

Android-Based Heart Monitoring Systems

Shraddha S. More¹, Dr. Rajesh Bansode², Anita Chaudhari³, Aruna Pavate⁴,
Brinzel Rodrigues⁵

¹(St. John College of Engineering & Management, India)

²(Thakur college of Engineering & Technology, Mumbai, India)

³(St. John College of Engineering & Management, India)

⁴(Atharva College of Engineering, India)

⁵(St. John College of Engineering & Management, India)

Abstract: Steady advances in wireless technology, medical sensors and interoperability of software creates exciting ways in improving the ways in which we provide emergency care. Nowadays Healthcare Atmosphere has developed technology oriented. People are facing a problem of unpredicted death due to the cause of a heart attack, which is because of absence of medical care to patient at the right time. So proposed system designed to avoid such sudden death rates by using Heartbeat sensor (HBS) technology. In this proposed system a patient will be carrying hardware having sensors and android phone will be contained an application, the sensors will sense the heart rate of the patient and these data is transformed to android smart phone via GSM modem. The device even allows the patient to move freely and can be monitored continuously. The android phone will be contained an application which will receive heart rate, according to the received data respectively, and if any abnormalities are found, then the message contains patient's heart rate will be sent to the patient's doctor.

Keywords: Heart rate, patient, Heartbeat sensor, GSM modem, Body temperature, Remote Monitoring.

I. Introduction

In today's world, the maximum use of resource is always complimented. So, the use of wireless technology is enhanced to meet the need of remote control and monitoring. Remote patient monitoring (RPM) is a technology that enables us to monitor patient outside of clinic or hospital without having to visit a patient. It may increase access to health services and facilities while decreasing cost. Remote Patient Monitoring saves time of both patient and doctor, hence increasing efficiency and reliability of health services. Heartbeat and body temperature are the major signs that are routinely measured by physicians after the arrival of a patient [1]. Heart rate refers to how many times a heart contracts and relaxes in a unit of time (usually per minute). Heart rate varies for different age groups. For a human adult of age 18 or more years, a normal resting heart rate is around 72 beats per minute (bpm). A lower heart rate at rest implies more efficient heart function and better cardiovascular fitness. Babies have a much higher rate than adults around 120 bpm and older children have heart rate around 90 bpm [2]. This paper describes the system which is based on telemedicine which uses telecommunication and IT to provide efficient medical facility to the patients. This application is very useful for the medical staff which is not qualified enough to take critical decisions of the patients during emergencies in the physical absence of the doctor. In this application the medical information of the critical patient is fed into the server and this information is automatically synchronized into the Database. The information which is fed into the database is acquired by the doctor who is on the move and can monitor the status of the patient. The heart rate of the critical patient are fed into the database. In case of an emergency these reports of the patients who require an immediate medical attention are provided to the doctor. All this information about the critical patient is accessed by the doctor using an android application on his/her smartphone and take necessary steps. Previously patients suffering from critical heart illness had to go to their respective doctors at their clinic or hospitals for their routine checkup for their corresponding treatment.

If the doctors were not available in the hospitals then the patients were not able to get their appropriate treatment. Due to this the death rate had increased by approximately 25%. Therefore in order to provide better medical healthcare facilities to the patients, we have built the project based on telemedicine which allows the medical staff to provide the patients critical parameters to the doctor on his android enabled smart phone. Following problems faces by peoples in daily life, People find it difficult to seek medical help at the time of emergencies, especially for the patients who are located in remote places. The manual procedure to seek help from the doctors present in other hospitals is time consuming. Due to lack of medical facility in remote areas it becomes difficult to treat the critical patients without the guidance of the doctor. Thus we have developed this application to provide an immediate response to the patients at the time of emergencies. This application is

developed so that the patient is able to seek treatment even in the physical absence of the doctor and irrespective of the patient's location. In our Proposed scheme is founded on Heart beat device(HBS). Sensors are linked to the hardware and attached to the patient's body. Using sensors values of heart rate sensed and these values are sent to the android mobile phone. Android application collects heart rate and these values are analyzed for guessing heart attack.

