

BLUETOOTH HEART RATE **MONITORING SYSTEM**

J Component Project Report EEE 1008

Bio- Medical Instrumentation

(Fall Semester 2021-22)

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She helped us in this endeavor and has always been very cooperative and without her help, cooperation, guidance and encouragement, the project couldn't have been what it evolved to be.

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OBJECTIVE:

Healthcare Monitoring System in hospitals and many other health centers has experienced significant growth, and portable healthcare monitoring systems with emerging technologies are becoming of great concern to many countries worldwide nowadays.

Usage of Internet of Things (IoT) technologies helps in the progress of healthcare to do face-to-face consulting to telemedicine. This project proposes a smart healthcare system in IoT environment that can monitor a patient's basic health signs such as heart rate, pulse rate and temperature of the patient in the room condition where the patients are now in real-time.

The novelty of our project is that we are giving an alert system and its families with the required vitals of the patient dip below the warning signs.

In this system, we have basically used five sensors which helps us to gather the data from hospital like heartbeat sensor, body temperature sensor, room temperature sensor, pulse rate sensors.

Error percentage that we observed in our developed prototype is within a certain limit ($<5\%$) for each case. The condition of the patients is conveyed via a portal to medical staff, where they can process and analyze the current situation of the patients.

The developed prototype is nicely suited for healthcare monitoring and that can be proved by the accuracy which we got from the system.

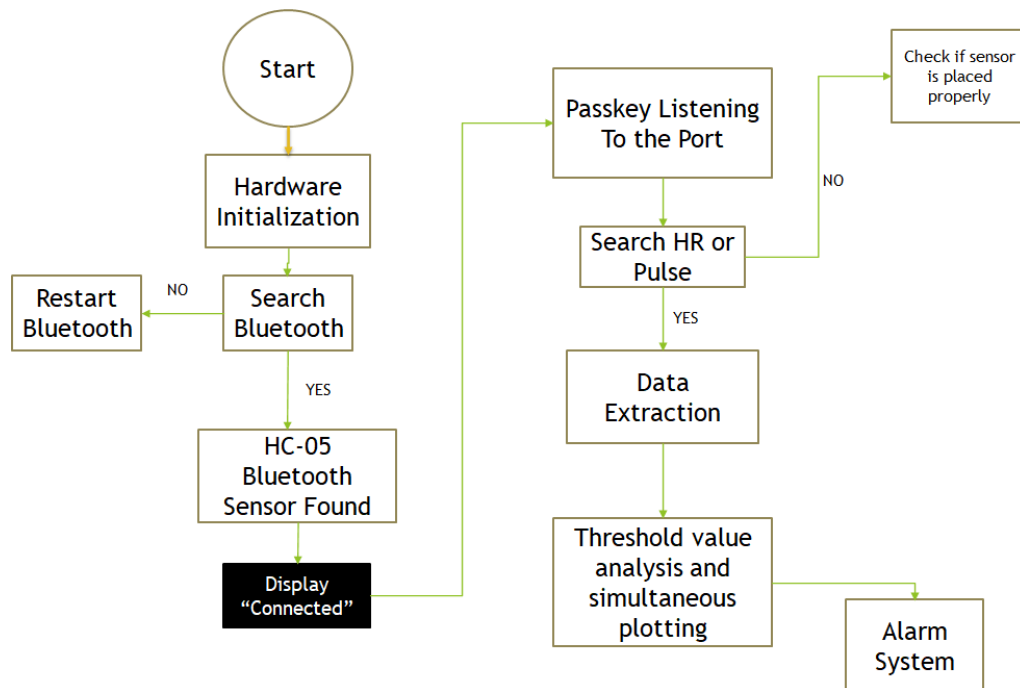
LITERATURE SURVEY:

Many people have heart problems which need a daily and periodic follow-up. One of the most important solutions for health monitoring is the Internet of Things (IoT) applications which are used for monitoring and regularly track the patient's health. These applications can highly reduce the number of patients visiting the hospital for health monitoring. These IoT applications are different in their software and hardware implementations, which leads to different accuracy and options especially in the remotely monitoring field.

