PATIENT MONITORING SYSTEM USING IOT

Abstract:

The Internet of Things (IoT) is intercommunication of embedded devices using networking technologies. The IoT will be one of the important trends in future; can affect the networking, business and communication. In this paper, proposing a remote sensing parameter of the human body which consists of pulse and temperature. The parameters that are used for sensing and monitoring will send the data through wireless sensors. Adding a web based observing helps to keep track of the regular health status of a patient. The sensing data will be continuously collected in a database and will be used to inform patient to any unseen problems to undergo possible diagnosis. Experimental results prove the proposed system is user friendly, reliable, economical.

Keywords: ArduinoUno, heartbeat sensor, temperature sensor, patient, illness.

1. INTRODUCTION

The Internet of Things is the internetworking of physical devices, vehicles buildings and other items. Embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. Our matter of concern in this project is to focus on the development and implementation of an effective healthcare monitoring system based on IoT.

The proposed system monitors the vital health parameters and transmits the data through a wireless communication, which is further transferred to a network via a Wi-Fi module.

The data can be accessed anytime promoting the reception of the current status of the patient. In case any abnormal behavior or any vital signs are recognized, the caretaker as well as the doctors are notified immediately through a message service or an audio signaling device (buzzer).

In order to design an efficient remote monitoring system, security plays an important part. Cloud computing and password protected Wi-Fi module handles authentication, privacy and security of patient details by allowing restricted access to the database. Hence the system provides quality healthcare to all. This paper is a review of Healthcare Monitoring system using IoT.

1.1 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals.

The Arduino Uno has 14 digital input/output pins (of which 6can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

1.2 Features of the Arduino Uno Board:

• It is an easy USB interface. This allows interface with USB as this is like a serial device.

• The chip on the board plugs straight into your USB port and supports on your computer as a virtual serial port. The benefit of this setup is that serial communication is an extremely easy protocol which is time-tested and USB makes

connection with modern computers and makes it comfortable.

• It is easy-to-find the microcontroller brain which is the ATmega328 chip. It has more number of hardware features like timers, external and internal interrupts, PWM pins and multiple sleep modes.

• It is an open source design and there is an advantage of being open source is that it has a large community of people using and troubleshooting it. This makes it easy to help in debugging projects.

• It is a 16 MHz clock which is fast enough for most applications and does not speeds up the microcontroller.

1.3 Heartbeat Sensor

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the lightintensity through that organ (a vascular region).

In case of applications where heart pulse rate isto be monitored, the timing of the pulses is more important. The flow of blood volume is decidedby the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

1.4 Two Ways to Measure a Heartbeat

Manual Way: Heart beat can be checked manually by checking one's pulses at two locations- wrist (the radial pulse) and the neck (carotid pulse). The procedure is to place the two fingers (index and middle finger) on the wrist (or neck below the windpipe) and count the number of pulses for 30 seconds and then multiplying that number by 2 to get the heart beat rate. However pressure should be applied minimum and also fingers should be moved up and down till the pulse is felt.

Using a sensor: Heart Beat can be measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heart beat changes.

1.5 LM35 Temperature Sensor

Temperature is one of the most commonly measured parameter in the world. They are used in your daily household devices from Microwave, fridges, AC to all fields of engineering.

Temperature sensor basically measures the heat/cold generated by an object to which it is connected. It then provides a proportional resistance, current or voltage output which is then measured or processed as per our application.

2. EXISTING SYSTEM

The healthcare system, which is further worsened by the lack of tools for communication between thespecialists, stimulates theneed of functional interoperability to ameliorate this coordination. A major aspect in the healthcare system is the monitoring of the patient's vital signs such as temperature, and heart rate.

2.1 Disadvantages

- The doctor couldn't be alerted in time when there is an emergency, despite of 24 hours of monitoring.
- The data couldn't be shared remotely with the other doctors who are specialists in that field and the family members.
- Technology that enables all these activities are available but aren't accessible and affordable by manypeople in developing nations.

3. PROPOSTED SYSTEM

To monitor different ECG values automatically, updating the database of website continuously and alerting the doctors by a message. Message is sent to doctors

through the GSM module connected to RS232 serial port and alerting the people there through a buzzer connected to GPIO pins. MySQL dB module has been used to update the website database continuously.
A display monitor can be connected to IoT through HDMI port and the website can be examined directly.

3.1 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.

