

Patient Health Monitoring System using Arduino – IOT application

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Abstract

Now-a-days Health care Environment has become technology oriented. Humans are facing a problem of unexpected death due to the reason of heart attack which is because of lack of medical care to patient at right time. So we are developing project to avoid such sudden death rates by using Body Health Monitoring. In this system a patient will be carrying hardware having sensors and android phone application, the sensors will sense the body temperature and heart rate of patient and these data is transferred to android smart phone via Bluetooth/Wi-fi. System has the cloud database which stores all information about patients health and the Doctors will prescribe medicine using this information stored on cloud. Device even it allows patient to move freely and can be monitored continuously. The android phone will be containing an application which will detect the heart attack according to the received data respectively and if any abnormalities are found regarding heart attack message will be send to patients doctor, relatives and hospitals. The SMS contains patients situation and location (via GPS) to provide urgent medical attention.

Index Terms - Ardino Uno Board, Internet Of Things, Cloud Computing, Heart rate sensor, Body temp sensor, Healthcare system, Android, GPRS.

I. Introduction

Hospitals always need better management. The database of all patients should be handy enough. But also, there should be data prevention. Also the patient data should be kept private in case. Healthcare is the most important concern of many countries in the world. Improving the lives of patients especially in the weaker parts of the society which include the elderly, physically and mentally disabled as well as the chronically ill patients is the major factor to be improved. In existing system, the data is recorded in the form of paperwork or on general storage server. But generally that data is accessible to all the staff and doctors. Hence we are proposing a new way where patient and doctors able to communicate through mobile application and web application. In hospitals there are provisions for continuous monitoring of patients. Their heartbeats are continuously monitored. There is no provision to check the parameters when they return to home. And hence there is a chance that the disease may return again. Patient's data (temperature, heart rate, position) will be frequently measured and sent to server. Period of sending (say every 3 min) can be set. Monitoring person learns patient specific threshold. Say the regular body temperature of a patient is 37.0°C whereas one person feels feverish if his body temperature is 37.0°C. By employing an averaging technique over a relatively long time, Observer can learn these thresholds for patients. Using Android Application in doctor's smart phone, doctor can view his patient's health status. When any of the parameter goes beyond the threshold value he will get an alert notification

In this project, we are monitoring various parameters of the patient using internet of things. In the patient monitoring system based on Internet of things project, the real-time parameters of patient's health are sent to cloud using Internet connectivity. These parameters are sent to a remote Internet location so that user can view these details from anywhere in the world.

There is a major difference between SMS based patient health monitoring and IOT based patient monitoring system. In IOT based system, details of the patient health can be seen by many users. The reason behind this is that the data needs to be monitored by visiting a website or URL. Whereas, in GSM based patient monitoring, the health parameters are sent using GSM via SMS.

This is one of the Latest Electronics application related to Medical applications which engineering students can select as their final year project. One more benefit of using IOT is that, this data can be seen using a desktop computer, laptop, using an Android smartphone comma using a tab or Tablet. The user just needs a working Internet connection to view this data. There are various cloud service providers which can be used to view this data over Internet. Things speak, Sparkfun and IOTGeek are few famous and easy to use service providers among these.

II. Related work

The area of health in recent years has been rapidly integrating technology in the monitoring, diagnosis and treatment of patients remotely and in situ. Thus achieving to improve the quality of life of patients and greater traceability of information from them. Most studies reviewed point to a chronic disease monitoring in particular as in which are responsible for the first remote monitoring of vital signs and the second of a telemedical ECG system of a patient. All these systems although quite complete is your scenario, include individual problems with regard to the treatment of some diseases that affect human being in the economic and social. Is a very important way to develop a comprehensive solution where no matter what kind of disease, the type of check, the different units to be handled this can become a possible solution for sequential monitoring of these patients. Other systems such as those proposed are fixed in the IoT bring advantages in terms of perception, transmission and application of information in the field perspectives of health and medical care. Enabling smart, an accessible and communication system based on IoT hosting segments such as: medical equipment, information management control medication of patients, telemedicine, mobile medical care, and personal health management, among others.

III. Working of the Proposed system

IOT patient monitoring has 3 sensors. First one is a temperature sensor, second is Heartbeat sensor and the third one is humidity sensor. This project is very useful since the doctor can monitor patient health parameters just by visiting website or URL. And nowadays many IOT apps are also being developed. So now the doctor or family members can monitor or track the patient health through the Android apps. To operate

To operate IOT based health monitoring system project, you need a WiFi connection. The microcontroller or the Arduino board connects to the Wi-Fi network using a Wi-Fi module. This project will not work without a working WiFi network. You can create a WiFi zone using

a WiFi module or you can even create a WiFi zone using Hotspot on your smartphone. The Arduino UNO board continuously reads input from these 3 senses. Then it sends this data to the cloud by sending this data to a particular URL/IP address. Then this action of sending data to IP is repeated after a particular interval of time. For example in this project, we have sent data after every 30 seconds.

