

Intelligent Traffic Control and Patient Monitoring For Efficient Ambulance Service

Suneesh S¹, Muhammed Mansoor P K², Bibin Varghees³, Nong Taku⁴

¹²³⁴ Under Graduate Students, M.A. College of Engineering, Kothamangalam, Kerala, India

Abstract: The project introduces a real-time monitoring system for a patient who enters in an ambulance in an emergency condition and an intelligent traffic system for efficient transport of ambulance for saving the life. The system is made up of three sub-systems: patient physical states data acquisition through communication system based on Zig-bee technology, and hospital monitoring control centre and an RF based traffic control system. Since a patient or a person who injured in an accident enters inside an ambulance, the patient physical states data acquisition and communication system monitors the main physical parameters and movement status continuously. The information from data acquisition system is sent to hospital monitoring centre by wireless communication module (Zigbee is used in demo). The monitoring centre receives the information from each patient and the doctor can diagnose the patient according to the continuous data and take necessary actions before he come in to the hospital. The system also contains an intelligent traffic control which is more efficient than present system by providing maximum support for emergency vehicles like ambulance. The information about the arrival of ambulance is read by the RFID reader at the signal junction and the traffic system dynamically adapt for clearing the route for ambulance.

Keywords: PIC, RF module, Zigbee, RFID, CMOS.

I. INTRODUCTION

The frequency of traffic collisions in India is amongst the highest in the world. A National Crime Records Bureau (NCRB) report revealed that every year, more than 135,000 traffic collision-related deaths occur in India. The most accident-prone time on Indian roads is during the peak hour at afternoon and evening. The monitoring and control of city traffic is becoming a major problem in many countries. With the ever increasing number of vehicles on the road, the Traffic Monitoring Authority has to find new methods. In this paper taking e.g. of emergency vehicles as ambulance. In this paper, the first aim is to collect the information of moving emergency vehicles using GSM, GPS, PIC via Zig-Bee communication to provide them clear path. Ambulance will consist of Heart Beat and Temperature sensor. When key is pressed, heart beats and temp values will be sent to predefined mobile phone (Hospital control centre) using GSM. On signal there will be RFID readers which will detect traffic density on roads. When ambulance is detected on any road signal for that side will be green and traffic on other roads will be blocked temporarily before the passage of ambulance through the junction. In the Hospital control centre the data from the ambulance will be displayed and can be utilized for providing further arrangements. The body parameters like Temperature and Heart beat will be measured using sensors and will be sent through mobile to the respective Doctor. To give them timely and proper help first we want to continuous monitoring of patient in an ambulance on the way to hospital. . In any critical condition the SMS is send to the doctor via Hospital control centre. So that we can easily save many lives by providing them quick service. Hence the active participation of GSM, GPS and PIC is used for better patient monitoring system.

II. SYSTEM WORKING

Our proposed system consists of a single 5v power supply, Pic controller, The MAX 232 IC is used in this project to make interface between microcontroller and GSM modem. In the receiver side it's coupled with RF card readers and GPS antenna Temperature sensors are thermally sensitive resistors whose prime function is to exhibit a large, predictable and precise change in electrical resistance when subjected to a corresponding change in body temperature. The Heart beat

sensor consists of a super bright red LED and light detector. . Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat.