II. Related Work

In 2014, C. K. Das, M. W Alam and M.I.Hoque [3] describes the development of a wireless heartbeat and temperature monitoring system based on a microcontroller at a reasonable cost with great effect. Most monitoring systems that are in use in today's world works in offline mode but it is of great need that a system must be designed so that patient can be monitored remotely in real time. They have used sensors which measures heartbeat and body temperature of a patient which is controlled by the microcontroller. Both the readings are displayed in LCD monitor. Wireless system is used to transmit the measured data to a remote location. The heartbeat sensor counts the heartbeat for specific interval of time and estimates Beats per Minute while the temperature sensor measures the temperature and both the data are sent to the microcontroller for transmission to receiving end. Finally, the data are displayed in the LCD at the receiving end.

In 2016, Sharanabasappa Sali¹, Pooja Durge, Monika Pokar and Namrata kasge [4] designed to measure heart beat (pulse count), by using embedded technology. ALSO simultaneously it Can measure and monitor the patient's condition. IT describes the design of a simple, low-cost controller based wireless patient monitoring system. Heart rate of the patient is measured from the thumb finger using IRD (INFRA-RED Device sensor).Pulse counting sensor is arranged to check whether the heart rate is normal or not. So that a SMS is sent to the mobile number using GSM module interfaced to the controller in case of abnormal condition. A buzzer alert is also given. The heart rate can be measured by monitoring one's pulse using specialized medical devices such as an electrocardiograph (ECG), portable device e.g. The patient heart beat monitoring systems is one of the major wrist strap watch, or any other commercial heart rate monitors which normally consisting of a chest strap with electrodes. Despite of its accuracy, somehow it is costly, involve many clinical settings and patient must be attended by medical experts for continuous monitoring.

In 2014, Paola[9] Describes Importance Of Heart Monitoring not only in sports but in medical research and diagnosis purpose. Observation of heart function, accurate identification of cardiac states, and interference of heart sickness are essential goals. The electrocardiogram (ECG) is the gilt standardized method to find cardiovascular normality. In 2017,Maria Islam[10] described the design of an integrated portable device that can monitor heart rate (HR) continuously and send notifications through short message service (SMS) over the cellular network using Android application is presented. In situations where there is an absence of doctor or clinic nearby (e.g., rural area) and where the patient cannot realize their actual poor heart condition, is where our implemented system is of paramount importance.

In 2017,Satavant Kumar[11] Described the heart rate monitor, body temperature measurement, displaying and data-collecting at android mobile device. Heart rate, heart rate variability and temperature of the body are considered as vital signs for health of the human beings, which are crucial parameters that may be measured regularly every time at the time of illness. It makes heart rate a significant property of cardiovascular system.

Liangliang CHENG[12] Described The incidence of cardio-cerebrovascular disease is high, if the abnormal heart rate can be detected in time, the patients can be quickly rescued at the time of onset. Based on Bluetooth Low Energy (BLE) technology, this paper develops a portable, low-power heart rate meter. The heart rate monitoring system contains two parts: the heart rate data collection end and the mobile phone App. After the heart rate is acquired by the sensor, processed through the hardware filter and software filter, it is sent to the Android mobile phone by Bluetooth 4.0 wireless transmission technology

III. Proposed System

If the doctors were not available in the hospitals then the patients were not able to get their appropriate treatment. Due to this the death rate had increased by approximately 25%. Therefore, in order to provide better medical healthcare facilities to the patients, we have developed this application to provide an immediate response to the patients at the time of emergencies.

The proposed system is based on Heartbeat sensor (HBS). Sensors are connected to the hardware and attached to the patient's body. Using sensor values of heart rate sensed and these values are sent to the android mobile phone. The Android application takes the values and these values are analyzed for predicting heart attack. This application is developed so that the patient is able to seek treatment even in the physical absence of the doctor and irrespective of the patient's location.

In Our system android application is connected to the hardware via Web service, data is received from hardware, Data received displayed on application i.e. heart rate. This data is analyzed for predicting heart disease. For guess of heart illness threshold values for heart rate is set. When the heart rate will be lower or overhead the threshold value, communication is sent to doctor's recorded number. A message is sent which contains patient's heart rate count with the time and date when it is measured.

