Wireless Heart Rate Overseeing System

P.Jayaseelan[1], H.Lokesh[2], P.Madhan Krishna[3], S.Nagaraj[4], S .Jeya Anusuya[5], M,Krishnamoorthy[6]
[1, 2, 3, 4, 5, 6]Dept of Electronics and Communication Engineering
[1, 2, 3, 4, 5, 6] T.J.S Engineering College

Abstract- *The Main aim of the project is to monitor the human heart rate wirelessly using the actual parameters like blood pressure and the pulse of the heart in accordance with the systolic and diastolic movement in the heart and it also has an added feature of measuring the temperature.*

Health monitoring is the major problem in today's world. Due to lack of proper health monitoring, patient suffer from serious health issues. Internet of Things (IoT) technology provides a competent and structured approach to handle service deliverance aspects of healthcare in terms of mobile health and remote patient monitoring. IoT generates an unprecedented amount of data that can be processed using cloud computing. The IOT platform will be enabled with gateway of NodeMcu. Normally the data, which is uploading in the cloud, are redundancy. So, In Order to manage this redundancy, event triggering concept and temporal health index. This indicates that if the data's are increased than the threshold (Critical) values, then the data will uploaded in the cloud. So, with this the redundancy values may get reduced. And this proposed system will be more helpful for the remote healthcare monitoring.

I. INTRODUCTION

IoT is a network in which all physical objects are connected to the internet through network devices or routers and exchange data. IoT allows objects to be controlled remotely across existing network infrastructure. IoT is a very good and intelligent technique which reduces human effort as well as easy access to physical devices.

The healthcare industry is in a state of great despair. Healthcare services are costlier than ever, global population is aging and the number of chronic diseases is on a rise. What we are approaching is a world where basic healthcare would become out of reach to most people, a large section of society would go unproductive owing to old age and people would be more prone to chronic disease. Isn‘t it the end of the world we suspected? Whatever, IoT app development is at your rescue. While technology can‘t stop the population from ageing or eradicate chronic diseases at once, it can at least make healthcare easier on a pocket and in term of accessibility. Medical diagnostic consumes a large part of hospital bills. Technology can move the routines of medical checks from a hospital (hospital-centric) to the patient‘s home (home-centric). The right diagnosis will also lessen the need of hospitalization. A new paradigm, known as the Internet of Things (IoT), has an extensive applicability in numerous areas, including healthcare. The full application of this paradigm in healthcare area is a mutual hope because it allows medical centers to function more competently and patients to obtain better treatment. With the use of this technology-based healthcare method, there are unparalleled benefits which could improve the quality and efficiency of treatments and accordingly improve the health of the patients. This IOT will be get connected with the health monitoring devices like BP sensors, Pulse and temperature sensors etc through the Nodemcu module. This Nodemcu module is an gateway trough which the devices can get connected through the internet. Because, it as inbuilt wifi module in it.

With this Internet Of Things, where it will be more helpful in monitoring the patient health in remote area like at home or any place other than the hospitals. This project involve with the Cloud computing inorder to pass the data of the Patient to the doctor. This may be already enabled project, but the one which we overcome is that the normally when we are connected with the Internet of things it will upload the patient data or informations continuously. But that is unnecessary, because here the redundancy of data will be happens. So, Inorder to manage this redundancy of data. We are moving forward with the Event triggering and the temporal health index. With this concept, the redundancy will reduced. That is the event triggering which means If the data of patient increases or decreases from the normal value, then that value alone will be uploaded in the cloud. Here the temporal health index indicates the critical values of the health values. So, whenever the value changes, so it may be considered as event is triggered. Because of this the value will be uploaded in the cloud. So this may be helpful for the doctor inorder to monitor the patient. And the patient can also governs for the further operations with that values. This concept is introduced only inorder to decreases the redundancy.

II. EXISTING SYSTEM

The remote patient health monitoring in smart homes by using the concept of fog computing at the smart gateway. The proposed model uses advanced techniques and services such as embedded data mining,distributed storage, and notification services at the edge of the network. Event triggeringbased data transmission methodology is adopted to process the patient‘s real-time data at Fog Layer. Temporal mining concept is used to analyze the events adversity by calculating the temporal health index (THI) of the patient.