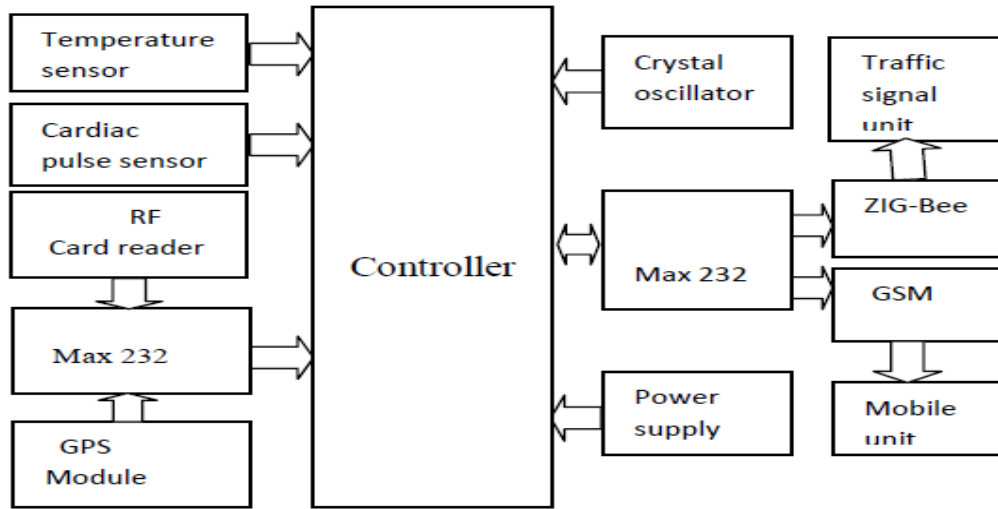


Figure 1: block diagram for ambulance patient monitoring

The RF encoders are a series of CMOS LSIs for remote control system applications. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The RF decoders receive serial addresses and data from a programmed 212 series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. Here Zig-bee is used for communication to the traffic signal from the RF card source's is used for transferring fetched data from patients body to the hospital control unit for further processing and arrangements. The following block diagram shows the working of traffic signal system which is used to allow pass ambulance through congested traffic. These block diagram contains ZigBee module interconnected with PIC microcontroller and its o/p ports. In the o/p of this s/m PIC is coupled with traffic signal control consisting of different signals corresponding for each way. Power supply for the s/m can be given through 230V by the virtue of regulator embedded in the s/m. Zig-bee is used for communicating between traffic signal and ambulance path through the heavy traffic. MAX 232 acts as an interfacing unit between UART and receiving terminal. The PIC processes input signals by using the embedded program. Then the PIC transfers the output to traffic signals for displaying output.

The RFID systems will be connected to microcontroller using serial protocol. The Tag will be attached to the ambulance, when it passes through the reader the tag would be read and the traffic Light will be made Green Signal. Also the body parameters like Temperature and Heart beat will be measured using sensors and will be sent through mobile to the respective Doctor. We are using GPS to track the position of ambulance, emergency vehicles so it will help us to direct the ambulance to reach the hospital as early as possible and also reach the vehicle to their destination.

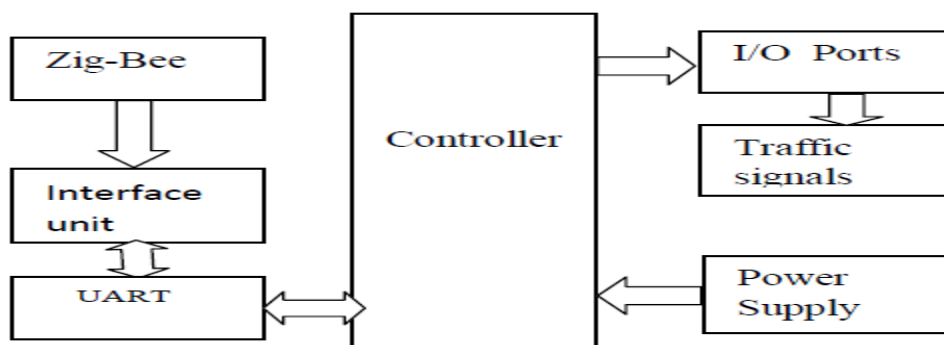


Figure 2: block diagram for traffic control system

III. CIRCUIT DESCRIPTION

An overall idea about the working of the system can be learned from the block diagram. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems. Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heartbeat. 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. The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Thermistors are thermally sensitive resistors whose prime function is to exhibit a large, predictable and precise change in electrical resistance when subjected to a corresponding change in body temperature. The data collected by using these type of sensors along with position are displayed on LCD screen.