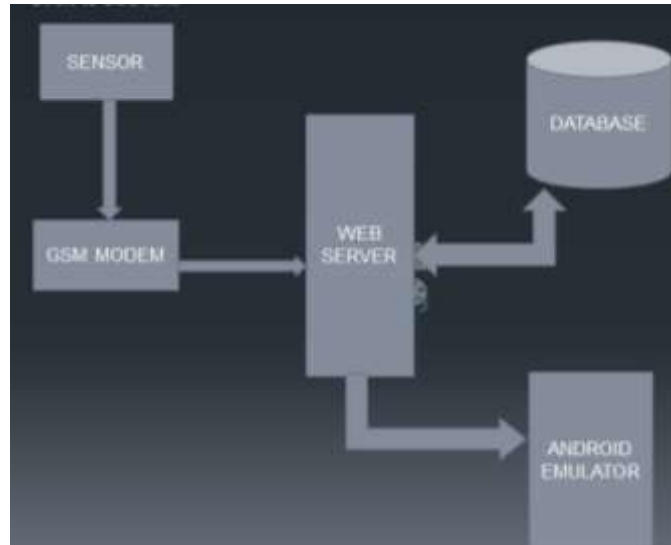


Fig 1: System Architecture

In the proposed system, first the doctor has to register into the application. After getting the registered user have to enter the user id and password into the Android application which is installed on the mobile device and submit it to the server if it's valid then he can see the heart rate of the patient and then it will send to the doctor to the mobile device using SMS. Then after analysis of data accordingly feedback prescription will be sent to the user.

Data Description:

dbo.Admin_Login

Column name	Data type
Admin_id	Int
Username	Varchar(50)
Password	Varchar(50)

Dbo.Threshold_Master:

Column name	Data type
id	Int
MinValue	Varchar(50)
MaxValue	Varchar(50)

HeartRateMonitor.Readings:

Column name	Data type
id	Int
Reading	Varchar(100)
DateAdded	Datetime

IV. Experimental Results

The system implementation is divided into following phases:

1. The android application is connected to the hardware via Web services. First the doctor will visit the application then to login he have to enter the user id and password on mobile device, if its valid then the unique then he can move further or else he has to register himself and then stored in database. After getting the registered user ,they have to enter the user id and password into the Android application which is installed on the mobile device and submit it to the server if its valid then he can see the heart rate of the patient and then it will send to the doctor to the mobile device using SMS. Then after analysis of data accordingly feedback prescription will be send to the user.

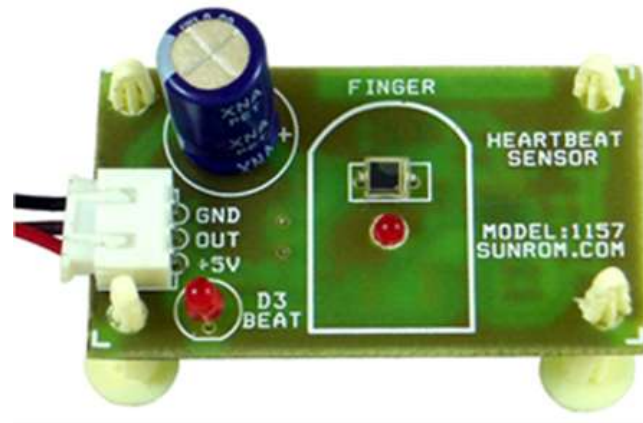


Fig 2: Heartbeat sensor

2. Data received from the hardware is displayed on the application which is shown in fig. 3 i.e. heart rate pulse. This data is analyzed for predicting heart attack. For prediction of heart attack threshold values for heart rate is set. When the heart rate will be below or upper the threshold value Notification is sent to the patient's relatives, doctor's and hospital's registered number. The Notification contains patient's heart attack parameters and location. Location is tracked via GPS. The application contains the IP address of server to which we want to send the data for graph plotting. The server comprises database also doctor can checked chart of heart rate for their suitability. The server also contains a database for telemedicine part.

Product perspective ,In this we investigates the feasibility of heart rate (HR) & breath rate(BR) using a cell phone camera without using external sources. This works by placing index finger over camera thus phone acquires PPG signal & from that HR is estimated using peak detection algorithm. Each user and doctor will be having id which can be used for the login and for entering details etc. whenever user or doctor login to system, authentication process has done by server. If doctor is not registered then register they can enter detail and register. The details store in database. In case of retrieval of records and ordering made, much of human intervention can be eliminated.