In smart communication mechanism, fog layer can retrieve the requisite information related to patient health history from cloud layer. On the other hand, in conventional communication, the updates related to fog node actions are transferred to the cloud with patient details for future necessary actions, further explained in Section III.B. To increase the novelty aspect of our proposed model, a layered architecture of Fog based Smart Home remote patient monitoring system. By incorporating various IoT devices, sensors, and other internet assisted hardware devices, the system forms a sensor network capable capturing different patientoriented events in an efficient manner. The main objective of this model is to monitor patients requiring intensive care at remote using Fog centric IoT technology. Fog layer consists of fog nodes, located at the network edge as shown in Fig. 1. Moreover, Fog features like real-time interactive services, mobility support, and scalability can serve as an optimal choice in IoT based health monitoring environment. The proposed layered approach for Fog based smart remote patient monitoring is composed of five layers, namely: i) Data Acquisition Layer (DAL) ii) Event Classification Layer (ECL) iii) Information Mining Layer (IML) iv) Decision Making Layer (DML) v) Cloud Storage Layer (CSL). Each layer performs its requisite function, thereby providing efficient services for adjacent layers.

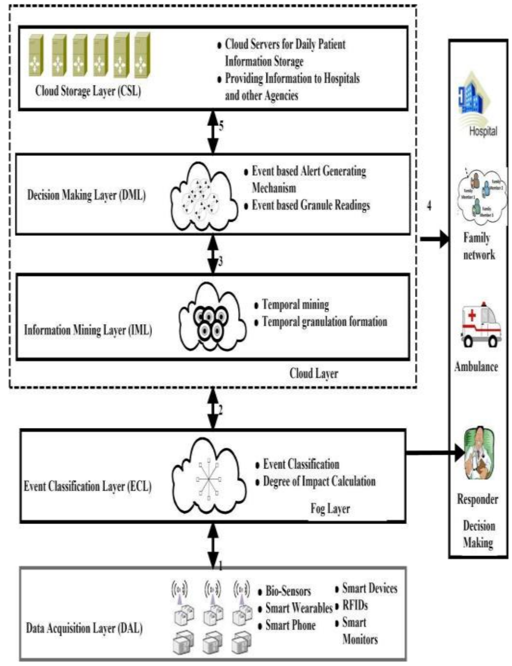


Figure 1.1 Architecture of Existing System

III. PROPOSED SYSTEM

This project is about monitoring the remote patient‘s health with the event triggering and temporal health index. This may includes that if the data, which are uploading in the cloud through the help of IOT, will be an non redundant value. Because of this event triggering and THI concepts.

In practically there are many proposed systems are involved in the healthcare monitoring projects through the IOT. But this is different only with uploading the abnormal values. Because only in the abnormal stages the patient health may affected. And also while monitoring the patients health it may have same ranges of values. So, in order to reduce this event triggering concept is used. So, whenever the values are changing then only the values will be uploaded. So, these will be uploaded to the cloud through the NodeMcu which is the gateway for the IOT. The NodeMCU will have the wifi inbuilt in it. So with these the data will be upload through the cloud with the help of Think speak, which is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak.

In this project we have included the two sensors for the testing purposes they are th e BP sensor and the temperature sensor. Here in the BP sensor it can also give readings of the pulse sensor. We all know the normal readings for the Blood Pressure. So during the monitoring of the patients, if the patients BP values exceeds the normal range that is if the reading will be in the abnormal stage then the data will be upload in the cloud. Because if the patient data will be reached the abnormal value then they must be in the critical conditions. So, they definitely needed the governance from the doctors. They need to get the treatment. So this project will be mostly will be helpful for the patients who and all in the remote health-care operations. Because for the patient who and all in the home itself without going to the hospital for taking the treatment I.e. remote heathcare treatment they may be more helpful with this projects. Here the data value will be uploaded only when it reaches the abnormal data. And in this case temperature sensor which is the dth11 sensor which is also used inorder to explain the project in deep.

In this project, it includes the sensitive data and the non-sensitive data. Because all the patients will be treated with some injurious values or data. If in case, the data or the values which is related that is the slight changes with the data of the temperature values of the patient in won't need any treatment. Because even the values get changes with the temperature of the room too. So this may does not affected the patient health, without the doctor consultant too the patient may get recovered.

