

AN EFFICIENT HEALTH MONITORING SYSTEM WITH TEMPERATURE AND HEART RATE SENSORS USING IOT

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ABSTRACT: Nowadays monitoring individual's health day to day has become an important concern in view of Covid19. It would help us to diagnose some changes that could happen inside a human body. Two of the important parameters that could be monitored are the internal temperature level and heartbeat of a person that could be made a part of an IOT system. This is used to monitor the health of a person. The objective of this paper is to build a structure for understanding the health care system and to provide treatment for patients. The theme of this paper is to build a framework organized for the survey of health professionals and to give answers for patients.

Key words: IoT, Health monitoring, Temperature sensor, Heart rate sensor

1. INTRODUCTION

The authorities of healthcare are planning to provide advanced treatment in clinical organizations. Similarly, the features of Electronic Health applications and E-Health are used by many people to improve their healthcare. The SMS is submitted to the person. A health monitoring system is to be designed which monitors the symptoms like heart rate, oxygen saturation percentage and temperature of the body in IoT network.

Internet of things is a technology which enables things around the world to connect with each other using internet. In this technology there will not be human intervention in connecting the things together which is a unique feature of it. The framework of IoT consists of three layers. Control layer, Device layer and Transport layer. Control layer is a method of security that can be used to control and manage the resources in a system. Device layer consists of various devices, types of sensors and many controllers. Transport layer will focus on communication at end-to-end providing features like high reliability, avoiding congestion and assuring that packets will be reached in the order they were sent.

2. LITERATURE SURVEY

A remote patient monitoring system is proposed in [1] where it is possible for doctors to monitor the patients from remote locations using World Wide Web (WWW). This system helps doctors as well as patients to get rid of the hospital environment for more amount of time in situations where diagnosis can be done at home.

The system developed in this paper includes a service for locating the patients and as well a system for monitoring all the physiological parameters of the patient.

Parameters like oxygen level, blood pressure, heart rate, temperature etc. are important to estimate one's health. Monitoring these parameters nowadays is very important to sense any danger that might happen in the near future.

In [2] Maradugu Anil Kumar et al have proposed a system for monitoring the above said parameters. The physician/doctor can be able to track the record of patient as the data is stored in a server.

In [3] Ufoaroh S.U et al have proposed a system which monitors the heart rate of a patient and sends an SMS alert to the concerned person and medical personnel if the value exceeds a set threshold through GSM. The heart rate is also displayed in an LCD screen.

Along with monitoring of the parameters related to health there is a need to store that data in a cloud platform and make the entire system connected to IOT. Such system is proposed by Ngo ManhKhoi et al in [4]. As the data generated will be huge in this paper authors have studied the bandwidth requirements and volume of data that is generated at every single point of time using protocols like CoAP, MQTT and HTTP.

In [5], [15] authors have presented how IOT can be applied to home automation. Using this technology a home can be converted in a smart way where most of the physical work will be reduced. We can also design our home in such a way that consumption of electricity can also be tracked.

In [6], [7] AyushBansal et al have discussed a system that could trace a person's ECG that will be sent to a server where analysis is done on the data and corresponding graphs will be given to the concerned person and doctor. This system helps in detecting any cardiac problems.

In [8] KaleemUllah et al have found out that in the existing methods of providing patient details and monitoring that patient namely e-health and m-health there is no involvement of mobile in sensing the parameters of the body. So they have proposed a system that looks into the aforesaid issue.

A novel idea of managing a hospital autonomously with IOT is presented in [9],[11],[12] where the patients of a hospital can be monitored remotely by doctors. As the data generated in this context is very huge data analytics should be done.

A bidirectional IOT gateway was proposed in [10],[13] by Gopi Krishna P et. al which explains the importance of gateway in an IOT network. The major concern with IOT devices is heterogeneity where one device works with one protocol and other device works with another where there comes a need for protocol conversion which can be taken care by a gateway. The proposed gateway works with both Zigbee and Wi-Fi enabled with MQTT protocol.