By using Android Based Heart Rate Monitoring System , we are able to provide the patients from remote location to seek medical help. The patient is able to measure his heart rate with the help of hardware , if the patients heart rate goes below or above the threshold value set by the doctor, the doctor will get a notification and then provide appropriate feedback to the medical staff.

The software provides good graphical interface for the user any Operator can operate on the smartphone, performing the required task such as sending, receiving, update, viewing the data information.

- User can send or received data from other devices
- Heart rate analysis and search for doctor facility based on different criteria.
- Provide Security

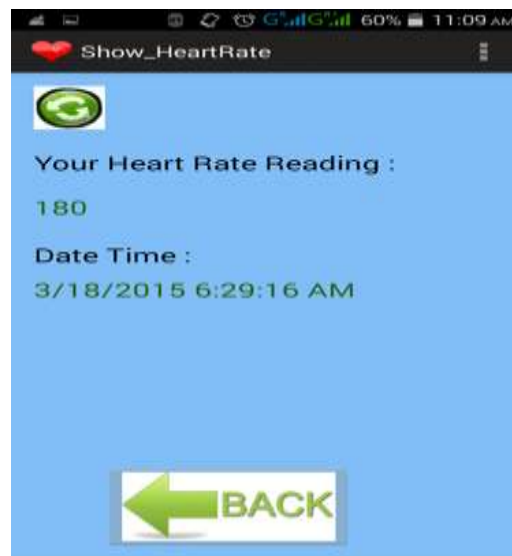


Fig 3: Hear rate reading

The constrain of our research is each user and doctor will be having id which can be used for the login and for entering details etc. whenever user or doctor login to system, authentication process has done by server.

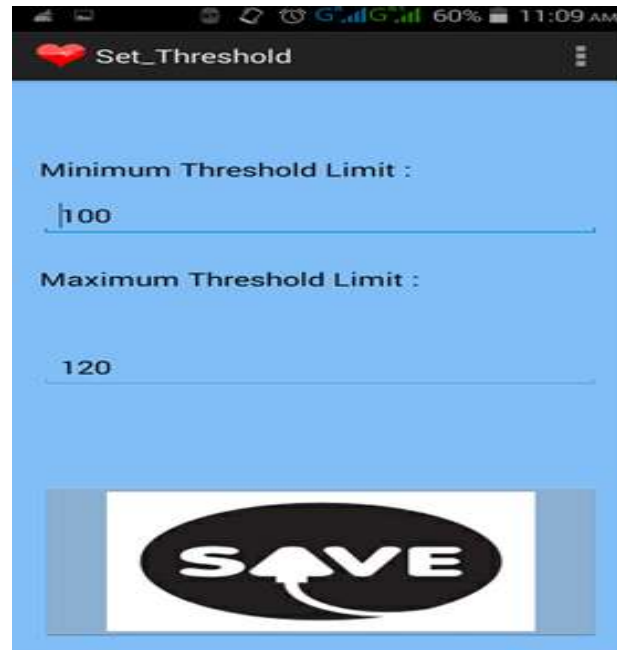


Fig 4: Setting threshold

If doctor is not registered then they can enter detail and register. The details store in the database. In case of retrieval of records and ordering made, much of human intervention can be eliminated.

V. Conclusion and Future Work

Proposed system 'Android Based Heart Monitoring System' is developed with the help of the Android Open Source Platform. The system is very usable for the patient as the patient can go wherever he wants along with the system. Also the parents and doctors will ensure the patient's safeties as if any problem occurred, the system will immediately inform them. Also, it is useful for the doctor as he can check each detail of patient whenever necessary. As the system is movable there is no longer need to stay in hospitals for patient. So he will be in real-life. We are developed model of this application using the constant monitoring of parameters to confirm and expect the heart attack and generate Notification alerts. Because of the availability of portable monitoring devices this application can be used in very great extent. The further addition to this system, would include collecting other critical parameters of the patient, such as ECG, Temperature, Blood pressure, etc. Also the location of the patient will be traced and accordingly a list of nearest hospitals, medical centers will be provided. Also the application will be made platform independent. In future we will use different prediction algorithm.

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