

## Review of Pulse Monitoring System

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**Abstract :** Technology has evolved over the years and revolutionized our lives that have enabled the evolution of fields such as monitoring systems. This paper describes the development of a wireless heartbeat and monitoring system based on a Arduino at a reasonable cost with great effect. This paper describes a technique of measuring the heart rate through a fingertip and Arduino. Most monitoring system that are used today is a system must be designed so that patient can be monitored remotely in real time. The paper consists of sensors which measures heartbeat of a patient which is controlled by the Arduino. Both the readings are displayed in Application. The heartbeat sensor counts the heartbeat for specific interval of time and estimates Beats per Minute. Finally, the data are displayed in the Application at the receiving end.

**Keywords :** *Arduino Uno, Pulse Sensor, Message Triggering, Optoelectronics.*

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### I. INTRODUCTION

As the technology is evolving rapidly in 21st century so the stress level of mankind. Due to this , heart related diseases are prevailing in each category of age groups. Heart attacks are seen as the major cause of deaths in urban as well as rural areas.

Immediate and proper health treatment is very much essential for early cure of patient. But the presence of doctor with patient for round the clock is an unimaginable fact. So the remote monitoring of patients is the most accurate solution in today's scenario. Home bound and bedridden patients feel painstaking challenges nowadays.

Our overall perspective of this project is to mitigate these challenges faced by those patients through technical devices. We are going to build a typical model of a handy wireless device which will continuously monitor the heart beats of bedridden patients and also will trigger the emergency alert to doctors.

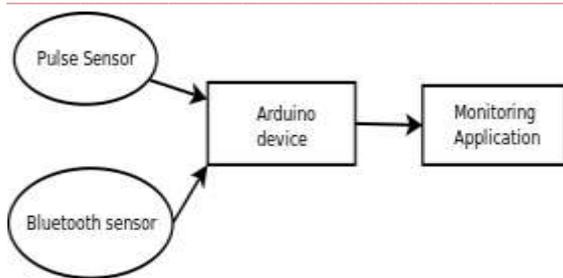
### II. EXISTING SYSTEM V/s PROPOSED SYSTEM

Heart beat measuring devices are available in abundance in the market. Such devices cost around INR 2500-3000. These systems scan the heart rate of patients and just display the result.

While on the other hand, our proposed system scans as well as sends this data to doctor. Furthermore, it also suggests some preliminary first aid measures in emergency condition. Manufacturing cost of this devise is around INR 800-1200. It is an assistive working prototype of a wireless device.

### III. SYSTEM ARCHITECTURE

Fig 1 shows the architecture of the system. Heart beat sensor and bluetooth module is connected to the Arduino. This arduino device is connected to the Mobile application. The communication link is established using bluetooth module. Further, application does the processing of the heart beats and triggers a notification about the results to the user. Application will send a message to the doctor in case of the heart rates measured are not normal. [4]



**Fig. 1 Architecture of Monitoring System**

**IV. SYSTEM IMPLEMENTATION**

For better understanding of the system, the system is divided into following sections:

- A. Monitoring unit
- B. Communication
- C. Application processing

*A. Monitoring Unit - Monitoring unit comprise of heart rate sensor and bluetooth device.*

**Pulse Sensor**

Pulse sensor is used to take input of heart beats of the users. User will place a finger on the sensor and the LED light of the sensor glows. This digital input is been passed to the arduino device which is further passed to the monitoring application through bluetooth. It works on the principle of optoelectronics. [1]

**Working**

In order to detect the heart beat, we will pass light using an LED from one side of the finger and we will measure the intensity of light received on the other side using an LDR. Whenever the heart pumps blood, more light is absorbed by increased blood cells and we will observe a decrease in the intensity of light received on the LDR. As a result the resistance value of the LDR increases. This variation in resistance is converted into voltage variation using a signal conditioning circuit usually an OP-AMP. The signal is amplified enough to be detectable by the microcontroller inputs. The count value of pulses per minute will give you the Heart rate in bpm (Beats Per Minute). [2]



**Fig. 2- Above figure represents pulse sensor**

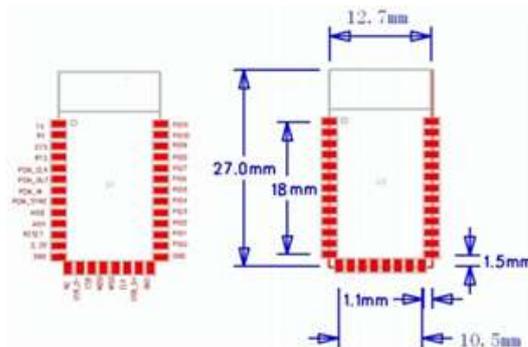
*B. Communication - Communication link is established between bluetooth module which is connected to arduino device and application developed for mobile. [3]*

**Bluetooth module**

HC-05 module is an Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). [5]

**Working**

In order to form the communication link between arduino and Monitoring application, bluetooth module is been used. This module takes the digital input from the arduino device and forwards the input to the monitoring application.



**Fig. 3 - Above figure represents the bluetooth module HC- 05**

*C. Application processing -*

Monitoring application is developed in android and is interfaced with the arduino device. Users are able to create their accounts in the monitoring app which will enable them to monitor the heart rates historically.

**Working**

Application takes digital input from the bluetooth module. Further it parse the input and displays the result in the desired format. Mobile application consists of several features. Some of the features are as follow :

- 1. Notification triggering
- 2. Preliminary first aid measures

➤ Notification triggering

Pulse sensor senses the heart beats and it sends this data to the mobile application. Further the application analyses the data and then triggers the emergency notification to the doctor and family members.

➤ Preliminary first aid measures

Mobile application also provides first aid solutions in emergency condition. It gives various solutions to the patient so that to alleviate the pain.

- Have the person sit down, rest, and try to keep calm

- If the pain does not go away promptly take nitroglycerin dose
- Do NOT give the person anything by mouth unless a heart medication (such as nitroglycerin) has been prescribed.

## V. RESULTS

Heart rate of patient is measured using pulse sensor and the data is processed by using monitoring application.

The measurement of result is shown in below table.

Heart rate measurement was performed on three subjects. Error percentage was calculated from obtained results. The maximum and minimum error percentage was found to be 5.55 and 3.48 respectively. The test results are shown in table 1.

**TABLE I**

The subject no.	Heart rate using pulse sensor (in BPM)	Heart rate manual measurement (in BPM)	Error (in %)
1	68	72	5.55
2	83	86	3.48
3	75	78	3.84

## VI. CONCLUSION

Heart related diseases are widely spread in today's world. Monitoring of such heart diseases is necessary to reduce the health risk. Pulse monitoring system would be a prominent solution for monitoring thus problem. Inclusion of technological instruments in medical treatment guarantees us for utmost efficiency and accuracy.

## REFERENCES

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- [5] Serial Port Bluetooth Module - [www.itead.cc](http://www.itead.cc)