

Design and Implementation of IOT Based Health Monitoring System Using Raspberry PI

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Abstract - In the advancement of Internet technologies all machineries are inter related. Using the technology Improvement, we can make many things in high effective and simple for human life. There are several places of Internet of Things (IOT) is used. Such as smart environment, smart home, smart city, smart parking, agriculture fields and medical fields. In medical field also, there are several process are used internet. In this paper, monitor patient's heart rate, body temperature using Raspberry Pi. After connecting Internet to the Raspberry Pi board it act as a server. Then the server is automatically sends data to the web server. Then these parameters are monitor using webpage anywhere in the world using laptops, smart phone etc.

Key Words: Health monitoring system, heart beat sensor, temperature sensor, IOT.

1. INTRODUCTION (Size 11 , cambria font)

The population in the world is increasing day by day. This brings a need for more healthcare options. To developed healthcare technologies and facilities. The proportion of senior citizens is increased in the society. These senior citizens which requires proper medical care than the rest of the population. So the monitoring and recording of Physiological parameters of patients outside the clinical environment is becoming increasingly important in order to take care of senior citizens. Today the networking technologies are very much developed. So that the communication or connection between the people, multimedia and services have been greatly changed. Wireless communications technologies has greatly affected on the peoples lifestyle.

The "Internet of things" - IOT is a concept and mode consisting of sensors, actuators, and development boards interacting with each other connected over the internet without any human intervention resulting into a more intelligent system. In simple words, IOT refers to a network of objects all connected to the internet at the same time. The main principle of Internet of things (IOT) is that the objects/things i.e. sensor nodes identify, sense, process and

communicate with each other [1]. IOT has a substantial influence in healthcare domain. Still, there are so many people who do not have access to quality healthcare services, thus remote patient monitoring becomes a need. Presently Healthcare system is shattered with the lack of communication between the patients and the doctors. Thus to address this problem information technology becomes a need. Healthcare services can be improved a lot with IoT-enabled healthcare devices. By applying IOT concepts in healthcare, there is a great possibility of virtually saving the lives. E-health solutions based on IOT should provide worth information about health to the patients and the doctors can make better decisions irrespective of their patient's location [2]. IOT has already brought changes in various domains of health care like intelligent healthcare tools and devices, diagnostics and monitoring of patients, data storage, transfer, and collaborations.

2. LITERATURE SURVEY

The study described in [1] monitors the health data using the e-health sensor platform. The architecture has been divided into 3 modules which are sensing module, main module and the interaction module using cloud to store the data to remotely monitor the patient's health.

In the proposed system described in [2], sensors such as glucometer, airflow and accelerometer have been used. Their main focus was to provide reasonable cost. As described, medical sensors are attached to the body which transmits the data through cloud using zigbee.

Another study of "real time wireless health monitoring app using mobile devices" is a smart phone based system which monitors the health parameters. The biggest drawback of this system is that only health care professionals can monitor and advice their patients about the health concerning issues if any as proposed in [3].

3. SYSTEM ARCHITECTURE

The design part consists of mainly two sections:-

- Hardware architecture
- Software architecture

3.1 Hardware Architecture

It include temperature sensor, pulse rate sensor, raspberry pi.

3.1.1 Raspberry pi

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed into end products with significantly reduced wireless LAN compliance testing, improving both cost and time to market. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B.

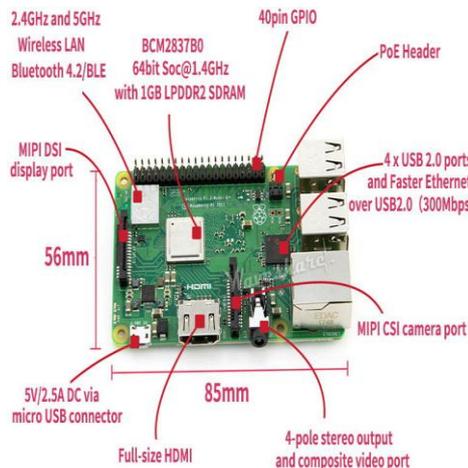


Fig 1: Raspberry pi 3 model B+

3.1.2 Heartbeat sensor

The heartbeat sensor is based on the principle of photoplethysmography. The blood volume changes through any organ of the body due to which the light intensity also changes through the vascular region/organ. The rate of heart pulses decide the rate of flow of blood volume and since light is absorbed by blood, the heart beat pulses are equivalent to signal pulses. The timing associated with the pulses is more important in the case where the pulse rate is to be monitored.

Working of a Heartbeat Sensor: The heartbeat sensor consists of an Infrared LED and a photodiode (light detecting resistor) to detect the pulse of the finger. On one side infrared LED is present whereas on the other side photodiode is present. When the light source illuminates the tissue, the reflected rays are being captured by the Photodiode . The output of the detector is an electrical signal which basically gives the number of pulses counted by the

sensor. This pulse rate sensor is shown in fig. 2 has the following features –LED for the heartbeat indication, Digital output, Compact in size with the operating voltage of +5 V DC.