In [14] B.S.S.Tejesht. al have addressed the issues that are being faced in smart agriculture, smart home automation, smart street lights etc which uses IOT. In this paper authors have also presented the importance of IOT in every sector and also security issues in these areas are also presented

IOT connected smart home system is gaining importance nowadays. All the appliances in home can be connected through a Wi-Fi module like ESP8266 ESP-01 where the status of each appliance can be monitored remotely from any place. Such type of system is discussed in [15] where the authors have

considered some of the appliances that are mostly being used in homes and their monitoring through an application called Blynk

Monitoring the temperature and humidity is possible through a sensor called DHT11 and there are specific sensors to monitor the quality of water. In [16],[20] authors have proposed a system where these sensors are connected to IOT which could provide the advantage of storing the values of sensors in the cloud platform. Here we could know how the data can be actually stored in a cloud platform as in our research we are storing the values obtained from the pulse oximeter in cloud

In [17] K Hari Kishore et. al have discussed the importance of a device which monitors the health of a patient by measuring his heart rate continuously. These values are stored in a cloud platform like Thingspeak where data can be visualized later which helps the doctor treating the patient for any ailment to refer to the previous data

In [18] Rao K.R.R.M et. al have proposed a smart health care system that is connected through IOT. The proposed system is able to monitor the condition of patient like heart rate, temperature, ECG etc remotely and advice the necessary medication and support to the patient through internet. This system can also be helpful for elderly and physically challenged people to obtain the medication

A soil moisture monitoring system is proposed in [19] by E. Raghuvraet. al which can not only monitor moisture of the soil but it also automatically turns on the motor when soil moisture is less than or equal to the set threshold. Also remote monitoring concept is discussed in this paper where it is possible for the farmer to observe his field from a remote location and also can control the appliances like motor from there itself. The values are continuously stored in cloud by which prediction of soil condition is possible.

In [20],[21],[22],[23],[24],[25],[26],[27],[28] authors mentioned about the basic issues in an IOT system and algorithms and protocols used in IOT are also proposed.

3. A DEEP INSIGHT

3.1 INTERNET OF THINGS (IOT)

IOT in today's world has become the most buzzed word and is being taught everywhere to everyone as a part of their research or academics. That is the importance that it has gained in almost every field. IOT is indulged in most of the fields like engineering, health sector, manufacturing sector etc. IOT is a network connecting devices together so that they can speak with each other and can decide on their own without any human intervention. For example consider an area that need to be monitored with the help of surveillance cameras. There we deploy the cameras and imagine if they are connected through IOT there need not be much man power required as the cameras will talk to each other and take the decisions like changing their mode i.e. day or night, alerting the person if there is anyone entering into that area, fetching the latest upgrades if there are any without manual operation etc. This not only reduces the man power but also makes the system intelligent.

IOT is not a single technology but is blended with some more technologies like Wireless sensor networks (WSN), Embedded systems, cloud computing, big data analytics etc. We cannot imagine an IOT network without these technologies.

3.2 Health Monitoring:

Health monitoring is important to administer any changes in an individual health. It can also detect any early symptoms of a disease. To keep track of the health we have many wearable devices that can be carried by a person like watch, ring, chain etc. The main parameters that need to be administered are pulse, oxygen levels, temperature, blood pressure etc. With the advent of IOT even remote health monitoring is also made possible where a patient can be administered by a doctor at his home so that the patient is out from the clinical settings. With IOT the parameters that need to be observed every minute are stored in cloud where it will be useful for the doctor to predict health condition of the patient in coming future.

