Heart Rate and Growth Measurement with Abnormality Detection And Send Emergency Alerts To Relatives and Ambulance

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ABSTRACT

In the real world, patient has to be monitored by the person present in the home or by the helpers. There is no automatic alerting system being implemented so far. In this paper, the condition of the Patient is fully monitored with the help of Arduino Heart Beat, Temperature and vibrations Sensors that are connected through wireless communication. These sensors, senses the various parameters of the patient and those parameters are monitored by an android phone connected through Bluetooth communication. In case of any emergency Mobile GPS is automatically triggered and the message is sent to the Server via mobile GSM. The Server will calculate the nearest path to reach the Ambulance and also sends an alert SMS to
the relatives.

Keywords— *IoT(Internet Of Things), Arduino, Android, Wireless sensors,Bluetooth*

I. INTRODUCTION

Several million people are disabled by cardiovascular disease. Cardiovascular disease is one of the main causes of death in many countries and thus it accounts for the over 15 million deaths worldwide. The delay between the first symptom of any cardiac ailment and the call for medical assistance has a large variation among different patients and can have fatal consequences. One critical inference drawn from epidemiological data is that deployment of resources for early detection and treatment of heart disease has a higher potential of reducing fatality associated with cardiac disease than improved care after hospitalization. Hence new strategies are needed in order to reduce time before treatment.
Heart attack is one of the major health problems which is rising all over the world. It has been estimated that every year, nearly 1 million people in the United States have heart attacks, and many of them die. Heart attack is the leading killer of both men and women throughout the world. According to World Health

Organization (WHO) nearly 24% of Indian population suffer from heart attack. . One half of the victims of sudden cardiac death are under the age of 65. By 2020, heart attack will be the leading cause of death throughout the world. Many more people might have recovered better from heart attacks if they have been rendered faster service. Among the people who suffer from severe heart attacks many of them lose their life within an hour of the first symptoms and before they reach the hospital. Our proposed system provides a solution which renders quick service to the patients who are in great need. It prevents patients from being hospitalized and serves the patients at remote areas who are away from the hospital and for those patients who are alone. The health care application is of two types: wearable and implanted. The wearable devices are placed on the surface of the surface of the human body or just close to the user. Whereas for the implantable medical devices are inserted inside the human body. At both the types, the patient is monitored by an expert system.

II. EXISTING SYSTEM

Firstly, the SFH7051 produces analog output in accordance with the contraction and relaxation of the heart. The output of the SFH7051 will be in terms of milli volts and cannot generate a logic HIGH by itself. Hence we cascade the HSF7051 along with an amplifier capable of generating a logic HIGH during the contraction of the heart and a logic Zero during the relaxation of the heart. By doing so we are converting the analog values to a digital bit stream. The advantage

of using the amplifier is the elimination of analog to digital converters and additional controllers. As a result of this design, a compact, low power design is obtained. Secondly, ESP8266 comes in various models. Depending on the model,

the number of GPIO pins varies. Our design makes use of the ESP8266-01 which has only GPIO0 and GPIO2. The ESP8266 supports wireless connection. It is connected to the user's wireless router for its proper functionality. GPIO2 is made as input and the heartbeat bit sequence is read by the ESP8266. The ESP8266 is programmed to determine the heartrate using the bit sequence. It monitors the heartrate continuously for any discrepancies. If found, it uses Simple Mail Transfer Protocol to immediately send an Email to the user's family and the concerned doctor to take necessary action. If this discrepancy occurs because of the user's negligence of taking the medication on time, the master device alerts the user to take the medication on time every time. The entire system is made to run on CMOS 3v battery to reduce the size and make it wearable.

III. PROPOSED WORK

Heart related diseases are increasing day by day; therefore, an accurate, affordable and portable heart rate and body temperature measuring device is essential for taking action in proper time. Such a device is more essential in a situation where there is no doctor or clinic nearby (e.g., rural area) and patients are unable not recognize their actual condition. The developed system of this study consists of Arduino NANO microcontroller system, transmission system and Android based application. Heartbeat rate means the number of heartbeats per unit time, usually expressed as beats per minute (bpm). The human heart pounds to pump oxygen rich blood to the muscles and carry cell waste products away from the tissues. Heartbeat rate can vary according to the demand of the muscles to absorb oxygen and excrete carbon dioxide changes such as during exercise or sleep. It also varies significantly between individuals based on age, fitness and genetics. This means that the heart must beat faster to deliver more oxygen rich blood. During exercise routines, the heartbeat rate gives a strong indication of how effective the exercise is to the body.