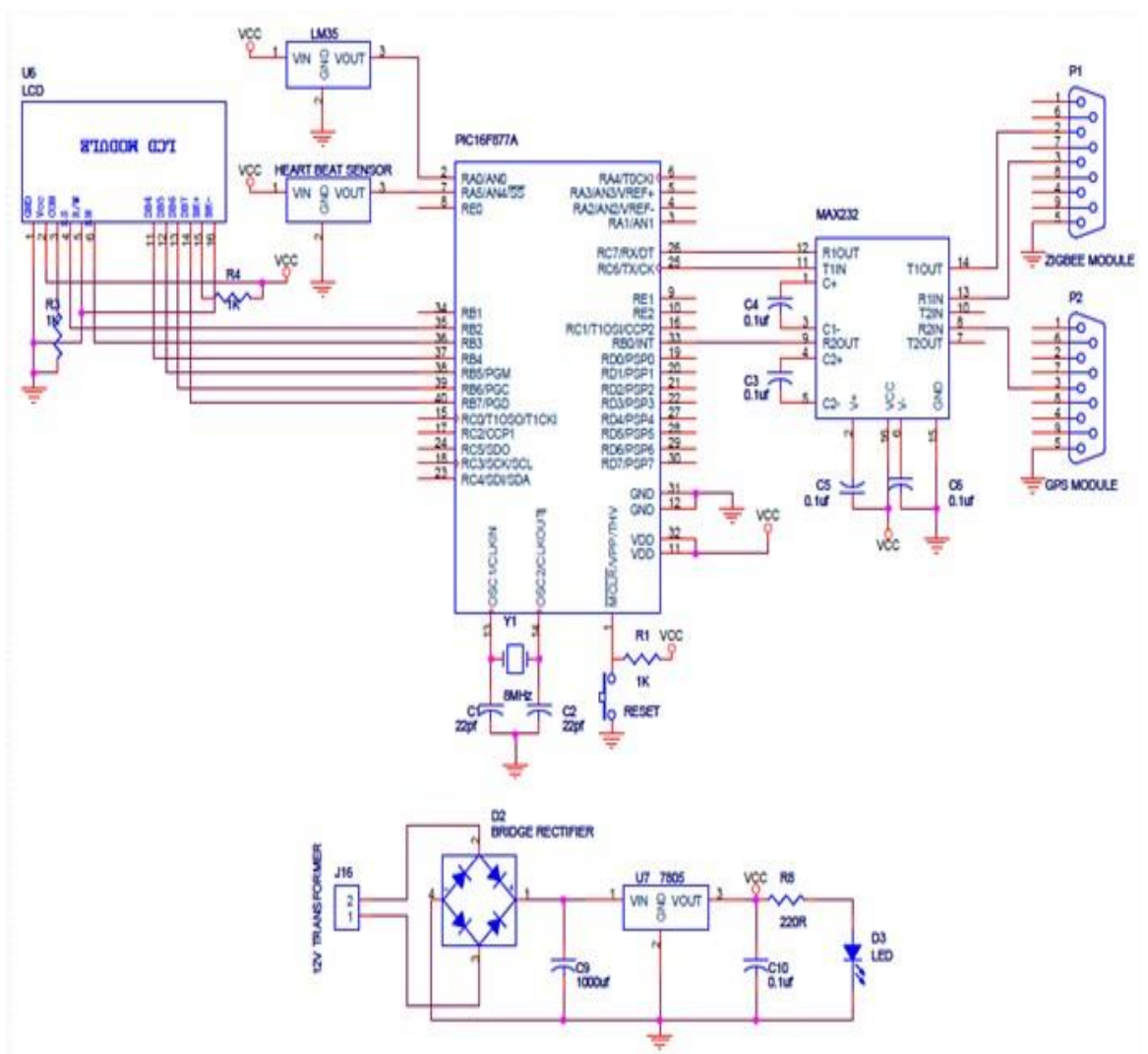


Figure 3: Circuit Diagram Ambulance patient monitoring

The problem of traffic light control can be solved by RFID based system. With this system, we can consider the priority of different type of vehicles and also consider the density of traffic on the roads by installing RF reader on the road intersections. Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. RFID is a technique that is widely used in the various application areas like medical science, commerce, security, Electronic toll collection system, access control etc. There are three main components of RFID: RFID tag, RF Reader and Database

