Health Monitoring and Secured Data Management Using IOT

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ABSTRACT

Health is most valuable resource of every human being. Hence it should give highest attention and care. Due to increase in population, there arises huge demand to provide proper health-care services. Due to the busy schedule, standard of living and food habits, health problems like diabetes, blood pressure, and heart attack cases are increasing. Thus, there is need of a system using which people can monitor such common health issues from home and visiting doctor for regular health check-up can be avoided. This saves a lot of people's time. Detections of some symptoms can be done by using sensors. It delivers the health-care services from remote patients to doctor. Cloud computing is gaining popularity for the way it shares data. Hence it can be used to exchange data of health care systems. This is done using IOT, which is used to connect the everyday things through internet. The cloud can store a large amount of data in its database. The health parameter values are stored in cloud. The cloud maintains the records until the user deletes it. It stores the health parameter values in the form of graph so it will be easy for the patient to interpret his health issues. But the data sent to cloud is not secured and hence the private data of the individual is at stake. Thus here, the security for cloud computing is provided to assure privacy. In this paper, values of health parameter are obtained by the sensors and are sent to RaspberryPi from which, it is sent to cloud. Also RaspberryPi displays these values on LCD display and has LED and buzzer module to indicate severity. By this life of an individual is made even easier by collecting the health information from the place wherever the patient is present and updating it to cloud so that the data can be retrieved, anytime and anyplace.

Keyword: - *Health-care services, Internet of Things (IoT), Cloud computing, Security, Privacy.*

1. INTRODUCTION

The internet of things has numerous applications in healthcare, from remote monitoring to smart sensors and medical device integration. It has the potential to not only keep patients safe and healthy, but also to improve how physicians deliver care as well and connects patients and physicians anytime which is referred to as structured health monitoring (SHM) [1][2][5].The sensor data can be accessed by the user anytime, anywhere and it is crucial to provide security to the biomedical data. With the advancement in technology and introduction of cloud technology the improvised framework is provided for the privacy of the data [3] [7].For mobile devices using WBAN(wireless body area network) that continuously collects the medical data and send it to other mobile devices of the patients or doctors, which is connected to back end server and database that securely stores the data and analyzes for generating required alerts[4][6][10].In real time systems, a healthcare system is developed on android platform for low cost community. This system collects physiological parameters of the patient continuously and send it to the PC on wireless mode of transmission [8].UbiNurSS-Ubiquitous Nursing Support System is also developed for real time health monitoring [9].To provide security to the cloud data a novel clustering algorithm can be used which identifies threats and add some protocols to ensure the privacy of the data against the cloud threats [11].A new security model for cloud which is into layers that can help cloud providers to identify privacy issues, to make difference between different sources of threats and also to provide security [13].This paper is organized as

follows. In section 2 Literature Survey is discussed. Proposed system and Experimental Results are discussed in section 3 and 4 respectively.

2. LITERATURE SURVEY

In this paper, it mainly concentrate on privacy model and cloud security which helps to identify and classify different privacy issues and cloud security, necessary counter measurements are adopted[13].In this paper algorithm have been developed to classify noise for BP signal and pulse oximetry which have been recorded earlier, systolic and diastolic of BP signal are identified[14].Previously BP have been estimated using only PTT by linear regression which may not reflect the actual relationship between BP and PTT and susceptible to arterial regulation ,but in this paper cuff less BP estimation is using PTT and PIR is done[15].temperature measurement of human body is done and updated using real time application which even consists of alarm to notify the patient if any severity found. A device called Analog front end is also used to measure temperature of human body in which threshold value of the temperature is already fed into the device while coding[17][19].Heart rate is most vital indicator which provide information about rhythm of the heart. In this paper heart rate is measure and kept securely which is the main issue now a days. Current technology trends such as ubiquitous computing and calm technology, call for novel unobtrusive sensors, it's a commonly used monitoring technique. In the previous paper it needs patient contact with the sensor, but in the present paper it doesn't require patient contact with the device used for the measurement of heart rate and Unobtrusive [16] [17]. As we all know that the security of the patient record is an international problem. So the activities like exchange security, privacy and interoperability of electronic medical record of health institution are secured using cloud computing using pattern and password techniques [20] [21].in this paper home health hub internet of things framework is proposed where by using this device the health management of elderly people at home at very cheap rate and it's very easy to use with mobility. It can be used in clinical environment such as hospital diagnosis centre.