In order to upload this values or data to the cloud we have used the thingspeak platform. This will be easily get connected with Nodemcu. Here the operations with the nodemcu is that all the components like the sensors are get connected with the nodemcu. This NodeMCU will be operated with th Arduino code language. Once the code is dumped with NodeMCU it just needed the power supply for the NodeMCU. Here we have used the algorithm with the temporal health index. This index will monitor the data or the values in the readings which is taking from the patients. Once the value will be reached the abnormal value. Then the value will be uploaded in the thingspeak platform. This platform will have get connected with the wifi module. The NodeMCU will have the inbuilt Wi-Fi module in it. Here the data will be uploaded in the cloud which is the form of IOT. With this project thr data will be uploading only the critical values. Hence the redundancy values are becomes reduces from the uploading of the data in the cloud. So the patient will be treated I.e. the remote patients can be monitored continuosly that is with eaesiest process through this method. Because it intimate only the critical conditions of the patients health.

3.1 IMPLEMENTATION METHOD

NodeMCU is an open source IOT platform which is used to upload the data in the cloud and also it can able to get connected with the sensor components like Blood Pressure sensor, pulse and temperature sensors. The data's from the sensors will be upload in the cloud through the nodemcu because it is enabled with WIFI.

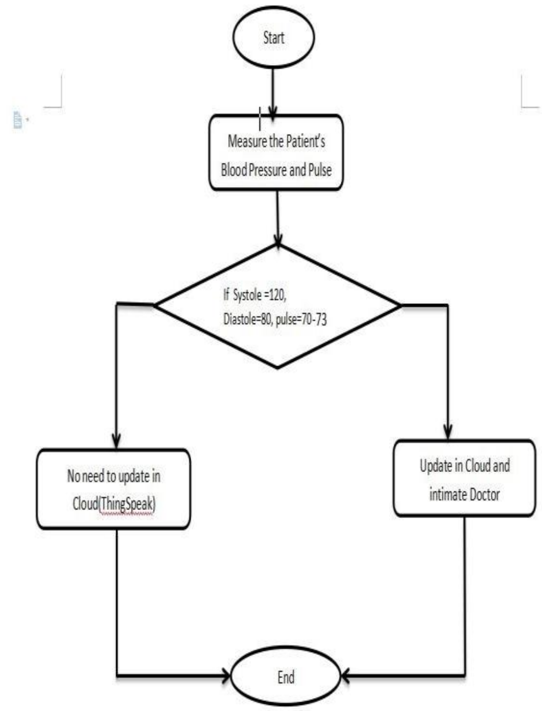


Figure 1.2: Flow Chart for Proposed Model

3.2 BLOCK DIAGRAM

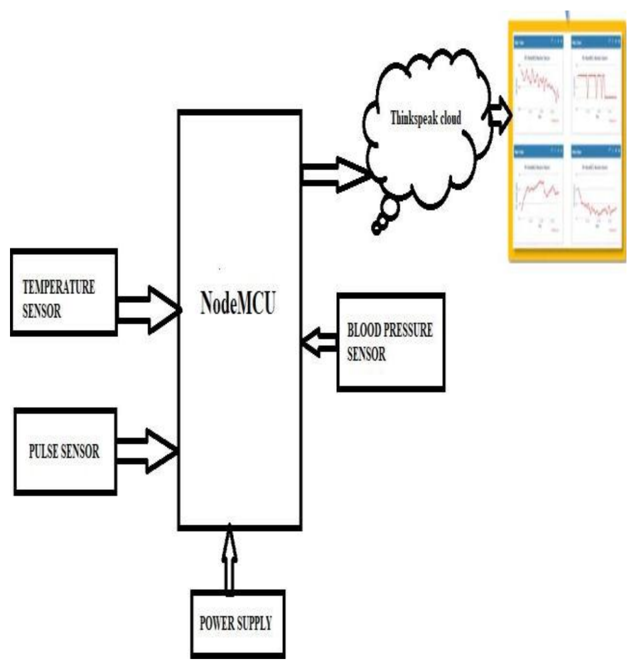


Figure 1.3: Proposed Block Diagram

IV. BP SENSOR

4.1 Introduction

Blood Pressure & Pulse reading are shown on display with serial out for external projects of embedded circuit processing and display. Shows Systolic, Diastolic and Pulse Readings. Compact design fits over your wrist like a watch. Easy to use wrist style eliminates pumping.

