**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM 59014**



Internet of ThingsProject Report on

**“HEALTH MONITORING SYSTEM”**

By

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Under the Guidance of

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IoT Application Development carried out at



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2019-2020

**BMS College of EngineerinG**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



***CERTIFICATE***

This is to certify that the Internet of Things project titled “**HEALTH MONITORING SYSTEM**” has been carried out by **Namratha V (1BM17CS151), Ramyashree B V (1BM18CS416), Sanjay M S (1BM18CS418) and Yashita P Jain (1BM17CS152)** during the academic year 2019-2020.

Signature of the guide

**Antara Roy Choudhury**

Assistant Professor

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**Examiners**

**Name Signature**

**1.**

**2.**

**BMS College of EngineerinG**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**



***DECALARATION***

We, **Namratha V (1BM17CS151), Ramyashree B V (1BM18CS416), Sanjay M S (1BM18CS418) and Yashita P Jain (1BM17CS152)** students of 5thSemester, B.E, Department of Computer Science and Engineering, BMS College of Engineering, Bangalore, hereby declare that, this IoT Application development work entitled " **HEALTH MONITORING SYSTEM** " has been carried out

by us under the guidance of **Antara Roy Choudhury**, Assistant Professor, Department of CSE, BMS College of Engineering, Bangalore during the academic semester Aug-Dec 2019.

We also declare that to the best of our knowledge and belief, the development reported here is not from part of any other report by any other students.

Signature

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**INTRODUCTION**

Health is one of the global challenges for humanity. In the last decade the healthcare has drawn considerable amount of attention. The prime goal was to develop a reliable patient monitoring system so that the healthcare professionals can monitor the patients, who are either hospitalized or executing their normal daily life activities. Recently, the patient monitoring systems is one of the major advancements because of its improved technology.

Health is always an important concern. However, the health of modern people is always interfered by various potential but dangerous factors, such as high blood pressure, and abnormal heart rate. High blood pressure, also called hypertension leads to major risk factors for stroke, myocardial infarction, heart failure aneurysms and peripheral arterial diseases.Low blood pressure leads to weakness, dizziness and lack of oxygen in the body. Normally resting heart rate for an adult ranges from 60 to 100 beats a minute. Although there’s a wide range of normal, an unusually high or low heart rate may indicate an underlying problem. Fluctuation in body temperature(hypothermia or hyperthermia) other than normal body temperature range weakens the immune system of the body and lead to a failure of the respiratory system.

In order to monitor health indicators regularly at home, we design a low-cost health monitor system that can measure heart rate and body temperature and alert the family members during an emergency.

**OBJECTIVE**

Our project aim is to design and build a health monitor that can measure heart rate and body temperature and then display the test results on a computer screen. The device is consisted of three major parts: analog circuit,software Python coding and Raspberry Pi3B+. The goal is to integrate all the circuit elements, so that all the health indicators can be measured through the sensors continuously in a real time system and the health condition of a person can be tracked continuously.

**LITERATURE SURVEY**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.No** | **Name of the Project or Product (Existing)** | **Commercial or Non-Commercial** | **Features** |
| **1.** | Automatic Wireless Health Monitoring System | Non-Commercial | The main goal of this project is to monitor the temperature of the patient’s body and display the same to the doctor using RF technology. |
| **2.** | **Health Monitoring System using Arduino** | **Non-Commercial** | The main goal of this project is to monitor the blood pressure of the patient’s body and display the same to the doctor and using RFID tags and Internet Protocols. |

**1.Automatic Wireless Health Monitoring System**

The main goal of this project is to monitor the temperature of the patient’s body and display the same to the doctor using RF technology**.** The required components used in this system include a power supply, an 8051 microcontroller, a temperature sensor, an RF TX, an RX module and an LCD display. The 8051 microcontrollers are used as a CPU for monitoring the temperature of the patient’s body.

The advantages of the automatic wireless health monitoring system mainly include the following.

* Associating the gap between the patients and the doctor
* Best to be used in rural areas for multipurpose. So that all the conditions are simply measured
* Operation of this device is very simple
* It gives a good performance when we compare it with a compact sensor.

The drawbacks of the automatic wireless health monitoring system :

* The project could have been enhanced by using different parameters such as retinal size, BP, weight etc.
* Advanced technologies like GPS and GSM were not used.
* RF distance and the sensors must be contacted to patients only.

**2.Health Monitoring System using Arduino:**

**The main goal of this project is to monitor the temperature,heart beat and pulse rate of the patient’s body and display the same to the doctor and other gaurdians using RFID tags to access the patient’s door and Internet protocols . A way** to collect the patient’s details and store it within the cloud information victimisation IOT. The IOT device contains differing types of detectors like cardiogram sensor, BP sensor, LM35 sensors to scan numerous details.Arduino board,GSM/GPRS module and ADC is also used.

The advantages of the Health Monitoring System using Arduino mainly include the following:

* The family members , guardians and the doctor are alerted via a mail or message if the patient’s health condition becomes critical and can even check the patients condition online.
* Operation of device is very simple and inexpensive.
* It is a real time system.

The disadvantages of the Health Monitoring System using Arduino mainly include the following:

* Arduino is used ,which is why there is a huge cost when Internet Protocols are implemented.
* The doctor can only view patient’s health condition online,but cannot add comments as to what has to be done in such a case when he/she is not around.
* RFID tags are used which can be sensed only at a short RF range and only those who have these tags have the access to the patient’s room.
* If the patient’s condition is not that critical,then he might have the devices at home as well instead of going to the hospital.

