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Design of Intelligent Health Monitoring and Human Tracking System

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Abstract

The mortality rate is exponentially increased due to delayed diagnosis. There is a need of a robust automated device for the early detection of the vital abnormal of the patients. This system uses real time sensor to sense the health condition of a person and uses GPS tracking to find his/her location. The device alarms when the heart rate and the body temperature exceed the provided threshold value. This threshold value is predefined by the programmer. Women safety is a grave issue and it is the need of the hour to track them. The system designed has a distress button, when it is pressed we will get the current location and health condition of patients and women to the mobile number of their near ones. So we have worked on the system which will be used outside the hospital also patient can go wherever he wants and he gets continuously monitored. System is of low cost and consumes less power.

Key words

Arduino Mega 2560, Biomedical Sensors, GPS, GSM

1. Introduction

According to international worldwide data of the global effects of hypertension heart diseases [8], the analysis study shows that blood pressure or hypertension affects more than 1 billion people worldwide. The risk of heart failure, due to Hypertension is almost increased by factor two or three-fold and may accounts for about 25% of all heart failure cases.

Army soldiers are protective shield of every nation, but when it comes to their protection we don't make large steps. Though there are many technologies, most of them are not used here they are given with protective bullet proof jackets, which are very helpful to save their life We still use the old bullet proof jackets which reduce the impact of bullet. These jackets does not having warning system that would alarm the command centre [6].

This is overcome by a system with the help of various sensors and embedded system [3]. In this paper, automatically monitor and control the physical status of each and every soldier and tracking the place through sensors and GSM by using embedded system. By this project the system will be useful for providing health status and medical help for the needy soldiers in the battle field. The system tracks the health by focusing on soldier's heart beat and temperature [2]. If an alarming situation occurs, there will be change in the heart beat patterns and thus a message will be sent along with the location of the soldier to the base camp for necessary help. The system is also equipped with a distress switch. When the soldiers press this switch, a distress message will be sent to the base station or to the concerned ones. ECG waveform can also be viewed from this device.

This project aims at health monitoring and human tracking in real time basis. Health monitoring system consists of a pulse rate and body temperature sensor. The system consists of a microcontroller based heart rate and body temperature measuring devices along with LCD output. When there is any change in the set threshold value, a message is sent to the appropriate person wirelessly. A heart patient should be monitored continuously. But being at a hospital for rest of the life after a heart disease is detected is not practical option. Thus, the system can be used by the patients outside the hospital and their location can be traced in real time.

2. Hardware Description

This project has two sections-Transmitter and Receiver section.

2.1 Transmitter Section

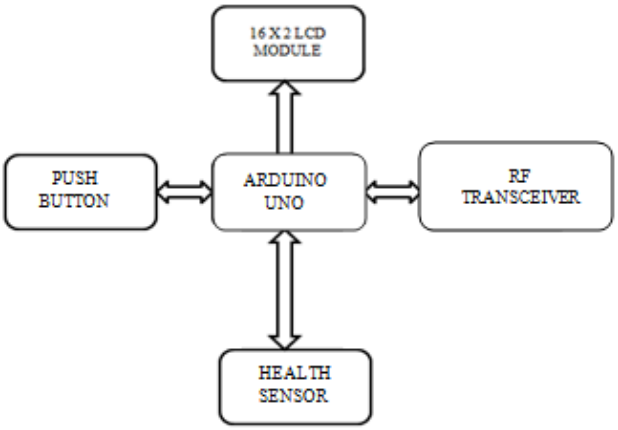


Fig.1. Block diagram of transmitter section

The block diagram of transmitter section is shown in Fig 1. The Arduino Uno is the heart of the transmitter system through which the input output communications to the system is carried out. The 16x2 LCD acts as the output display device. RF transceiver is used to send data to the receiver. The health sensors are used for the heart beat and body temperature monitoring. The push button is used for emergency situation.

2.2 Receiver Section

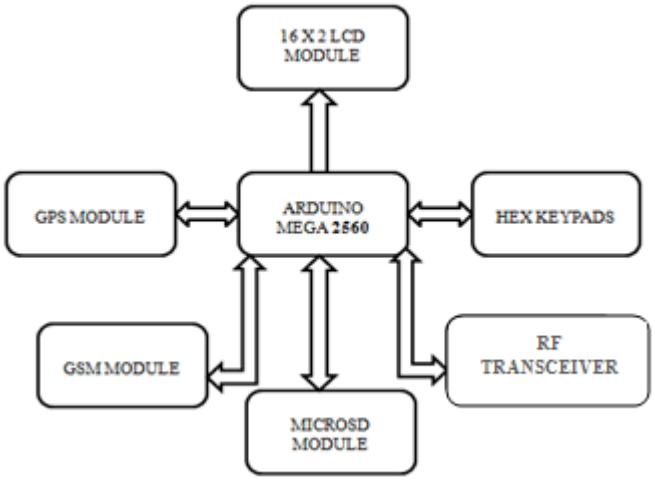


Fig.2. Block diagram of receiver section

The block diagram of receiver section is shown in Fig 2. The Arduino mega 2560 is used in the receiver section. The Mega 2560 board can be programmed with the Arduino Software (IDE).The open-source Arduino Software (IDE) makes it easy to write code and upload

