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GSM Based Heart attack Detection and Heart Rate Monitoring System

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ABSTRACT

In this work we are implementing a heartbeat monitoring and heart attack detection system using the Internet of things. These days we have an increased number of heart diseases including increased risk of heart attacks. The sensor is then interfaced to a microcontroller that allows checking heart rate readings and transmitting them over internet. The user may set the high as well as low levels of heart beat limit. After setting these limits, the system starts monitoring and as soon as patient heart beat goes above a certain limit, the system sends an alert to the controller which then transmits this over the internet and alerts the doctors as well as concerned users. Also, the system alerts for lower heartbeats. Whenever the user logs on for monitoring, the system also displays the live heart rate of the patient. Thus, concerned ones may monitor heart rate as well get an alert of heart attack to the patient immediately from anywhere and the person can be saved on time.

Keywords:Electrocardiogram, Photoplethysmogram, Global system for mobile, AC to DC Convertor

1. INTRODUCTION

The heart is one of the most important organs in the human body. It acts as a pump for circulating oxygen and blood throughout the body, thus keeping the functionality of the body intact. A heartbeat can be defined as a two-part pumping action of the heart which occurs for almost a second. It is produced due to the contraction of the heart. When blood collects in upper chambers, the SA(SinoAtrial) node sends out an electrical signal which in turn causes the atria to contract. This contraction then pushes the blood through tricuspid and the mitral valves; this phase of the pumping system is called diastole. The next phase begins when the ventricles are completely filled with blood. The electrical signals generating from SA node reach the ventricle and cause them to contract. This phase of the pumping system is called systole. The tricuspid and mitral valves are closed tightly to prevent the backflow of blood; the pulmonary and aortic valves are opened. Once the blood moves from the pulmonary artery and aorta the ventricles relax and the pulmonary and aortic valves close. Tricuspid and mitral valves open because of the lower pressure from the ventricles leading to the start of another cycle. In today's scenario, health problems

related to heart are very common. Heart diseases are one of the most important causes of death among men and women; it claims approximately 1 million deaths every year. Heart rate is a critical parameter in the functioning of the heart. Therefore, heart rate monitoring is crucial in the study of heart performance and thereby maintaining heart health.

The blood pressure, an important physiological parameter of the human body, is also a vital indicator in clinical care and even daily health care. In the modern society with rich material lives, high blood rate is continuously increasing. At the same time, people attach more and more importance to their health and hope that they can know their health conditions at any time for preventing various diseases. Therefore, safe and simple-to-use blood pressure monitors become common home blood pressure measuring tools [1]. Currently, two common kinds of blood pressure monitors in the market are mercury column blood pressure gauge and electronic blood pressure monitor. This paper focuses on electronic blood pressure monitor.

With the development of modern medical equipment, intelligent medical treatment gradually becomes a trend. Relying on the Internet of things, it is a health care information platform that achieves interaction between patients, medical personnel, medical institutions and medical devices over a wireless network. The main idea of the design is collecting users' vital signs data by using sensors like vital signs detection equipment, then transferring the data over a wireless network to a remote service platform. After this, the data center on the platform will do the comparative analysis of the data. Meanwhile, according to the data indicators, the doctor will provide remote users with medical treatment and health management [2,3]. With the continuous development of intelligent medical treatment, more and more intelligent health monitoring products will continue to emerge, and this research is to cater for this opportunity.