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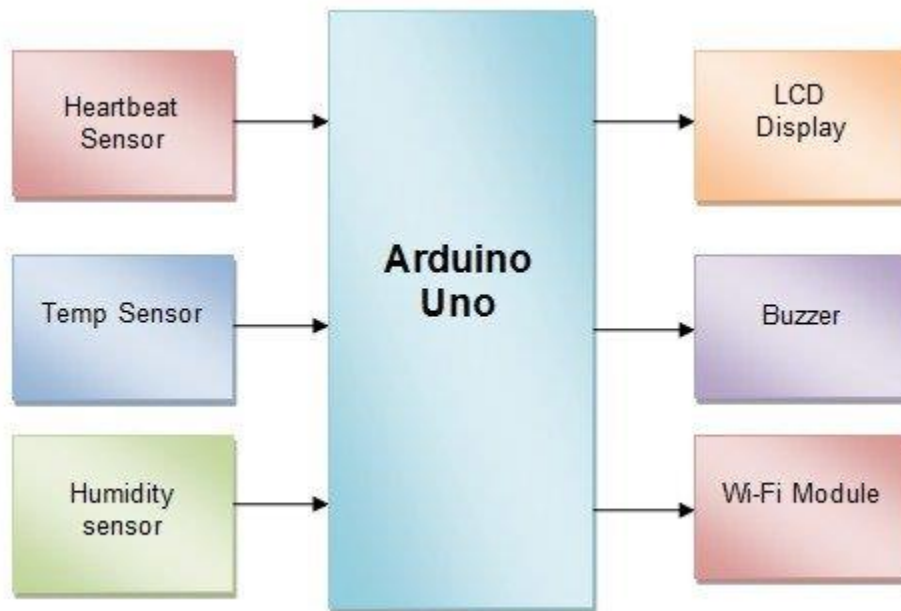


Figure 1. Block Diagram of IOT based health monitoring.

The Lm35Temperature(Thermo) Sensor: The LM35 series are precision integrated circuit LM35 temperature sensors, whose output voltage is linearly proportional to the temperature in Celsius (Centigrade). The LM35 sensor thus has an advantage over linear temperature sensors, calibrated in °Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. The LM35 sensor does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^{\circ}\text{C}$ at room temperature and $\pm 3/4^{\circ}\text{C}$ over a full -55 to $+150^{\circ}\text{C}$ temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. As it draws only $60\ \mu\text{A}$ from its supply, it has very low self-heating, less than 0.1°C in still air.

Heartbeat Sensor(ECG) Sensor: Heart beat sensor is designed to give digital output of heart beat when a finger is placed inside it. This digital output can be connected to Arduino directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger each pulse. IC LM358 is used for this sensor. Its dual low power operational amplifier consists of a super bright red LED and light detector. One will act as

amplifiers and another will be used as comparator. LED needs to be super bright as the light must pass through finger and detected at other end. When heart pumps a pulse of blood through blood vessels, finger becomes slightly more opaque so less light reach at the detector. With each heart pulse, the detector signal varies which is converted to electrical pulse.

IOT Applications and Applications of this project

This is an important sensor based project which has the latest technology implemented in it. And it has many applications & advantages as mentioned below.

- 1) IOT Healthcare is the most demanding field in the medical area. This project is for, elderly person in our home. Also for the senior citizen living alone or living with 1 or 2 members. This project really proves helpful when family members need to go out for some emergency work.
- 2) Disable patients can use this project. Disable patients who find it really difficult to go to doctors on daily basis or for those patients who need continuous monitoring from the doctor.

Advantages

- 1) IOT Monitoring proves really helpful when we need to monitor & record and keep track of changes in the health parameters of the patient over the period of time. So with the IOT health monitoring, we can have the database of these changes in the health parameters. Doctors can take the reference of these changes or the history of the patient while suggesting the treatment or the medicines to the patient.
- 2) Hospital stays are minimized due to Remote Patient Monitoring.
- 3) Hospital visits for normal routine checkups are Minimized.
- 4) Patient health parameter data is stored over the cloud. So it is more beneficial than maintaining the records on printed papers kept in the files. Or even the digital records which are kept in a particular computer or laptop or memory device like pen- drive. Because there are chances that these devices can get corrupt and data might be lost. Whereas, in case of IOT, the cloud storage is more reliable and does have minimal chances of data loss.

Experimental Setup



Figure 2. Experimental setup

This hardware setup gives us the development of a microcontroller based system for wireless heartbeat and temperature monitoring using Wi-Fi module. By this we can easily provide real time information available for many users and can send them alert in critical conditions over internet. In India many patients are dying because of heart attacks and reason behind this factor is that they are not getting proper help during the period. To give them timely and proper help first we want to continuous monitoring of patient health. The fixed monitoring system can be used only when the patient is lying on bed and these systems are huge and only available in the hospitals in ICU.

CONCLUSION

From this proposed system, it is conclude that Wireless sensor technology is emerging as a significant element of healthcare services. In this proposed system a mobile physiological monitoring system is presented, which is able to continuously monitor the patients heart beat, blood pressure and other critical parameters in the hospital. The system is able to carry out a long-tem monitoring on patients condition and is equipped with an emergency rescue mechanism using SMS.

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Biography

Athira G Krishna received her BTech degree in Electronics and Communication Engineering from Cochin University of Science and Technology(CUSAT),Kerala (2001)and her MTech degree in VLSI System Design from JNTUH, Telangana(2010).She has been in the teaching field for the past 16 years(2002-2018) as Asst. Professor in ECE department in



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