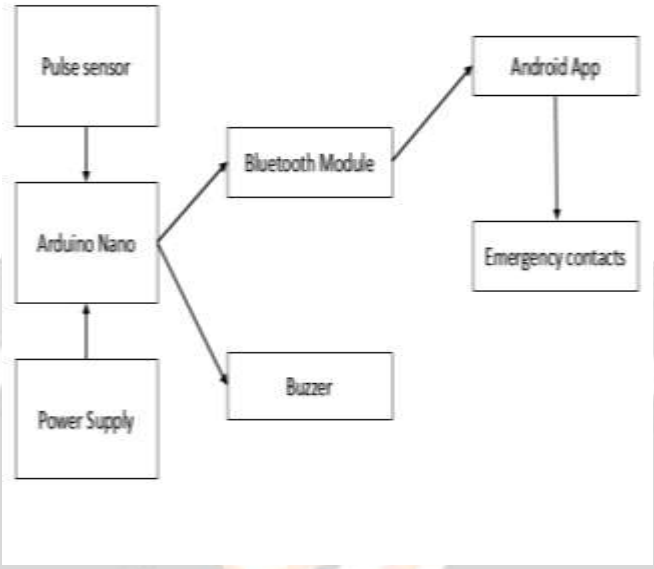
The patient monitoring systems is one of the major improvements in the global health care program because of its advanced technology. A patient monitoring system measures the heartbeat and body temperature by using embedded technology. This advancement in technology is highly needed because many sick patients at the hospitals die because of high fever and heart attacks. The trend of cardiovascular disease has shown that heart beat rate plays a key role in determining the possibility of a heart attack while an increase in the body temperature can induce fever on a patient. Heart diseases such as heart attack, coronary heart disease, congestive heart failure, and congenital heart disease are the leading causes of death for men and women in many countries. Most of the time, the aged people of the society are more prone to heart disease problems than the younger ones. For people who live alone with no one to monitor their health condition, this device offers an opportunity to them for a constant monitoring of their health status, it is developed to monitor and alert the doctors about the heartbeat and temperature condition of a patient. It is developed to give patients a timely and proper healthcare.

These days it is not easy for doctors and the nurses to remain close to a patients bed side to monitor their health condition. In the past, a huge and fixed monitoring device was used (only in the hospitals) to know the health status of a patient when on a bed. These monitoring devices are only available in the hospitals and are constantly on the patient's body. Many of them are not user friendly so it is important that the doctors and family members will have a handy device that can always monitor their patients when they are not around. One of the vital things to monitor on a patient is the body temperature. This has to do with the measurement of the body's ability to generate and get rid of heat. Temperature monitoring is one of chief indicators of the normal functioning of health. The nature of the human body is to keep its temperature within a narrow, safe range in spite of large variations in temperatures outside the body. Normal human body temperature depends upon the place in the body, from which the measurement is made, and the time and level of activity of the person. The typical body temperature is 37.0 °C ± 0.4°C (98.6 ° F ± 0.7°F). When the body temperature is high, the blood vessels within the skin expand (dilate) to carry the excess heat to the patients skin surface. One may begin to sweat, and as the sweat evaporates, it helps to cool his/her body. When one is too cold, the blood vessels narrows (contracts) so that blood flow to the skin is reduced to conserve body heat. This may cause an involuntary shivering in some people due to cold which is a rapid contraction of the muscles. This extra muscle activity helps to generate more heat. Under normal condition, thus keeping one's body temperature within a narrow, safe range. Body temperature is regulated by neural feedback mechanism which operate primarily through the hypothalamus. The hypothalamus contains not only the control mechanisms, but also the key temperature sensors. Under control of these mechanisms, sweating begins almost precisely at a skin temperature of 37°C and increases rapidly as the skin temperature rises above this value. The heat production of

the body under these conditions remains almost constant as the skin temperature rises. If the skin temperature drops below 37°C a variety of responses are initiated to conserve the heat in the body and to increase heat production. These includes: Vasoconstriction to decrease the flow of heat to the skin, Cessation of sweating, shivering to increase heat production in the muscles, Secretion of norepinephrine, epinephrine, and thyroxin to increase heat production.

Another vital thing to monitor in a patient is the heartbeat rate. It is very important that the heartbeat is to be normal. That is 72 BPM. If there is any abnormality, then the patient is in distress. Heartbeat rate means the number of heartbeats per unit of time. The normal heartbeat rate of a resting person is about 70 bpm for adult males and 75 bpm for adult females.

The average heartbeat per minute for 25-year old ranges between 140-170 beats per minute while for a 60-year old it is typically between 115-140 beats per minute and body temperature is 37 degree Celsius or 98.6 Fahrenheit. . Normally it is difficult to keep track of the abnormalities in the heartbeat count of by manual means. Patients are not well versed with the manual treatments, which the doctors normally use for tracking the count of the heartbeat. Thus, there must be some kind of device which would help patients and their family member to keep track of their health by themselves. This sole reason is why this project presents a heartbeat and temperature monitoring device using radio frequency (RF.). The concept of developing an RF. based patient monitoring device is to have a simple home and hospital based pulse and body temperature monitoring device for sick person's that are in critical condition and needs to be constantly or periodically monitored by clinician or family.