3. PROPOSED SYSTEM

The block diagram of health monitoring system is shown in fig 1. The block diagram consists of three sensors such as Temperature sensor (LM35), Blood Pressure sensor (26PC SMT), and Heart Rate sensor (TCRT1000).

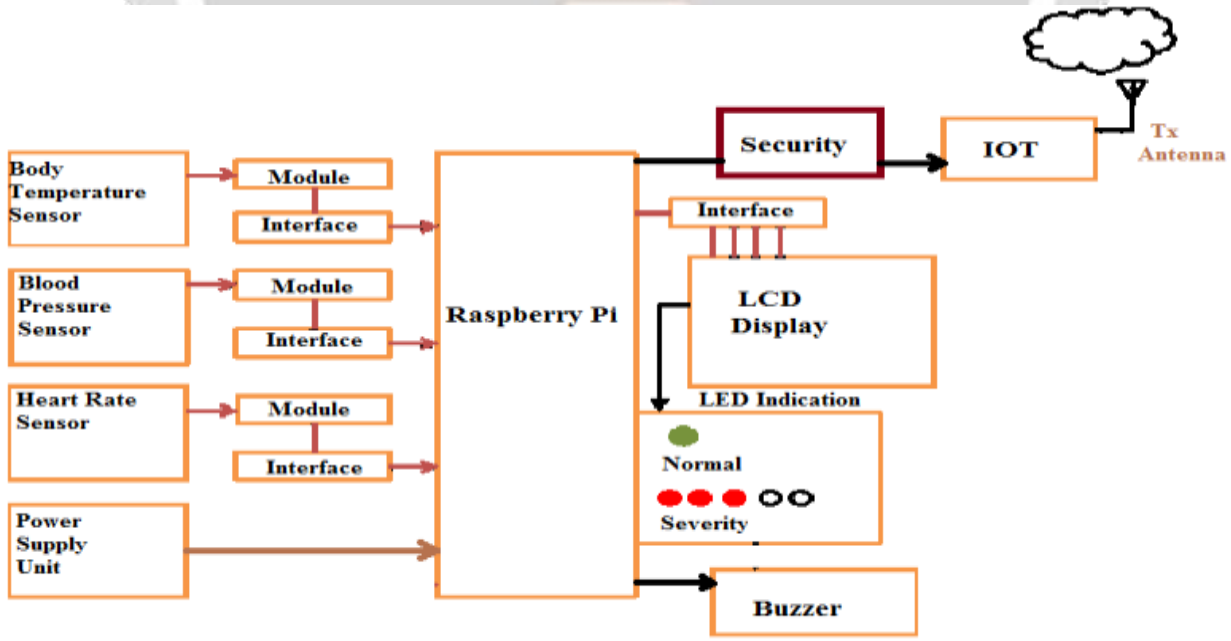

Fig 1: Block Diagram of Health Monitoring System

The LM35 sensor is a precision integrated-circuit calculated in Celsius temperature devices, output voltage linearly proportional to centigrade temperature and rated for full -55 to 150 degree Celsius range with 0.5degree Celsius ensured accuracy at 25^{o}C. Heart beat rate is measured by TCTRT 1000 sensor with module and it has an operating voltage 3.5 to 5V and output is obtained in BPM. 26PC SMT series sensor is used for measuring the blood pressure, calibration is required at regular intervals where properly sized blood pressure cuff is strapped to the arm. These sensors produce analog output, which is fed to interfacing module which converts analog to digital. The interfacing module used is MCP3008, MCP3008 has 8 single-ended input channels.The temperature range is from -40 to +85 degree Celsius. It has 200 ksps (kilo sample per second) sample rate at 5V.it also has 10 bit resolution. The interfacing module is connected to RaspberryPi kit. It compares the input value with threshold value, if any severity is found it gives an alert by buzzer and also the LED glows red. If severity is found the LED glows green and there is no alert sent by the buzzer. The values read by the sensor are displayed on the LCD screen. The display of resolution 128X64 is interfaced with the raspberry pi is used to display spo2, body temperature, blood pressure and heart rate. Raspberry pi connected to 3 switches to control the order, when switch 1 is pressed temperature sensor is on and readings are taken, when switch 2 is pressed blood pressure sensor is on and readings are taken and when switch 3 is pressed heart rate sensor is on and readings are taken.

The RaspberryPi sends the received values to the cloud through IOT. The cloud used is THINGSPEAK. The raspberry pi connects to the cloud using the inbuilt Wi-Fi. The received data is stored in the cloud, which can be retrieved using unique password, which is known only to the user.