4.2 Features

- Intelligent automatic compression and decompression
- Easy to operate, switching button to start measuring
- tore groups memory measurements
- Can read single or all measures
- minutes automatic power saving device
- Intelligent device debuggin0g, automatic power to detect
- Local tests for : wrist circumference as 135-195mm
- Large-scale digital liquid crystal display screen, Easy to Read Dsplay
- Fully Automatic, Clinical Accuracy, High-accuracy
- Power by External +5V DC
- Serial output data for external circuit processing or display.

4.3 Specification

- Working Voltage: +5V, 200mA regulated
- Output Format :Serial Data at 9600 baud rate(8 bits data, No parity, 1 stop bits). Outputs three parameters in ASCII.
- Sensing unit wire length is 2 meters

4.4 Sensor Pinouts

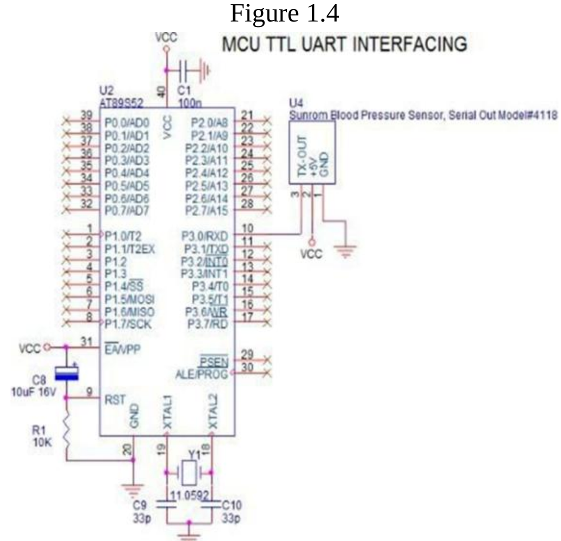
TX-OUT = Transmit output. Output serial data of 3V logic level, Usually connected to RXD pin of microcontrollers/RS232/USB-UART. +5V = Regulated 5V supply input. GND = Board Common Ground

4.5 Diagram

Figure 1.4: General Diagram of BP Sensor

4.6 Interfacing Diagram

Figure 1.4



V. SOFTWARE SPECIFICATIONS

5.1 ARDUINO

5.2 5.1.1 Introduction

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language(based on Wiring), and the Arduino Software (IDE), based on Processing.

5.1.2 Description

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessibleknowledgethat can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer fromsimple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs.

The software, too, is open-source, and it is growing through the contributions of users worldwide.

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.
There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package.

5.1.3 Features

Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50.

Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

Open source and extensible software - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVRC code directly into your Arduino programs if you want to.

Open source and extensible hardware - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

The Arduino board is connected to a computer via USB, where it connects with the Arduino development environment (IDE). The user writes the Arduino code in the IDE, then uploads it to the microcontroller which executes the code, interacting with inputs and outputs such as sensors, motors, and lights.

Both beginners and experts have access to a wealth of free resources and materials to support them. Users can look up information on how to set up their board or even how to code on Arduino. The open source behind Arduino has made it particularly friendly to new and experienced users. There are thousands of Arduino code examples available online. In this post, we take you through some basic principles of coding for Arduino.

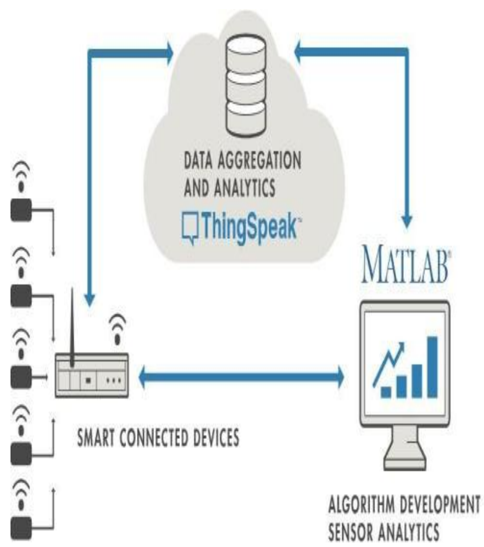


Figure 1.5: Connection through IoT

Arduino code is written in C++ with an addition of special methods and functions, which we‘ll mention later on. C++ is a human-readable programming language. When you create a sketch‘ (the name given to Arduino code files), it is processed and compiled to machine language.

