10)

VI. CONCLUSION

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ACKNOWLEDGEMENTS (optional)

The authors can acknowledge professor, friend or family member who help in research work in this section.

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