2. EXISTING SYSTEM

Designing of a continuous smart health monitoring system is the hot topic for researchers. A remote healthcare monitoring system has more advantages for those who are living in rural areas and not able to reach the hospital center on time and from the other aspect, the strain on hospital medical resources like doctors, patients, and wards would also have decreased. The continuous healthcare monitoring system is generally relying on wireless sensor network which decreases the rate of energy consumption and extend the coverage area for communication [10]. According to [11], smart healthcare monitoring and giving more attention to people health is the difficult tasks that people must be aware of. The development of sensors has brought huge facilities to the hospital environment. Sensor is used for the evaluation of different signs like ECG, motion, temperature, blood pressure and heart beating. Besides WSN, RFID technology is also used to localize equipment in hospitals [11]. Wireless localization network is used to monitor the patient's present conditions and track the inner side area of the patient [8]. The three main standards WSN, RFID, and GSM are utilized jointly to check sick people in healthcare center, as well as supervise their psychological status. A healthcare platform that are using these three technologies for patients to monitor them in actual time is explained in [12]. 6LoWPAN is another smart technology which is used to screen the healthcare of patients and provide a few smart healthcare monitoring services [13]. Constrained application protocol (Coap) also playsa key role in connection and monitoring of medical sensors. The adoption of CoAP inhuman services play an outstanding role, since the CoAP worked in highlights like, resource monitoring (particular advantageous for continuous checking of sick people' essential signs) and disclosure empower a dynamic condition where the accessible resources are directly found and designed [13]. Received signal strength indicator (RSS) and particle filters on which localization and tracking system relay while bi-axial accelerometers are utilized to categorize the patient's movement conditions [14]. Moreover, the different technologies and technological standards used for data access and storage, visualization and healthcare analysis techniques are essential parts of a continuous healthcare structures. The development of electronic healthcare monitoring platform has changed the traditional way of healthcare method, compromise IOT into these systems which have increased adaptability, intelligence, and interoperability [15]. The modern smart phones have the ability to generate continuous healing monitoring services by customizing the related applications. Not at all like the UHF-RFID standards, has the utilization of sense network given the sick people the power to be

checked in a progressively proficient way at the cost of sophisticated functions and required for their exact examining and monitoring. Furthermore, in the literature review some of the proposed IOT architectures for healthcare monitoring are also discussed: In [16], a model proposed for the implementation of an "IOT based smart healthcare kit" which used for immediate medical situations that provide assistance to services. INTEL GALILEO second generation board was used which could collect data from the sensors touched to patients and were able to send the data over the internet for further temperature clarification and LM35 sensors were used for patient record. In [17], a paper has described proposed model "Implementation of a healthcare monitoring system using Raspberry pi". The primary purpose of this model was to track temperature of patient body and the heartbeat of sick one at runtime. Physical parameters are concentrated and many users can access it. B+ model of Raspberry pi is used, through which healthcare parameters are focused and supervised. In [18], system is discuses as "K-healthcare" that has the four main layers such as internet, network, sensors and service layers. It has sensors like Raspberry Pi, Arduino, smart phones, RTX-4100, and pulse oximetry and IEEE 802.15.4, 802.15.6, IEEE 802.11/b//g/n, ZigBee are used for communications between layers. Cloud storage is used by the system to manage data storage.

3.PROPOSED SYSTEM

The block diagram of Heart Monitoring system is as shown in figure 1. This system consists of four modulus which are pulse sensor, ECG sensor, microcontroller and GSM section pulse sensor has direct contact with human body or y the use of human finger. The output of this pulse sensor is given to the microcontroller section which will run the heart monitoring algorithm feed into it. After the execution of program, it will send heart pulses to the cloud which will require wi-fi module and as the system uses WEMOS microcontroller so it will bypass the use of external wi-fi module in the system. WEMOS has inbuilt wi-fi, and when it is programmed, it will automatically send information on the cloud server and when the heartbeat is detected too low or too high other than the safer heartbeats, then GSM module will get activated and will send an alert SMS to the number which already has been feed into the system. hence the life of the person can be saved.

3.1 WEMOS Microcontroller

WEMOS is a microcontroller board. This board is a compressed version of the Arduino board. There are less number of pins in WEMOS board compared to the Arduino and this board is provided with the wi-fi module inbuilt in it. It is an Arduino compatible microcontroller.