5.3 THINGSPEAK

5.2.1 Introduction

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute MATLAB code in ThingSpeak you can perform online analysis and processing of the data as it comes in. ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics.

5.2.2 Description

Internet of Things (IoT) describes an emerging trend where a large number of embedded devices (things) are connected to the Internet. These connected devices communicate with people and other things and often provide sensor data to cloud storage and cloud computing resources where the data is processed and analyzed to gain important insights. Cheap cloud computing power and increased device connectivity is enabling this trend.

IoT solutions are built for many vertical applications such as environmental monitoring and control, health monitoring, vehicle fleet monitoring, industrial monitoring and control, and home automation.

At a high level, many IoT systems can be described using the diagram below:

Ontheleft,wehavethesmartdevices(the“things”inIoT)t hatliveatthe edge of the network. These devices collect data and include things like wearable devices, wireless temperatures sensors, heart rate monitors, and hydraulic pressure sensors, and machines on the factory floor.

In the middle, we have the cloud where data from many sources is aggregated and analyzed in real time, often by an IoT analytics platform designed for this purpose.

The right side of the diagram depicts the algorithm development associated with the IoT application. Here an engineer or data scientist tries to gain insight into the collected data by performing historical analysis on the data. In this case, the data is pulled from the IoT platform into a desktop software environment to enable the engineer or scientist to prototype algorithms that may eventually execute in the cloud or on the smart device itself.

An IoT system includes all these elements. ThingSpeak fits in the cloud part of the diagram and provides a platform to quickly collect and analyze data from internet connected sensors.

5.2.3 Features

ThingSpeak allows you to aggregate, visualize and analyze live data streams in the cloud. Some of the key capabilities of ThingSpeak include the ability to:

- Easily configure devices to send data to ThingSpeak using popular IoT protocols.
- Visualize your sensor data in real-time.
- Aggregate data on-demand from third-party sources.
- Use the power of MATLAB to make sense of your IoT data.
- Run your IoT analytics automatically based on schedules or events.
- Prototype and build IoT systems without setting up servers or developing web software.

Automatically act on your data and communicate using third-party services like Twilio or Twitter

VI. RESULT AND CONCLUSION

Thus the system will effectively uploading the critical values of the patients without any redundancy values with the temporal health index. The output of the patients data will be updated in the thingspeak where the result will be displayed as in the form of the graph with the help of the different fields in the thingspeak.

Figure 1.6:Output of the Project APPENDIX Program

REFERENCES

[1] Prabal Verma, Sandeep K Sood,"Fog Assisted- IoT Enabled Patient Health Monitoring in Smart Homes", 2018

[2] M. K. Suh, C. A. Chen, J. Woodbridge, M. K. Tu, J. I. Kim, A. Nahapetian, L.V. Evangelista, and M. Sarrafzadeh, "A remote patient monitoring system for congestive heart failure," Journal of Medical System, vol. 35, no. 5, pp. 1165-1179, 2011.

[3] M. S. Hossain and G. Muhammad, "Cloud-assisted Industrial Internet of Things (IIoT) enabled framework for health monitoring," Computer Networks, vol. 101, pp. 1-11, 2016.

[4] Sacchi, C. Larizza, C. Combi, and R. Bellazzi, "Data mining with temporal abstractions: learning rules from time series," Data Mining Knowlegde Discovery, vol. 15, no. 2, pp. 217-247, 2007

[5] Liu, E.Stroulia, I. Nikolaidis, A.M.Cruz and A.R.Rincon, "Smart homes and home health monitoring technologies for older adults: A systematic review," International Journal of Medical Informatics, vol. 91, pp. 44-59, 2016.
[6] B. Negash, A. Anzanpour, I. Azimi, M.Jiang, T. Westerland, A.M. Rahmani, P. Liljeberg, and H. Tenhunen, "Leveraging fog computing for healthcare IoT," in Fog computing in the Internet of Things Intelligence at the edge, Springer, 2017, pp. 145-169.