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# Health Monitoring System using Gsm Modem

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***Abstract:** The new outbreak of Corona virus poses a major threat and has been declared a global public health emergency. Whole World is trying to stop the virus but no efficient tool and strategy is there to control it. Monitoring of Patient's health remotely is really important especially for patients suffering from a long-term disease. Vital signs such as pulse rate, Body temperature etc., needs to be monitored regularly as they are the primary indicators of a human's health. Also, Elderly people gets benefited by making less visits to the hospitals for regular check-up. Therefore, we intend to bring in a GSM based health monitoring system for patient's which provides security to patient's health. Health monitoring is a technology to enable monitoring patient's health outside clinical settings. The system measures the heartbeat and body temperature of patient and then the immediate information will be sent to the registered number.*

***Keywords:** Body temperature, Heart Rate, Arduino, GSM, Registered mobile number, Miscellaneous.*

## I. INTRODUCTION

The most familiar Wireless Sensor Networks (WSN) play an important role in the technological community and research which results in the improvement of various high-performance smart sensing system. Mainly innovative research is concentrated at better quality of life in terms of health. This can be achieved by designing and fabricating sensors which are invasive or noninvasive in contact [1]-[2]. Improving health care diagnosis, monitoring and therapy was made possible by the development of biomedical engineering

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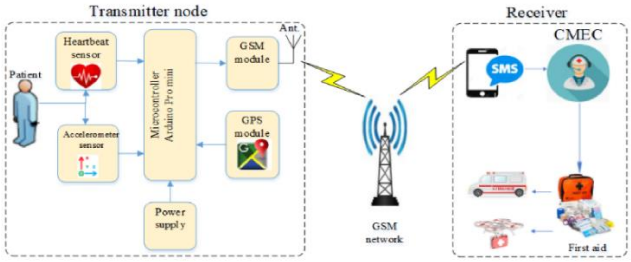


**Figure 1. Transmission and Reception of Calculated Parameters.**

Fig. 1. shows the Transmission and Reception of the measured values of temperature and heart rate. The vitals are sensed measured and processed using the sensors and micro controller respectively and then the calculated values are sent to the mobile using GSM network as shown in the figure.

The job of the monitoring system is to keep an eye on a particular activity and to make sure that it stays in the desired manner. This can be achieved by using various electronic sensors. Irregularities in pulse rate and inconsistent or high temperatures can lead to serious issues which may finally lead to death of the patient. A Smart Health monitoring system focuses on the safety of patients by monitoring and controlling different parameters affecting Human body.

This project paper is explained as follows. A brief investigation of existing techniques presented in section 2, 3rd section explains the proposed block diagram and methodology, and the components used in the project is described in section 4, Implementation of project is presented in section 5 with results drawn in section 6 and finally concluded in section 7.

## II. LITERATURE SURVEY

The pandemic has turned out to be worse. The major hazard for serious illness from Corona Virus is among those aged 80 or older. A system which can be used for preliminary tests such as measuring body temperature and heart rate owes to leave healthcare workers from effected to suspected or quarantined cases is very important.

This provides elder people to escape from any diseases using Internet Of Things (IOT) and some medical devices.[3]-[4] This establishment will help people to know their health status without going outside or medical centers.

[5] This is used to check the temperature of patient 24 hours using Zigbee mesh protocol. [6] This is used to check the heart beat per minute and temperature of body and pass the information to them using GSM module and web technologies and GPS to save patient's life on time without any delay.

[7] It gives a remedy for enhancing the flexibility and reliability by increasing the power management and performance of the monitoring system of patient.[8] It gives the architecture of proposed model for measuring heart rate and temperature using Bluetooth techniques.
[9] It describes that an SMS will be sent to registered mobile after measuring biological data using wearable sensor device.[10] Present medical support in growing countries allows suffering people to appear physically for regular health check-up or patient needs to get admitted for regular observation.
The system is time consuming and non-flexible. Today remote sensor system allows patients to control their daily lifestyle constantly from anywhere at any places. Hence, to support real time patient health monitoring, in this work we 5 propose constant health monitor of a person by transmitting one's body temperature and heart rate's data utilizing GSM modem to a web server that is accessible to both doctor and the patient.