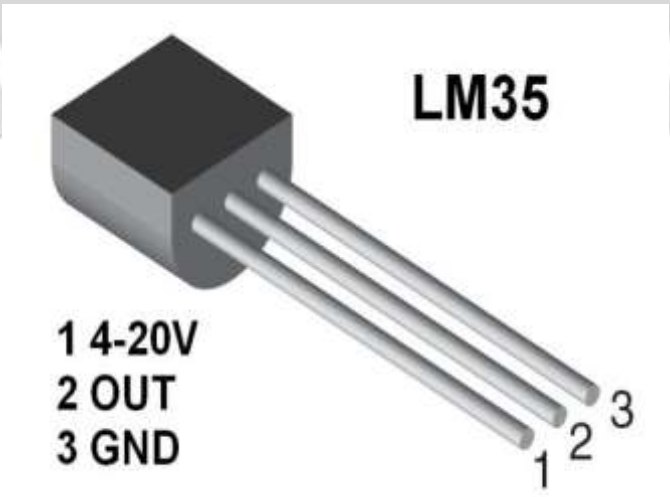


Dia. Block Diagram

A) Power Supply Unit

This unit was developed around, built and incorporated in the Arduino Nano board. The power supply source for the system would be mains AC. The circuit would use a 9V DC.

B) Temperature sensor



Dia.Temperature sensor

There are different temperature sensors available. In our system we use LM35 to measure the body temperature of the patient. LM35 is an integrated circuit temperature sensor that is capable of measuring temperature more accurately with an electrical output proportional to the temperature in degree Celsius. The sensor is sealed so it will not be subjected to any oxidation. When the sensor is touched an output voltage is generated corresponding to the temperature in degree Celsius.

C) The Pulse Sensor Unit

Dia.Pulse Sensor

A Heartbeat sensor is a monitoring device that allows one to measure his or her heart rate in real time or record the heart rate for later study. It provides a simple way to study the heart function. This sensor monitors the flow of blood through the finger and is designed to give digital output of the heartbeat when a finger is placed on it. When the sensor is working, the beat LED flashes in unison with each heartbeat. This digital output can be connected to the microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

The Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It also includes an open-source monitoring app that graphs your pulse in real time.

III.Algorithm

Step 1 : Initialize variables H1,D1
Step 2 : Read current analog heartbeat data
Step 3 : Convert analog value to digital
Step 4 : Check if value exceeds specified limit
D1 <Abnormal_LOW_Heart_Rate
OR
D1>Abnormal_HIGH_Heart_Rate
Start Buzzer
Send Emergency Message data write command on serial Bluetooth
Step 5: delay 100ms
Step 6 : Go to step 1

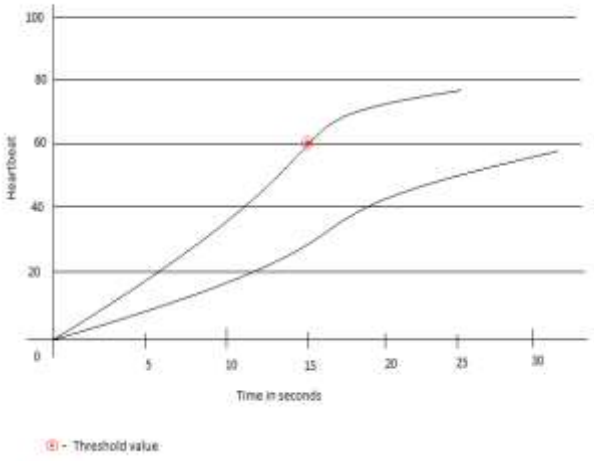
V. Software Implementation

In the software part, an android application is developed to look after the readings of the sensors. Android SDK provides the developers with a rich set of tools such as emulators, libraries and debuggers. Android application can be developed with the help of eclipse using plug-in called Android Development Tools (ADT).

The android application constantly running on the mobile phone looks after the readings from the sensor and checks whether the temperature or heart beat goes beyond the normal rate. If such case arise the application will automatically trigger the GPS and trace the location of the patient. The server will search for the nearest ambulance service based on the location of the patient. Thereby sending alert message the caregiver about the condition and location of the patient.

VI .Results

This research is to construct the heartbeat measurement, which used embedded system and pulse sensor techniques as shown in system architecture. This preliminary study will be composed the system design, analysis, testing, implementation, and performance evaluation. The research illustrates the efficiency, accuracy, quantity of subjects, and good results. This prototype is accuracy 95% by comparison between our prototype and commercial. The master prototype can be developed the commercial product.



VI. Future Scope

WSN is expected to play a vital role in the future of wireless and communication technology. This paper mainly aims to implement wireless sensor network to form a patient monitoring system and take necessary actions under critical conditions. This application offers a lot of scope, in the future by integrating more number of sensors. And also other systems like intrusion detection or object finding can be integrated with this system.

VII. Conclusion

The key idea of developing this module is to provide timely help to the patient and elderly people in critical situation. An alert message about patient's condition is sent to the caregiver for immediate help. A prototype of the system has been successfully designed and tested for the same.

VIII. REFERENCES

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