it to the board. GSM module is used for the sending and reception of messages and the GPS module is used for the 24x7 tracking of the user position with reference to latitudes and longitudes. The hex keypad is used as the input device. Micro SD module is used as the data storage system. The 16x2 LCD acts as the output display device.

3. Circuit Diagram Description

3.1 Transmitter Section

Figure 3 shows the circuit diagram of transmitter section. Arduino Uno is the core of the transmitter. It is provided a VCC of 5V. The RS (Reset),E(Enable),D4,D5,D6,D7(Data pins) are connected to pins 9,10,3,2,1,0 of Arduino respectively.LM35 represents the temperature sensor which is provided with 5V.It is connected to the A1 pin of Arduino Uno. Pulse sensor is provided with 5V and is connected to pin A0 of Arduino. Emergency distress button and is provided 5V.It is connected to pin 8 of Arduino.nRF24L01is the module used to transmit data wirelessly. It is provided with 3.3V.

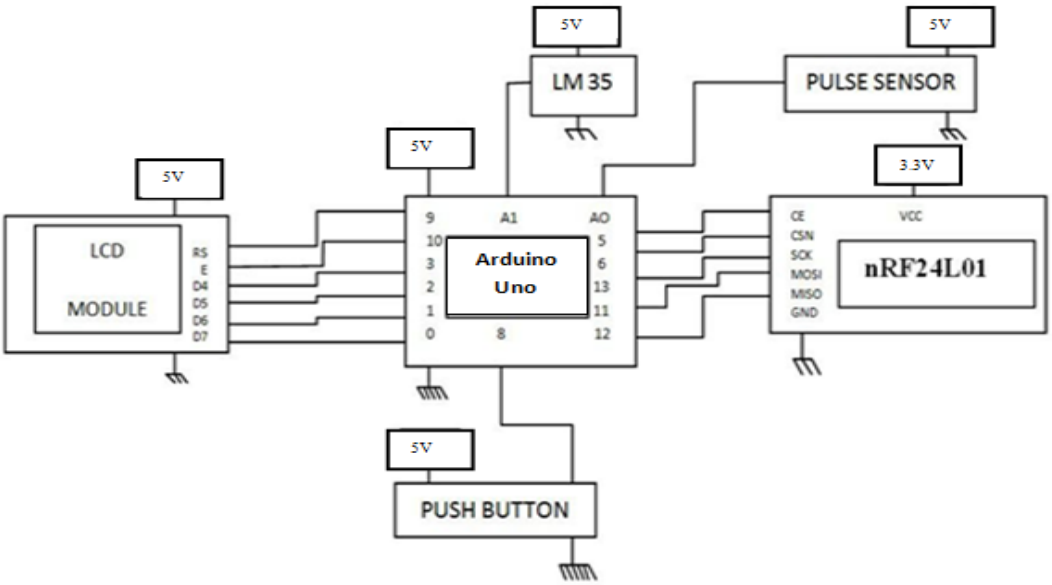


Fig.3. Circuit diagram of transmitter section

3.2 Receiver Section

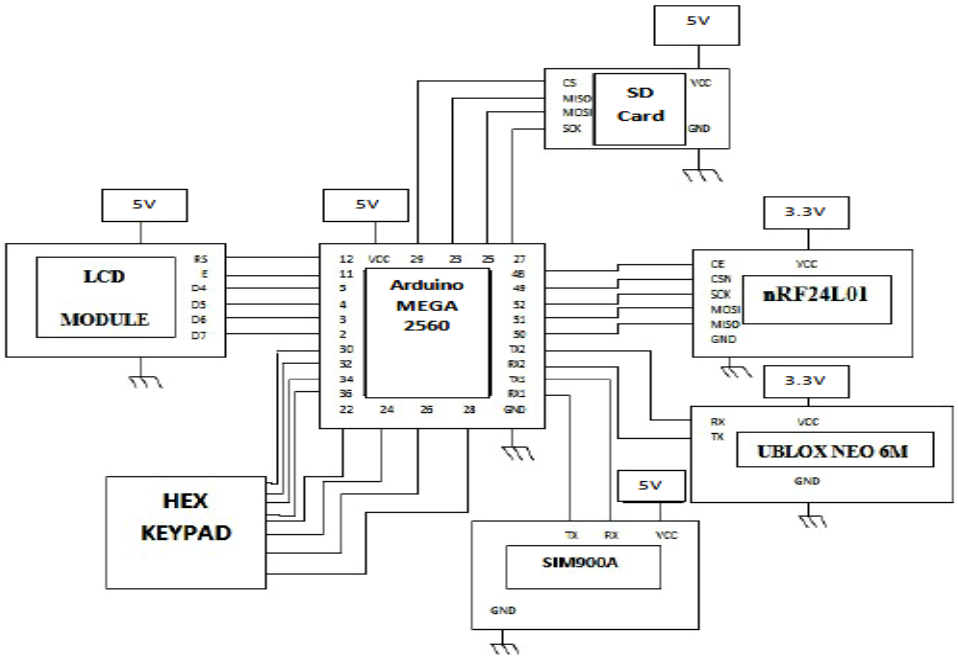


Fig.4. Circuit diagram of receiver section

Figure 4 shows the circuit diagram of receiver section. Arduino Mega 2560 is the core of the system. It is provide with a VCC of 5V.SD card module is to store the health parameters and the location. It is provided with a voltage of 5V.LCD Module is provided with a VCC of 5V.RS, E, D4,D5,D6,D7 pins of LCD module are connected to pins 12,11,5,4,3,2 of the Arduino respectively.SIM900A represents the GSM module for mobile communication. It