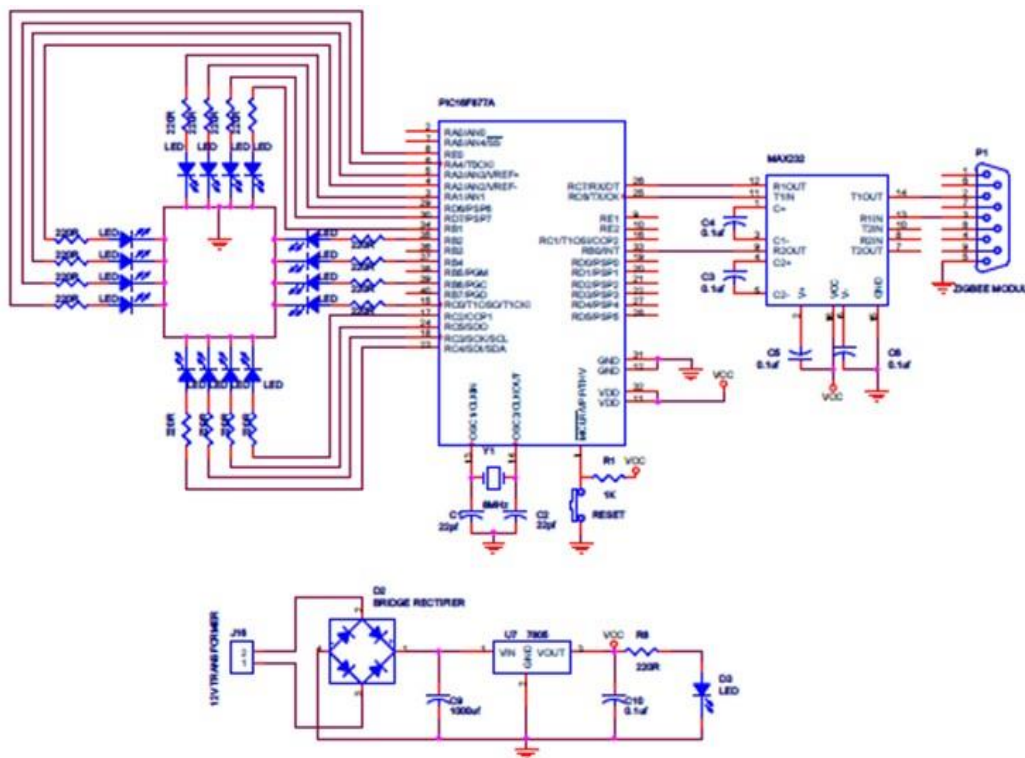


Figure 4: Circuit Diagram for Traffic control signal

Various types of tags are available but we can mainly divide them into two categories: passive tags and active tags. The passive tags don't contain any internal power source. There are three parts of the tag: antenna, semiconductor chip and some form of encapsulation. The life of the passive tag is very long. The reader sends electromagnetic waves that produce current in the tags antenna. In response antenna reflects the information stored in it. The active tags contain a battery as an internal power source used to operate microchips circuitry and to broadcast the information to the reader. The range and cost of these tags is more as compare to passive tags. We have three kinds of tags which work on the three different frequency ranges: low frequency, high-frequency and ultra-high frequency.

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.

a) Microcontroller PIC 16 F877P:

PIC is a family of modified Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1650. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to Peripheral Interface Controller. The hardware capabilities of PIC devices range from 8-pin DIP chips up to 100-pin SMD chips, with discrete I/O pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types. PICs have a set of registers that function as general-purpose RAM. Special-purpose control registers for on-chip hardware resources are also mapped into the data space. PIC's instructions vary from about 35 instructions for the low-end PICs to over 80 instructions for the high-end PICs. The instruction set includes instructions to perform a variety of operations on registers directly, the accumulator and a literal constant or the accumulator and a register, as well as for conditional execution, and program branching.

b) 16x2 Characters LCD:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical, easily programmable, have no

limitation of displaying special and even custom characters (unlike in seven segments), animations and so on. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

c) RF Transceiver Module:

An RF module (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. 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 achieving operation on a specific frequency. An RF Transceiver module incorporates both a transmitter and receiver. The circuit is typically designed for Half-duplex operation, although full duplex modules are available, typically at a higher cost due to the added complexity. As with any other radio-frequency device, the performance of an RF module will depend on a number of factors. For example, by increasing the transmitter power, a larger communication distance will be achieved. Correspondingly, increasing the receiver sensitivity will also increase the effective communication range, but will also potentially cause malfunction due to interference with other RF devices.

d) Electrical Heart beat sensor:

Heart beat sensor is designed to give digital output of heart beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heartbeat. 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. The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat. The target range is the pulse rate needed in order to provide suitable exercise for the heart. For a 25-year old, this range is about 140-170 beats per minute while for a 60-year old it is typically between 115 and 140 beats per minute.

e) Zig-Bee Module:

ZigBee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15 standard. Though its low power consumption limits transmission distances to 10100 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 networks are secured by 128 bit symmetric encryption keys.) ZigBee has a defined rate of 250 kbps, best suited for intermittent data transmissions from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer.

f) MAX 232:

The MAX 232 IC is used in this project to make interface microcontroller with zigbee module and GSM modem. This IC is a dual driver/receiver includes a capacitive voltage generator to supply TIA/EIA-232-F voltage levels from a single 5-V supply. Each receiver converts TIA/EIA-232-F inputs to 5- TTL/CMOS levels. These receivers have a typical threshold of 1.3 V, a typical hysteresis of 0.5 V, and can accept 30-V inputs. Each driver converts TTL/CMOS input levels into TIA/EIA-232-F levels.