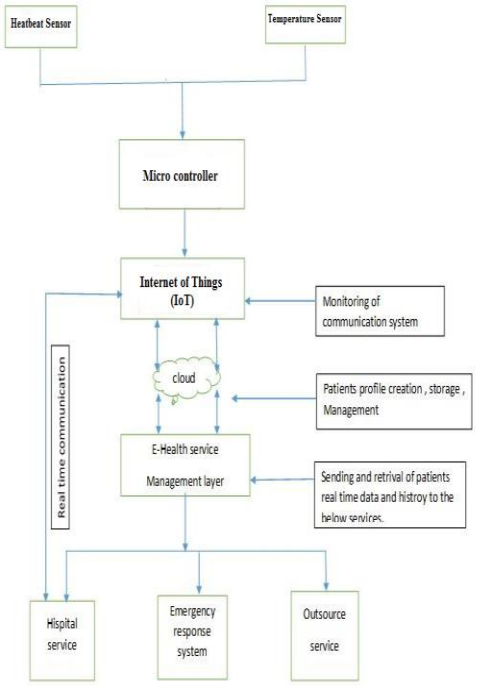
3) Hospital visits for normal routine checkups are minimized.

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, he cloud storage is more reliable and does have minimal chances of data loss.

4. SYSTEM ARCHITECTURE

The sensors Temperature and Heartbeat are connected to the Arduino board. The values from the Microcontroller are given to the Web Server using IoT. The parameter values can be viewed bydoctors usingWebsite.



5.WORKING PRINCIPLE

1. Processing Unit
2. The Lm35Temperature (Thermo) Sensor:
3. Heartbeat Sensor
4. Web Login
5. Monitoring the Patient’s Data

5.1 Processing Unit

In our system Arduino Uno Board is used. The microcontroller is connected with all other hardware units in the module. This module takes analog parameters from the sensors attached to patient, Process it and convert them in digital output. This module also contains IoT device which sends the sensors converted data to the Cloud.

5.2 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 ±¼°C at room temperature and ±¾°Cover a full -55 to +150°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 µA from its supply, it has very low self-heating, less than 0.1°C in still air.

5.3 Heartbeat Sensor

Heart beat sensor is designed to give digital output of heat 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.

5.4 Web Login

Web login module is the cloud platform for connecting hardware and software solutions to remotely monitor, control, and automate processes for healthcare Applications. The Cloud server has three distinct components: storage, analytics, and visualization. The system is designed for long term storage of patient's biomedical information as well assisting health professionals with diagnostic information. Here we are using the real time cloud platform for monitoring the patient's information. To monitor the data, the user have to login with their account which is already configured with our IoT Devices.

5.5 Monitoring the Patient's Data

This is the Visual Interface module, which makes regular web server invocations. Doctor can remotely track both Heartbeat and temperature sensor values of the patient. Connecting healthcare devices with patients to central IoT platforms monitor by using cloud server. The Doctor can track the patient's record both numerical and graphical data. By using the graphical data, doctor can easily diagnose the patient's health condition. Meanwhile the doctor can check the history of the patients. So that, whenever the doctor wants to see the patient's old data, he/she can easily track the record which is stored in the cloud server.

5.6 Doctor's prescription

In this module, the doctor receives patient's profile from the Cloud server and identifies the problem. The doctor can set the threshold value for the patient's heart beat and temperature data after diagnosing the patient's health condition. If the patient temperature/heartbeat is crossing the threshold value, the medicine information will be automatically send to patient's guardian mobile and nearby medical center mobile, so that the patient can receive and intake the medicine whenever they need. The doctor can change the medicine information and medical center number Doctor will set the auto medical prescription in the web server according to the patient's health.and threshold

values of the patient's health data whenever he wants.

ALGORITHUM

- IoT is installed with an operating system, Arduino supports all programming languages like C, Dotnet etc. Programming language is used for the communication with ECG machines and updating website databaseusing MySQL db.
- Import all the modules required for Serial Communication, MySQL db.
- Communicate with the ECG's connected to Arduino.
- Find the heart beat from the input data.Update the website database with new health parameters.
- Check if the heart beat is in the normal range.
- If heart beat is not in normal range alert the authorized person by sending SMS through GSM module andalert in the hospital through buzzer sound.
- Delete the message in SIM card to make space.
- If heart beat is in normal range monitoring continues.

6. CONCLUSION AND FUTUREWORK

Developed a system that measures and detect Human Heartbeat and body temperature of the patient, sends the data to user or server end by using microcontroller with reasonable cost and great effect. Use two different sensors and these are mainly under the control of microcontroller. For Human Heartbeat measurement use fingertip, it's in bpm (beats per minute). These calculated rates will have stored in server by transferring through Wi-Fi module via internet. liquid crystal display (LCD) has been used to display the calculated human heart beat rate.

To measure the human body temperature, use LM35 sensor, the measured data is given to transmitter module, it interns transfer these data to server through wireless system due to this notice avoided use of wires. Finally, the stored data in server will be displayed for further analysis by physician or specialist to provide better aid. From Experimental results, proposed system is user friendly, reliable, economical. Further research work can be carried out for the following issues:

- In Real-time heath monitoring system using ARDUINO can be integrated or implemented in hardware using various types of sensors to detect the human-health conditions of the patients in critical sites continuous Observing of health can be made and the data's will be stored in database.

- In future, a portable Human-Health monitoring system can be designed using Arduino

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