is provided with a voltage of 5V.The transmit (TX) and receive (RX) pins of GSM are connected to RX1 and TX1 of Arduino respectively. Hex keypad is used to input the data. The pins of hex keypad are connected to 30, 32,34,36,22,24,26,28 pins of Arduino. UBLOX NEO 6M is the GPS module. It is provided with VCC of 3.3V.RX and TX pins of GPS module are connected to TX2 and RX2 pins of Arduino. NRF24L01 is the module used to transmit data wirelessly. It is provided with 3.3V.

4. Flow Chart Description

4.1 Transmitter Section

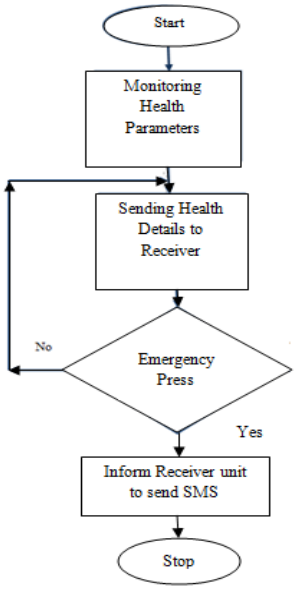


Fig.5. Flow chart of Transmitter Section

Flow chart of the transmitter section is shown in Fig 5.When the transmitter section is initialized, the system starts monitoring the health parameters. The health details will be sent to the reception unit. If an emergency press or a health problem is detected, it informs the receiver unit to send SMS to the saved mobile numbers.

4.2 Receiver Section

The flow chart of the receiver section is shown in fig 6.The module gets initialized and the input details like mobile number and threshold temperature is given. This unit receives the data from transmitter section. If an emergency press at transmitter section or an SMS “BTRACK” is received or a health problem is detected, an SMS consisting of health details and location will be sent to the registered mobile number and it will be saved to an SD card module. If an SMS “STRACK” is received, the data will stop to get saved in the SD card module.

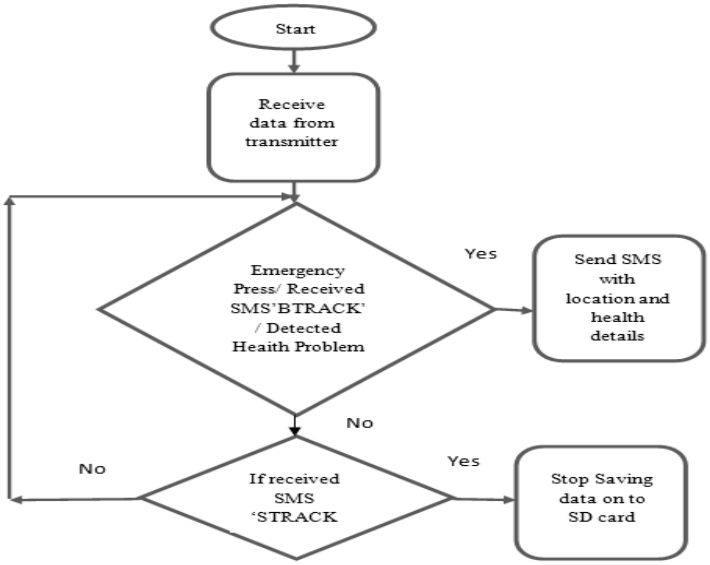
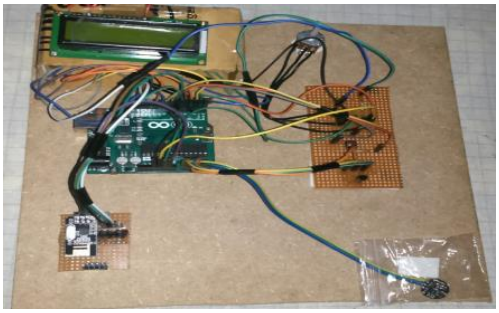