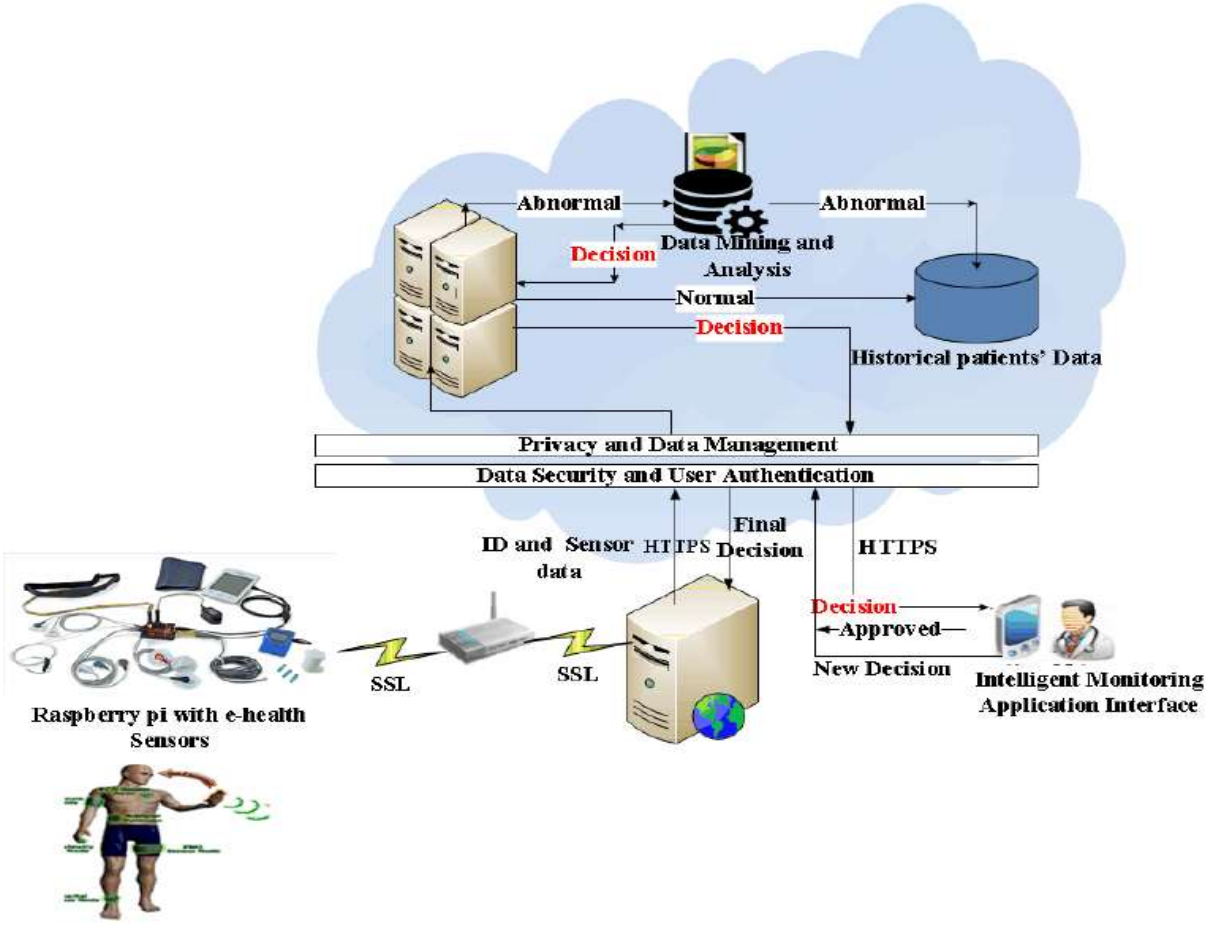

Fig -2: Functional Diagram of Security System

The health parameters are sent to cloud with security as shown in fig 2. The values received from the sensors are fed to raspberry pi with the help of interfacing unit. The RaspberryPi-3 has inbuilt Wi-Fi module using which it connects to internet. It encodes the data values before sending it to cloud to ensure security. It sends the encrypted

values to the cloud using IOT through a secured connection. These values are compared with the threshold values in the data base. If there is any severity found, it sends an alert to the doctor. If no severity found the received data from RaspberryPi are stored in database which can be retrieved using a unique key by the patient anywhere and anytime. This reduces the pain of carrying the paper records to the doctor and maintaining it. In this system the data cannot be manipulated by the third party as it is secured. It also cannot be viewed by anyone without the unique password. The key can be changed frequently by the user so that the data cannot be hacked.

4. EXPERIMENTAL RESULTS

The sensor values, which are converted to digital using interfacing unit i.e., MCP3008 are fed to RaspberryPi. These values are displayed on the LCD display. When the system is turned on, the LCD displays "Health Monitoring System". When we press the first switch, & hold the finger on temperature sensor, it displays the Temperature value. Similarly, when we press the second switch and third switch, it displays blood pressure and heart rate values respectively when finger is held on the respective sensors. Fig 3 shows heart rate value display on LCD.