## III.BLOCK DIAGRAM AND WORKING PRINCIPLE

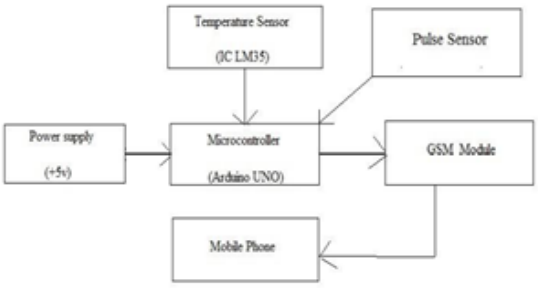


**Figure 2. Block Diagram of Remote health monitoring system**

Fig. 2. Shows the basic blocks in a propose model it checks the temperature of body and heart beats remotely. The block diagram shown in the figure consists of a power supply of 5V, Temperature sensor (LM35), Pulse sensor, Arduino UNO, GSM Module and a Mobile phone.
An open-source platform which is Arduino for electronic projects. It consists of both programmable circuit which is physical in nature called micro controller and an IDE (Integrated Development Environment) which runs on our system and it is used to write and upload code to the board. There are sensors to measures and monitors the vital signs like temperature and heart beats. The LM35 sensor and pulse rate sensor will measure the body temperature and heart beats per minute when we place the finger on sensors. LCD [Liquid Crystal Display] is a 16x2 display that displays the values from the sensors.

## IV. COMPONENTS USED IN THE PROJECT

### A. Ardunio (Atmega 328)

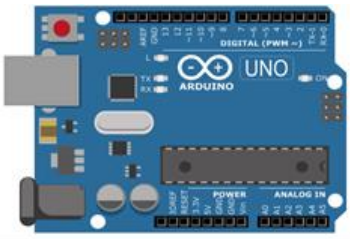


**Figure 3. Arduino UNO**

Arduino UNO helps in high-speed programming. It has 28 Pins in total. 20 I/O ports are available to user in which 14 are digital and 6 are analog inputs. ATMEGA 328 is an 8-bit micro controller which means it can process 8 data lines in single clock pulse and it is open sourced. Specifications:

- 5V- Operating voltage
- 7-12V Recommended input voltage
- 32KB flash memory in which 0.5KB used by Bootloader
- Clock input required is 16MHZ
- EEPROM data memory is up to 1KB

### B. Temperature Sensor (Lm35)

**Figure 4. Temperature Sensor (LM35)**

It is an integrated circuit made of Semi-conductors. LM stands for Linear Monolithic. It is a precision integrated temperature sensor. It produces analog output in linear form. This sensor provides an output voltage of 10.0Mv for each degree of temperature from a reference voltage.
Specifications:

- It operated in the range of 4 to 30V
- It doesn't require an external calibration. It is designed directly in centigrade.
- -55°C to 150°C is temperature range.
- Ensured Accuracy of 0.5°C (at +25°C).
- It uses only 60µAmps from source and possesses a low self-heating capability.

### C. Pulse Sensor

**Figure 5. Pulse sensor**

It is an open- source heart sensor. This sensor clips on to a Finger-tip or earlobe or any place on the skin where capillary veins are being sensed.
This sensor works on the principle of Photo Lithosmography.


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Its principle says that the using intensity changes of light travelling through the organ can measure the volume of blood in an organ.

When the front side of sensor is placed over a vein in our body (finger/ear), LED blows light and the veins will have flow of blood. We will observe the blood flow. If the blood flow is detected, more light will be effected by the blood.

Features:

- Biometric heart rate detecting sensor.
- +5V to +3.3v is Operating voltage.
- 4mA is current consumption.
- Inbuilt noise cancellation and amplification circuit.

### D. Gsm Modem

**Figure 6. GSM Modem**

Global system for mobile communication is the abbreviation of GSM. It is used to make calls, send SMS, smart home appliance etc. For the purpose of communication, it requires power supply up to 12V, RS232 is communication interface, and a SIM card which is similar to the mobile phone to establish communication with the network. To change the modes of GSM we use AT commands.[5]

- GSM 900A is a quad band version operated in 850/900/1000MHz. It will work for 2G sim.
- It needs 12V (230V converted into 12V by transformer.
- GSM works with less speed than Arduino.
- To get signal for GSM, Network LED is there, it blinks for every 3 sec.