**PROPOSED PROJECT**

Health Monitoring System is a remote healthcare process and a project built to measure and monitor the body temperature and pulse rate parameters of a patient at home using Internet of Things on a Raspberry PI 3B+ and some hardware and software components. This system has a Patient, a Doctor and family members as its participants.

Cloud is thought for its logical information storage of digital information. This information will be served to multiple purchasers at a time. The physical surroundings is managed by the holding organization. The cloud service suppliers area unit liable for providing the information to be on the market all the time and it ought to be accessible from anyplace. The physical surroundings should be in an exceedingly running state. the information security is additionally taken care by the hosting organization. The users will read this information any time. In this project, The real-time parameters of the patient’s health are sent to the cloud using internet connectivity and are sent to remote internet location so that the users (family members, concerned doctor) can view these details from anywhere in the world. The data is monitored by visiting a website or URL.

Along with the sensors and the hardware part, two communication methods are used- one is using a GSM module to alert the users by sending an SMS, if the patient’s health condition is getting worse(such as low or high BP or Hypothermia or Hyperthermia), and other is an SMTP protocol for the doctor to communicate with the other users,that is,family members and the patient himself, when he/she wants to communicate about treatment schedules, drug dose information, health-relevant statistics,via an e-mail.

The raspberry pi3B+ module has an inbuilt Wi-Fi module which can be used for Wi-Fi connectivity to upload the real time data of the sensed values of body temperature and pulse rate to the cloud.

**Feature and its advantage**

**Features of using a health monitoring system are:**

* **Users can view the constant monitoring of data in the system which gets automatically updated to the cloud via cell phone or any other electronic device.**
* Physicians or doctors prescribe medicines to the patients remotely and the System can send reminders on the patient and other family members as a notification via an email. The family members can then take care of purchasing the medicines and giving it to the patient as prescribed.
* Participants are able to review dynamics of changes in their characteristics and the prescription history of the patient even when they are not around.
* Theh message is automatically sent to the user if the patient’s health condition becomes critical.

Advantages:

* Health Monitoring System proves really helpful and advantageous 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.
* Hospital stays are minimized due to Remote Patient Monitoring at home itself.
* Hospital visits for normal routine checkups are Minimized as the doctor notifies the users when the patient has to be taken to the hospital.
* 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.
* The system is portable and the health conditions can be monitored all the time without any tedious process.
* It is cheaper than the existing solutions as the system is long lasting and is of low cost in terms of time. This system is multifunctional as it mesures to health parameters at the same time.

**Hardware and Software Requirements**

**Hardware requirement**

**Any electronic device which has a display screen,such as laptop, is required as a hardware to connect it with the raspberry pi3B+ module. For hardware part, we initially use MCP3008 (10-bit resolution with SPI serial interface) as the ADC for the entire project. This is connected to the Raspberry PI 3B+ module which is the heart of the project. The analog values from the respective sensors are sensed are are converted to digital values and sent to the raspberry pi for further analysis. TMP36 is used as a temperature sensor and PLSNSR1 is used as the pulse sensor to detect the body temperature and pulse rate of the patient. All the hardware requirements once met, have to be integrated on a breadboard using jumper wires.**

**List the Component used**

* **Raspberry PI 3B+ module**
* **MCP3008 ADC**
* **GSM sim900a**
* **TMP36 (Temperature Sensor)**
* **PLSNSR1 (Pulse Sensor)**
* **Jumper wires**
* **Bread Board**
* **USB cable (c-type)**

**Do cost analysis {separately}**

**Software Requirements**

**For the software part, we design to plot a graph of the temperature rate and pulse rate against time by accessing the real time data that is sensed from the respective sensors by running the python program that is coded in Thonny Python IDE in Raspbian OS. The plotted graph is seen by signing in to the cloud.**

**OS**

**A linux OS(Ubuntu 19.04) is used as an interface between the Raspbian OS (on the Raspberry pi 3B+ module) and the users. Raspbian OS is used for the project work.**

**IDE**

**Thonny Python IDE in Raspbian OS is used to code the program in Python Proramming Language.**

**Any cloud used:**

**Thingspeak is used as a Cloud communication platform to show the graphs that have been plotted based on the real time data collected from the sensors.**

**SMTP protocol is used for the doctor to communicate with the patient and its family members via an e-mail.**

**Design**

**Architectural diagram or Circuit diagram**

**Explanation about your design { interaction between elements}:values an**

**In our project, we use temperature and pulse sensor which measures the body temperature and pulse rate of the patient. These sensors are the primary inputs of the project. These sensors are connected to the respective pins and channels of ADC MCP3008 through the jumper wires on the bread board. The ADC converts the input sensed analog values to output digital values and sends it as an input to the raspberry pi 3B+ module’s by connecting it’s pins to the GPIO pins of the module through jumper wires. Basic GND and 3.3V connection is done beforehand. When the python program for the Health Monitoring System is run, the raspbian OS then sends the obtained real time data values to the terminal window and to the cloud as well. The graph is plotted for the respective sensors which can be seen on the cloud platform (here, we have used thingspeak.com) . A GSM sim 900a module is connected to the raspberry pi3B+ module via its 5V and GND connection. The TX and RX pins of GSM module is connected to the RX and TX pins of the raspberry pi module respectively. If the sensed data for any sensor is sensed below or above the range of average data, then an SMS is sent to the users.**

**Implementation**

**Steps to be followed to execute your project:**

1. Setup the circuit as shown in the circuit diagram.
2. Git clone the python files from the \*githublink\* to the Thonny Python IDE.
3. Run the code Health\_Monitoring.py and simultaneously attach the pulse sensor and temperature sensor on the patients’s body. Login to your thingspeak.com account, if you wish to
4. After a certain delay, the values will be

**Source code**

**Result**

**Conclusion**