3.3 NODE MCU

Node MCU is basically a firmware developed for the chip ESP8266 Wi-Fi SOC and hardware is the ESP-12 module. Node MCU is commonly available as development kits where it can be used to build prototypes for IOT applications. Its pin out consists of 3.3V voltage pins, Ground pins to provide power supply and ground to the board. The board also consists of GPIO pins where they can be used to provide input or output to or from the board. Along with these pins RST pin is reserved for reset where it resets the whole program whenever required. Some other pins are Master Out Slave-In(MOSI), Master In Slave-Out(MISO), Serial Clock(SCK) and Chip Select(CS) which indicates that it follows an SPI protocol for establishing a serial communication with the peripheral devices. The development board also contains a 3.3V voltage regulator to take care of the excess voltage that could pass through any module on the board, CP2102 which is a USB to TTL converter; 2.4Ghz antenna for a wide coverage range etc. It has an inbuilt Wi-Fi/ Bluetooth. The pin out of Node MCU can be referred from figure 1. Coding language that is used for Node MCU is Lua which demands the user to again learn the commands which could be a tedious task. Alternatively Node MCU board can also be coded using Arduino IDE which is flexible and easy.

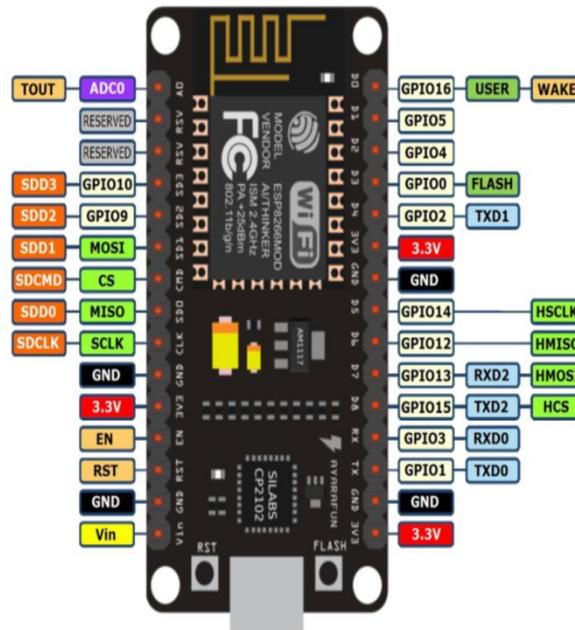


Figure 1: Pin-out of Node MCU



Figure 3: Heart Rate Sensor

5. IMPLEMENTATION

As shown in figure 4 the block diagram consists of temperature and pulse sensors in the input section where they sense the respective physical parameters like temperature and pulse. These physical values are given to Node MCU for further processing. Then again the data from Node MCU can be displayed on LCD and can also be stored in Cloud platform.

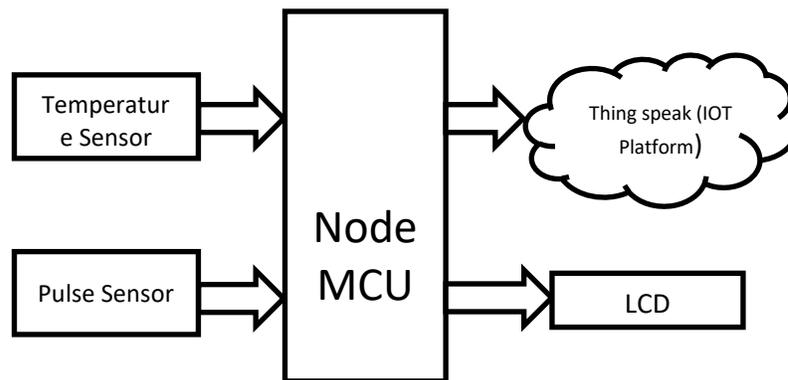


Figure 4: Block Diagram

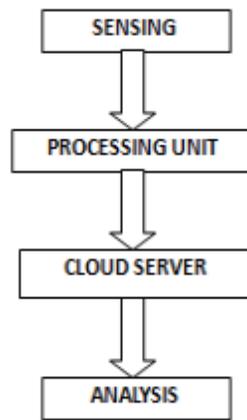


Figure 5: Flow diagram of implementation

Flow diagram of implementation is as shown in figure 5 where it follows a sequential order as shown