Fig.6. Flow chart Receiver Section

5. Result

Figure 7 shows the hardware model of the project. Arduino Uno is the heart of the transmitter. LCD is the component that displays the output information like heart beat and temperature. The module consists of the heart beat sensor and the temperature sensor. The readings like heart beat and temperature is transmitted to the receiver. Arduino Mega 2560 is the core of receiver section. Hex keypad is provided to input the threshold values of heart beat and temperature and to register a mobile number.SD card stores the data pertaining to the health and the location. While a message "BTRACK" is sent to the receiver, the data regarding the health status and location will be sent to the registered mobile number and the server will get uploaded with the values. When a message "STRACK" is received, the data will stop getting saved to the SD card and the updating to the server will end. If an emergency press or the threshold values gets cut, then the receiver will sent a message to the registered mobile number with the health details and location automatically.



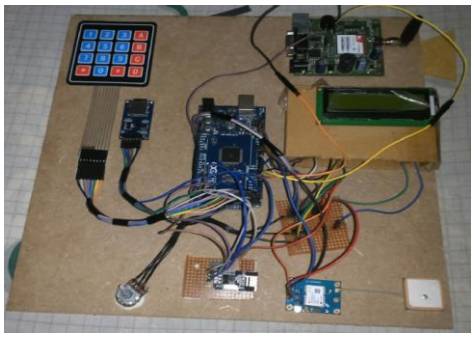


Fig 7: Hardware model of Transmitter Section and receiver Section

Fig 8 shows the screen shot of the message exchanged by the system. When a message B TRACK is sent from the registered mobile number, first the system checks whether it is from a valid user. Once the message received is identified as that from a valid user, the system finds out the health parameters and the location and sends SMS to the valid number. When a message "STRACK" is sent from the registered user the message will not be sent. By using Google Map the location of the patient could be determined, and appeared in the SMS.

Fig 8: Screen shot of the Message Exchanged by the System

Fig 9 shows the screenshot of the location of tracked person using Google maps. By using Google Map the location of the patient could be determined, and appeared in the SMS shown in Figure 8. From the above figure, it can be seen that the tracked person is at 8.39.28.4N and 76.46.54.0E.The exact location name can be found out from the Google maps shown at the right side. Thus the tracked person can be located precisely.

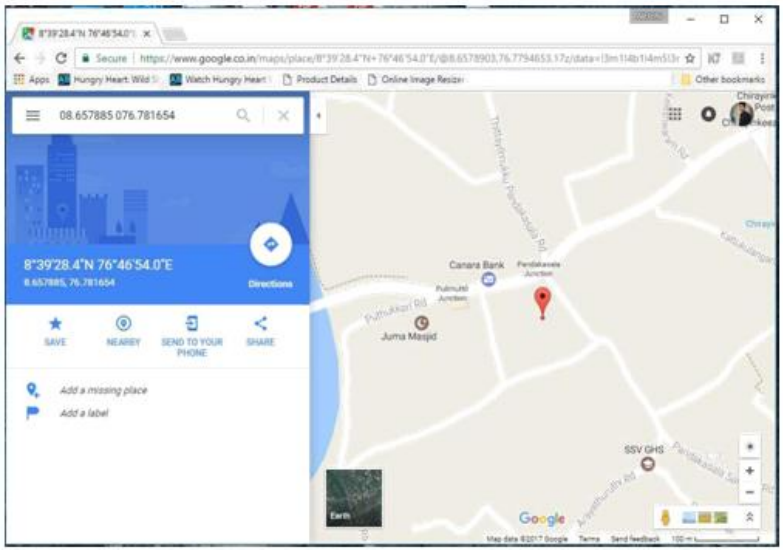


Fig 9: Screenshot of the location of tracked person using Google maps

Fig 10 shows the screenshot of the health details being uploaded to the server. Server shows the last updated time and the heart beat chart and temperature chart by which the person is constantly monitored.

Fig 10: Screen shot of the Data Exchanged by the System

6. Conclusion

This paper proposes a methodology for tracking and locating a person and gives a detailed insight on his current health condition. Our designing focuses on a low cost, low power, reliable and wearable system so that it could be used in the day today life. This prototype could also be used by hospitals for continuous monitoring of the health conditions of patients, rather than high cost, non reliable and bulky conventional equipments. This is also helpful for finding injured and missing soldier, and thus can rescue the soldier life and provide necessary medical facilities. The same is applicable for women safety as well.

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