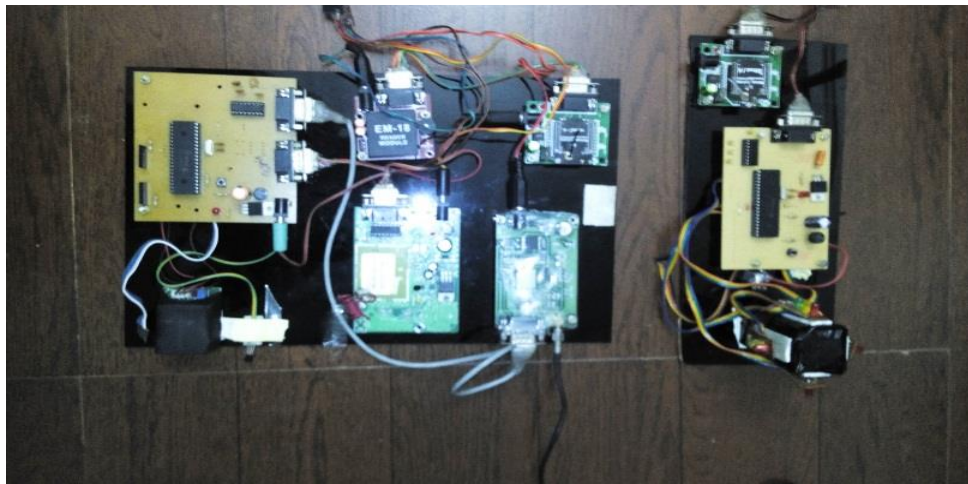
g) Electrical temperature sensor:

Thermistor- Thermistors are thermally sensitive resistors whose prime function is to exhibit a large, predictable and precise change in electrical resistance when subjected to a corresponding change in body temperature. Negative Temperature Coefficient (NTC) thermistors exhibit a decrease in electrical resistance when subjected to an increase in

body temperature and Positive Temperature Coefficient (PTC) thermistors exhibit an increase in electrical resistance when subjected to an increase in body temperature

VI. CONCLUSION

Since this is a cheap and effective technique, applicable in countries like India Ambulance service made more efficiently for patient lifesaving. These technique reduces risk for transportation for patient in crowded traffic.is capable of providing its customizable best route identification based on multiple possible optimization factors such as travel time, fuel cost, and distance. The dynamic time management scheme operates in real time and emulates the judgment made by a traffic policeman on duty. This system aims at saving a large amount of man-hours caused by traffic problems and accidents, where prevention can save lives and property. It is able to manage priority emergency tag vehicles. It offers a valuable detailed database records and preference to planner and investigators, V knowledge about its set of target tags, for unknown target information collection, the reader must first figure out all target tags before reading information from them. We begin with two categories of solutions that are derived from the existing ID-collection protocols and information collection protocols and demonstrate that they cannot efficiently solve the unknown-target information collection problem due to significant time overhead for identifying the target tags.



REFERENCES

- [1] Hao Yue "Remote Health Monitoring System Using ZigBee Network and GPRS Transmission Technology", IEEE vol. 22, no. 4, august 2014.pp- 345–367.
- [2] Jaesoon Choi,"An Intelligent Remote Monitoring System for Artificial Heart", IEEE, Jun.W. Park, Member, IEEE, Jinhan Chung, Student Member, IEEE, and Byoung G. Min, Member, IEEE, IEEE Transactions on information technology in biomedicine, vol. 9, no. 4, december 2005.pp - 767–782
- [3] LCD16*2datasheet <http://www.engineersgarage.com/electroniccomponents/16x2-lcd-module-datasheet>.
- [4] Beatriz Lpez, Bianca Innocenti, and Ddac Busquets, "A Multiagent System for Coordinating Ambulances for Emergency Medical Services", IEEE, vol -67, no -7, January 2008 pp - 2987–3056
- [5] Dimitar H.stefanov, Zeungnam bien"the smart house for older persons and persons with physical disabilities: structure technology arrangement and perspectives" senior IEEE members, IEEE. Volume 12, pp – 22s -25 o,no-2 June 2004
- [6] Dipti Srinivasan, Min chee choy " Neural network for Real-time traffic signals", members IEEE, volume 7, no – 3, pp -261-272, September 2006
- [7] Balaji Parasumanna Gokulan, Dipti Srinivasan " Distributed geometric fuzzy multiagent urban traffic signal control", members IEEE, IEEE volume-11, no- 3, pp-714-727, September 2010.