**Table-I. GSM AT-Commands**

| AT-Commands | Description |
|---|---|
| AT | Enter |
| AT+CMGF | Select SMS Message Format |
| AT+CMGS | Send SMS Message |

### E. 16x2 Lcd Display


**Figure 7. LCD Display**

It is a very basic module and it can display 16 characters per line. It is used to display the values from the temperature sensor and pulse sensor.

## V. IMPLEMENTATION

The methodology to monitor the Heart rate and body temperature is implemented in the following manner to be discussed in the rest of the section. The prime requirements are listed below:

### A. Hardware requirements:

- Arduino Uno
- 16X2 LCD Display
- LM35 Temperature Sensor
- Pulse Sensor
- GSM Module
- Jumper Wires

### B. Software requirements:

- Arduino IDE

The circuit is initialized when the switch is turned ON. After pressing reset, finger is placed on the temperature sensor and then the pulse sensor respectively.

Then the measurement of heart rate and temperature takes place. We can sense the pulse in some blood vessels which are very close to the skin surface such as wrist, neck surface, upper arm etc. The heart rate count for nearly 30 sec and then it is converted into bpm.

Simultaneously, the body temperature is measured.

Body temperature = 98.6°F or 39°C. Body temperature is usually affected by the part of the body and also time of the day. It is lower in the morning due to the rest taken at night and it is high in the evening due to the muscular activity throughout the day.

Final measured values of body temperature and pulse rate are passed to the doctor or to the relatives of patient by GSM modem using AT+CMGS command.

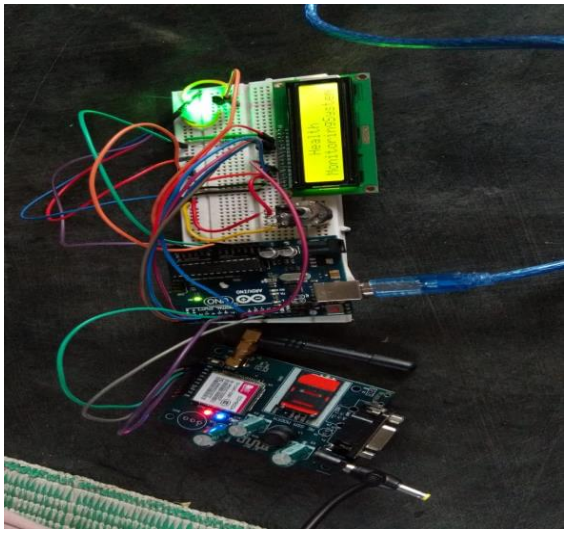

**Figure 8. Hardware Setup**

The values from the sensors that are obtained are given to the Arduino as the sensors are connected to the pins of the Arduino board. If the values obtained from the sensors reach the critical values, then as per the code written in the Arduino Software, then we get a display regarding the condition of patient.



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**Flow chart of Proposed system**:

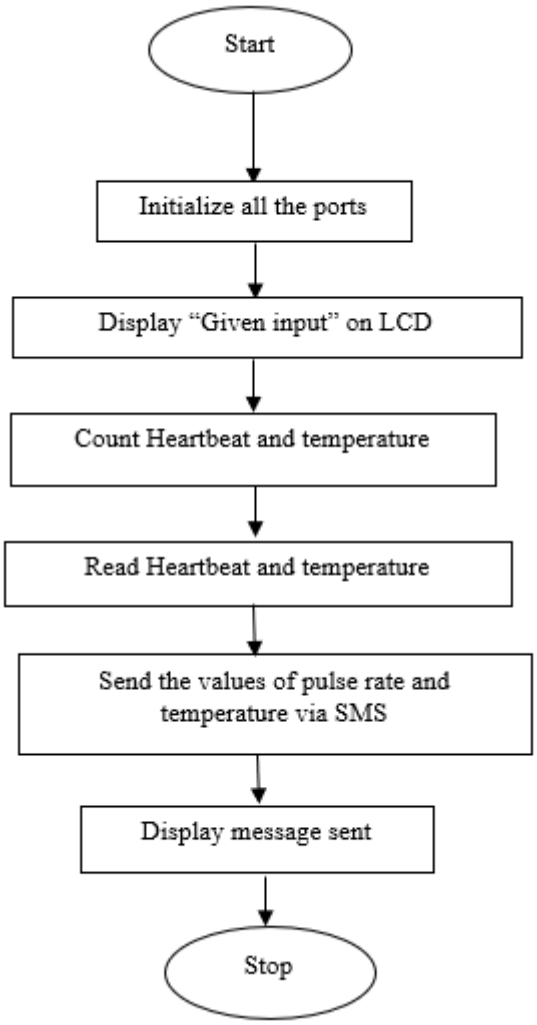


**Figure 9. Flow chart of the proposed system**

Assemble all the required components and start connecting the model and initialize all the ports and dump the code from Arduino IDE to Arduino UNO and then verify and upload the code. The message "Given input" will be displayed on the LCD. For counting and reading the temperature and heartbeat biological data, touch the temperature sensor and pulse sensor. The output will be displayed on the LCD and GSM model will send the values of pulse rate and temperature via SMS to the registered mobile number. After sending the message the message sent will be displayed on the LCD with this the procedure is completed.

## VI. RESULTS

The values of body temperature and heart rate was measured for different patients and the values are noted.

**Table-II Output at Tested Conditions**

| S. No | Body Temperature (Celsius) | Body Temperature (Fahrenheit) | Heart Rate (BPM) |
|---|---|---|---|
| PERSON 1 | 28.32 | 82.98 | 72 |
| PERSON 2 | 37.22 | 99 | 101 |

The details of the condition of patient are displayed on the LCD.


**Figure 10. LCD showing the measured values.**


**Figure 11. LCD display after the message was sent.**

After the measuring of temperature and heart rate is done, then the message will be sent to the registered number and a message saying "Message was sent" will be seen on the LCD. Whenever the message is received the doctor or the relative of patient sees this notification and they can ensure safety on patient's health.

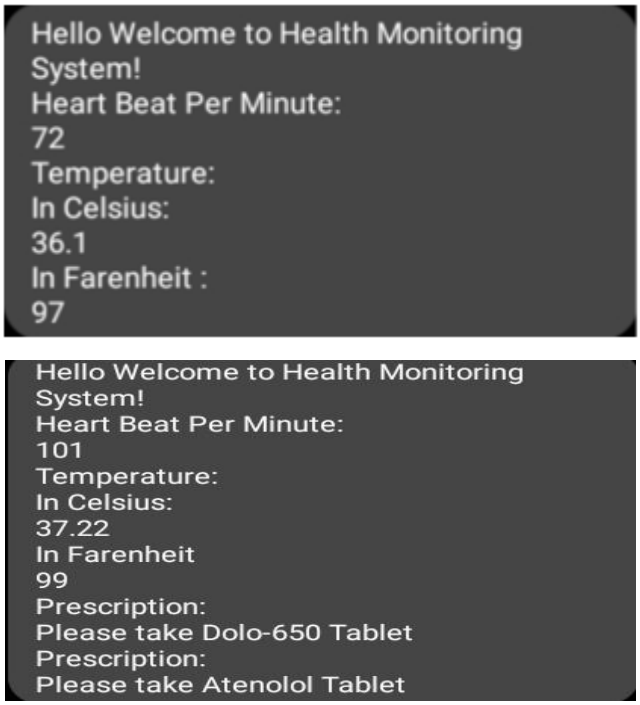


**Figure 12. Output of the developed system**

## VII. CONCLUSION

The integrated IoT-based health monitoring approach using GSM that can measure various vital signs such as temperature of body and pulse rate is built. Users also can get output in the form of notification through the LCD and can also get a message through the GSM. The main agenda of establishing this model is to alert the doctor or relatives of patient about the current health condition of the patient via mobile phone. This system improves chronic condition management, reduces emergency situations and increases patient's accountability.

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This module is applicable for Hospital, home and also in ambulance. This project can be further enhanced by sensing and displaying other vital signs like ECG, blood pressure and glucose levels of a patient.

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