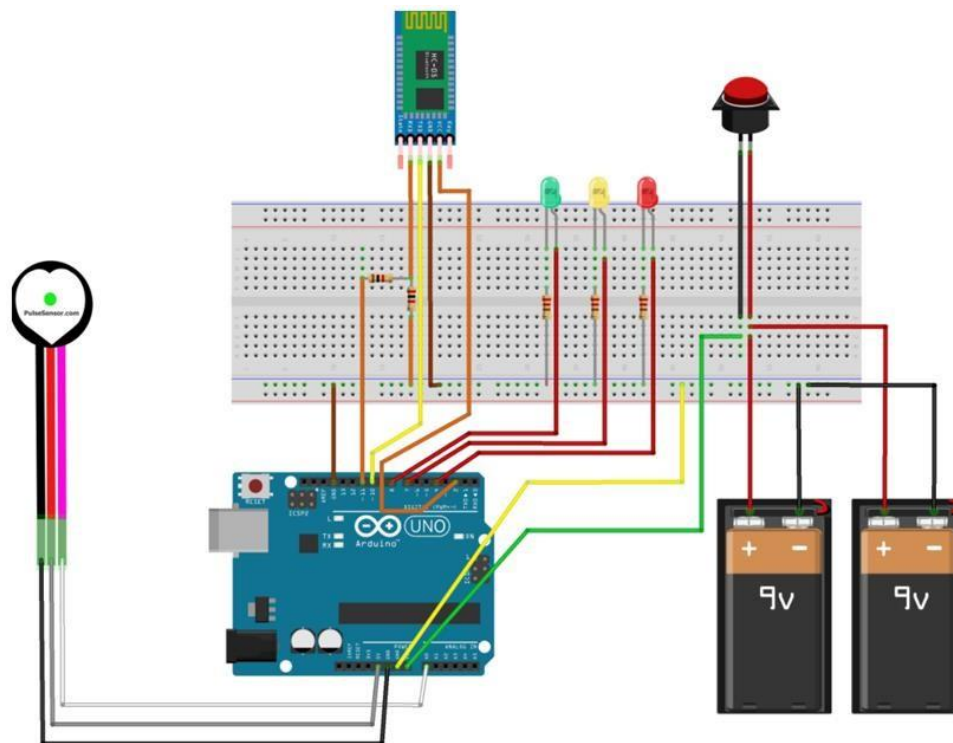
1. Miah et al. [1] developed an integrated portable device for heart rate and body temperature monitoring system by using Arduino UNO microcontroller, transmission system (Bluetooth), and Android-based application. This approach uses the analog signal of pulses for each person and uses a Bluetooth device to send and receive data then sending it to Android application.
2. Hashem et al. [2] developed a device which measures heart rate and the body temperature using infrared technology and analog temperature sensor respectively. This approach calibrates the analog signal of pulses for each person and uses a wireless device to send and receive data then sending it to computer by using serial port then the data is sent to a webserver using internet and can be viewed from anywhere using any web browser.
3. Vaishnave and Jenisha [3] developed a remote sensing parameter of the human body pulse and temperature. They sent the data via wireless sensors which was viewed on the web and that helped them to tell about patient's health. The data is collected in a database and used to inform patients of any unseen problems to undergo possible diagnosis.
4. Parihar et al. [7] developed an approach that consists of heartbeat and body temperature sensors which are controlled by the microcontroller and the readings are displayed on an LCD monitor. In this approach they have used wireless system (nRF24L01) which helps them to transmit measured data from remote location and then the data will be displayed at the receiving end.

METHODOLOGY:

BLOCK DIAGRAM



CIRCUIT DIAGRAM:



HARDWARE COMPONENTS:

- HC05 Bluetooth Module
- Heartbeat Sensor

SOFTWARE COMPONENTS:

- MIT App Inventor
- Arduino IDE

WORKING MECHANISM:

The whole health monitoring system can be divided into 2 parts-

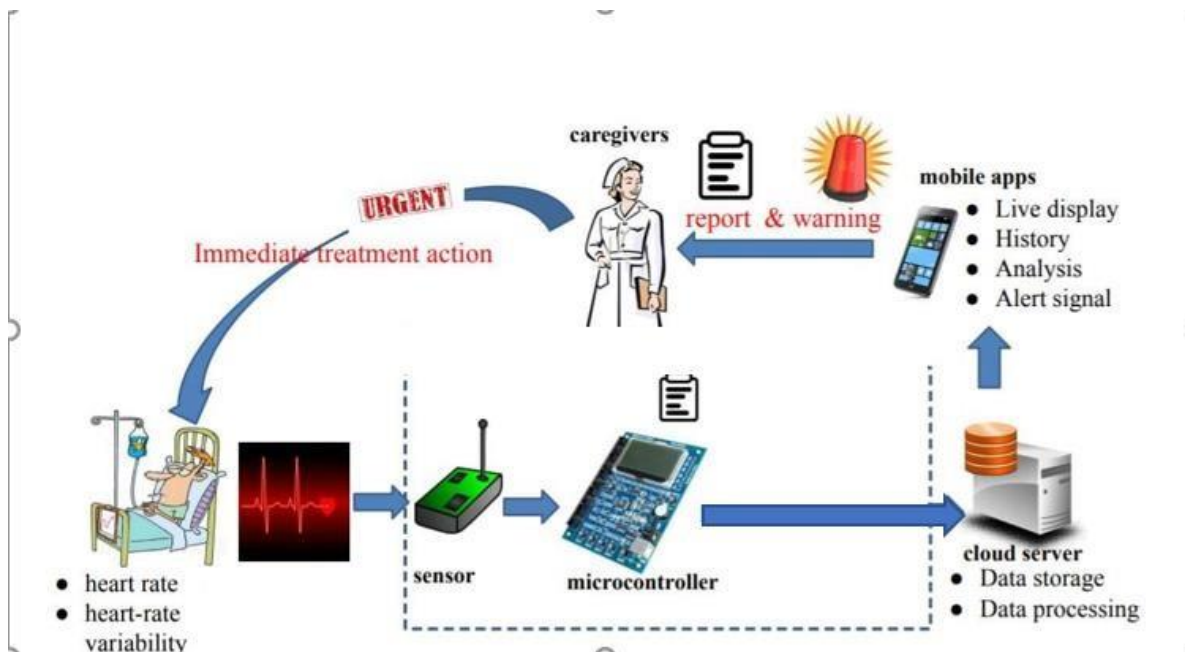
The first part being the hardware setup with microcontrollers, Bluetooth module and the pulse sensor, the second part being the application which is connected to the Bluetooth monitoring system.

- The person being monitored is in one bedroom
- Pulse Sensor straps around one finger or one toe; more likely to work with a finger than a toe.
- We have installed breadboard 2.5meter distance away from the bed, thus providing the wearer 2.5 meters of leeway.
- The person monitoring is in another bedroom
- The phone should remain connected to its charger throughout the night.
- The screen must be locked in vertical position.
- The screen saver timer needs to be set to a value superior to one minute.
- The distance between the phone and the breadboard should be inferior to 10 meters; the maximum distance may vary as a function of the building materials separating the circuit from the phone.

IMPLEMENTATION DETAILS:

We have implemented the whole system after combining all the required hardware components. We gathered all hardware components and assembled it in the implementation phase. All the sensors relate to Arduino uno using physical pins. HC-05 is used as a processing device. For all sensors, the V_{cc} and GND relate to the V_{cc} and GND pin of Arduino Uno. In the case of Bluetooth module, the RXD and TXD relates to D11 and D10 pin of Arduino. The data pin of pulse sensor is mapped with A0 pin of microcontroller.

FEATURES COVERED FROM IOT POINT OF VIEW:



RESULTS:

VIDEO LINK:

<https://drive.google.com/file/d/1dOya-sjhqcuD12UUATMxToGJ83XHi9OM/view?usp=sharing>

CONCLUSION

Biomedical engineering (BME) is the application of engineering principles and techniques to the medical field. It combines the design and problem-solving skills of engineering with medical and biological sciences to improve patient's health care and the quality of life of individuals.

A medical device is intended for use in the diagnosis of disease, or in the cure, treatment, or prevention of diseases.

We successfully created Bluetooth Heart Rate Monitoring System device and tested it on ourselves and it worked nicely and even gave an alarm when the pulse rate fell below threshold value and we can even modify this project in future.

This is a very cheap project and easy to carry anywhere so we can use this project in remote areas also as well as in our homes also. We can even try to even add more sensors to it like spo2 sensor and pass even ECG signals as our future work.

We will even try to make it more worthy so that it can be give more accurate real time readings.

We have even added a video in which we have performed real time pulse rate and heart rate monitoring and we have added features like alarm, vibration also.

FUTURE SCOPE:

The system introduced smart healthcare to monitor the heart rate. We can develop the above prototype as it is very simple to design and very efficient while using. The developed system will improve the current healthcare system that may protect lots of lives from death resulting from diagnosis on time. Our system looks somewhat bulky, but it will be a tiny device by which we make properly in future.

The video feature can be added for face-to-face consultation between the doctors and patients through a website. Some more measures which are very significant to determine a patient's condition like monitoring of various other health monitoring parameters such as, spo2 level, body temperature, level of diabetes, respiration monitoring, ECG signals monitoring etc. which we can do as future work.

- EEG, ECG and other health parameters can also be monitored.
- We can monitor patients continuously on a regular basis.
- We can use it monitor many patients located at different locations using one prototype.

REFERENCES:

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- [2] IoT Application Development Using MIT App Inventor to Collect and Analyze Sensor Data
- [3] M. A. Asghar, A. Musani, S. A. Ailia, M. K. Shaikh, Study And Control Of Bluetooth Module Hc-05 Using Arduino Uno, 2016.
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