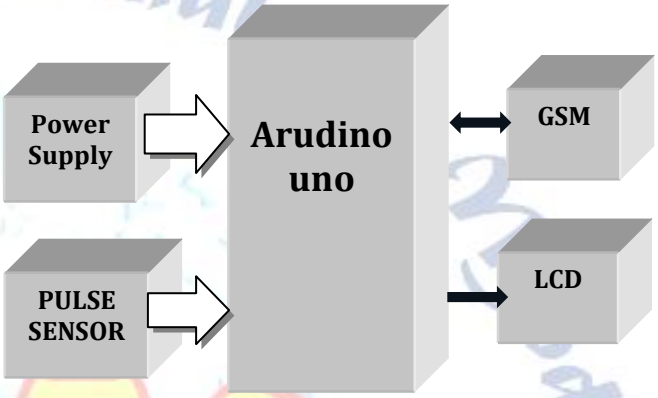

Figure 1: Block Diagram of Heart Monitoring System

Heartbeat sensor monitor the heartbeat rate of a person continuously, monitor heartbeat rate and send message to microcontroller. After receiving message from heartbeat sensor, microcontroller executes necessary action. The LCD display with 16x2 configurations is used to user to know the status. By using the module, data will be uploaded into the Thing speak server.

4. RESULTS& DISCUSSION

After setting up the system, check all the connections. Once the system is ready upload the source code. After uploading the code place the index finger on the heartbeat sensor. The heartbeat sensor will start monitoring the pulse rate. LCD is used for displaying the calculated pulse rate. The system has configured maximum range of heart beat. Once the system starts measuring the Human heart beat, if it crosses the set limit then the system will send alert about heart rate. Also, the system alerts for lower heart rate. The reading from sensor will be sendto GSM. After setting these limits person can start monitoring the heart beat and whenever the person's heart beat goes above certain set point, they can get an alert on high heart beat and also about chances of heart Attack. Also, the system alerts for lower heartbeat.

Figure 2: Heart beat monitoring system using GSM

Table1 shows the heart beat rate of five persons. It is measured and analyzed using heart beat monitoring system. The data are tabulated and compared with the standard value. The health condition report is stored in the database and transmitted to the user's mobile phone using GSM modem.

Table1:Record of heart beat rate

S.No	Person's Age (Years)	Heart Rate (Beats/min)
1	21	70
2	22	71
3	20	67
4	23	71
5	22	69

Cardiovascular disease is one of the major causes of untimely deaths in world, heart beat readings are by far the only viable diagnostic tool that could promote early detection of cardiac events. By using this we can measure one's heart rate through fingertip. This paper aims on the monitoring of heart rate and an alert message system. The system determines the heart beat rate per minute and sends short message service (SMS) alert to the user's mobile phone. It is cost effective and portable. It is an efficient system and thus provides greater flexibility and serves as a great improvement over conventional monitoring and alert systems. The continuous monitoring allows doctors to predict any abnormal conditions in the heart. a. It also finds applications in the medical industry and biomedical engineering.

This project is designed to alert the family members of patient,if the patient's heartbeat goes above or below the predetermined value then it will be informed to the family members via SMS. It fulfills the objective to detect and monitor patient's heartbeat rate using PPG technique, interfaced with GSM modem and sends alert to the family or medical experts via SMS. For Knowing exact condition of heart ECG sensor will help and the electrical pulses of the heart can be seen on lcd screen. By analyzing the output waveform of ECG sensor patient can be provided with proper treatment. This system is particularly use for the measurement of heartbeat of human being. This system is not useful for hospital room but also it is useful to home, office, gymetc.

5. CONCLUSIONS

Till now, we have reviewed various pieces of literature and demonstrated the model for a continues healthcare monitoring that ensures a consistent checking of different healthcare parameters and expectation of any sort of sickness or confusion that keeps the patient from paying more attention to visit the healthcare centers. The various systems that we have analyzed from the literature review and the proposed prototype architecture show that the IOT based designs provide more accuracy and ability to progressive track the patient healthcare conditions from any locations in real time. The paper also discussed the main components of the system such as raspberry pi, sensors, and modules. The proposed framework can be setup in the healing centers and a huge amount of information can be acquired and put away in the online database. It will be possible to access the patient record through Smartphone, tablet, and iPhone by using applications. Even though it is a prototype model, but prove that we can implement it in the real world.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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