Fig 2: Heartbeat sensor

3.1.3. Temperature sensor

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1°C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every °C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/°C. fig 3 show the typical view of temperature sensor.

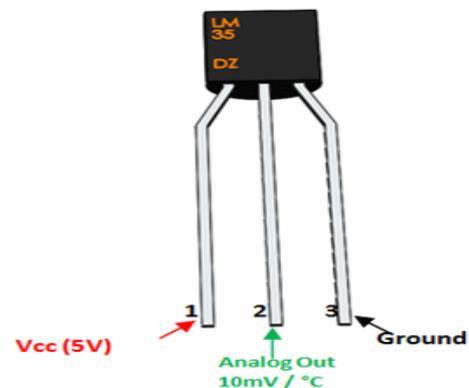


Fig 3: Temperature sensor

3.2 SOFTWARE ARCHITECTURE

It includes MQTT protocol,

3.2.1MQTT protocol

MQTT (Message Queuing Telemetry Transport) is a low bandwidth, a lightweight protocol which was developed in 1999 for connecting different devices and applications together especially for the machine to machine

communication(M2M). Unlike HTTP protocol which uses request/response architecture, MQTT protocol follows publish/subscribe architecture. It provides great flexibility to the clients to connect as a publisher, subscriber or both. By using this protocol, the user gets connected to MQTT broker which is solely responsible for all the messages being transmitted and received.

4. METHODOLOGY

In this paper we have temperature, heart beat reading results are monitored. These sensors signal are send to the Raspberry Pi via ADC8080 because signals are in analog form. To convert into digital form and send to Raspberry Pi. Raspberry pi is linux based operating system works as small pc processor system. Hear patients body temperature and heart beat is measured using respective sensors and it can be monitored in the monitor screen of computer using Raspberry pi as well as monitoring through anywhere in the world using internet source.

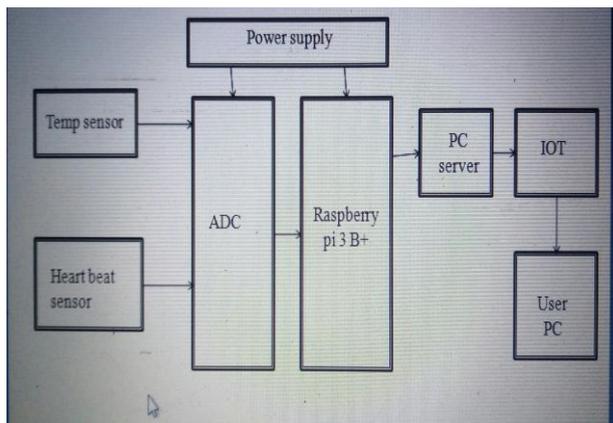


Fig 4: Block diagram of proposed system

5. EXPERIMENTAL SETUP

Experimental setup for our system has been shown in fig 5. The sensors are connected to ADC and raspberry pi is connected via cable.

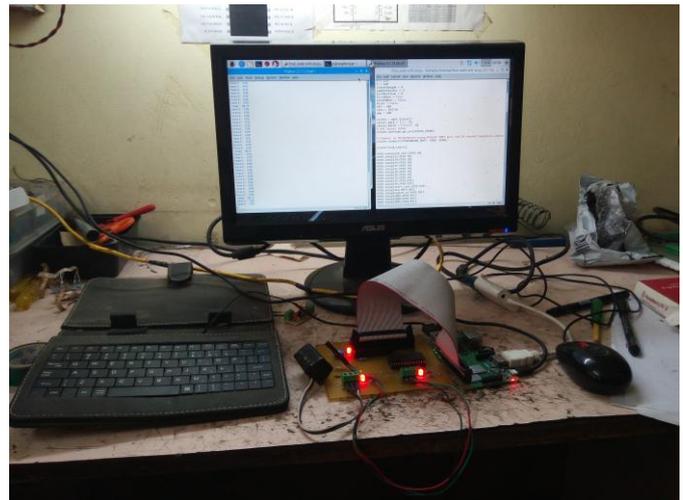


Fig 5: Experimental setup

6. CONCLUSION

In this paper, we designed system gives minimum complexity and very portable for healthcare observing of the patient. Furthermore, it disregards of the need of usage of costly facilities. The specialist or the doctor can readily get to the patient's information at any place with the help of internet services. The proposed system used sensors platform integrated with Raspberry pi board. Three sensors have been utilized in this project and which temperature sensor, heart beat sensor. All the patient's vital signs sent remotely and displayed via system website.

7. REFERENCES

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