- i) Sensing: Sensing stage consists of sensors which sense the physical parameters like temperature. Humidity, velocity, pressure etc. generally. In implementation part of this research temperature and pulse are the physical parameters being sensed.
- ii) Processing: Processing stage consists of processing the physical data obtained from the sensors. The temperature and pulse readings are given to Node MCU where it processes these values to be displayed in an LCD.
- iii) Storage: Storage stage consists of servers which will store the data sensed and processed. The capacity of the servers should be very high as data generated by IOT devices is huge.
- iv) Analysis: Analysis stage consists of tools to do the data analysis where the required data is analyzed.

4. RESULTS

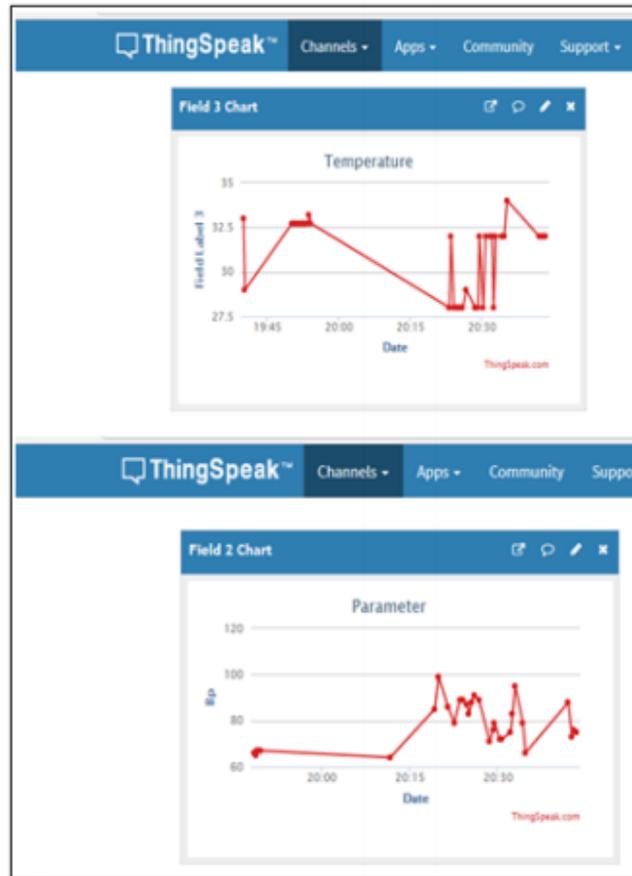


Fig 5: Temperature values in Thing speak

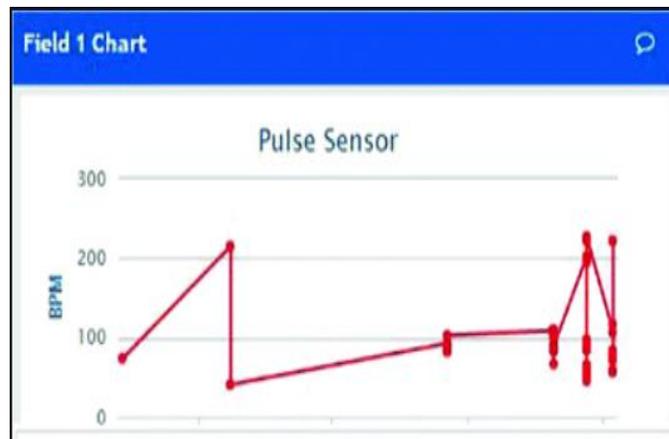


Fig 6: Pulse sensor values in Thing speak

As shown in figures 5 and 6 the temperature and pulse sensor values are stored in cloud platform like thing speak where these values can be used for further analysis

4. CONCLUSION

In this paper we have presented a health monitoring system using IOT where temperature and pulse values of a person can be monitored and stored in cloud platform. Further some more parameters like oxygen levels, blood pressure etc of an individual can also be stored in the cloud platform using which one can estimate about the health condition of a person.

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