Fig-3: LCD display for heart rate

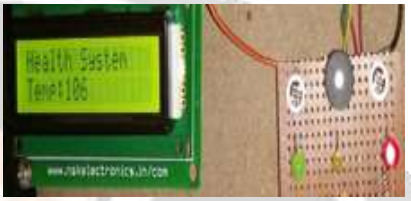

Fig-4: LED display when severity is found

The system also consists of LED display and buzzer to indicate if there is any severity found. The RaspberryPi compares the sensor values with the normal range of that health parameter. If the readings are within that range, the LED glows green and if there is slight change in the values, it glows yellow. In both the cases, the buzzer is off. If the values crosses the normal range, the LED glows red and the buzzer beeps to alert the user. Fig 4 shows LCD and LED display of temperature. Here the LED is glowing red as the temperature value has crossed the normal range.

(a) (b) (c)

Fig -5: The output graphs of **a)** Temperature, **b)** Blood pressure, **c)** Heart rate

The encrypted values are sent to cloud. In cloud, it decrypts the encoded data and stores in the database. These values are converted to graphical form. From these graphs, monitoring the health becomes easy as the patients can see the variations in the health parameters clearly. Also it makes it easy for the doctors to diagnose the patient's health. Fig 5(a) shows the graph of temperature value. Fig 5(b) shows the graph of blood pressure values. Fig 5(c) shows the graph of heart rate.

5. CONCLUSION

In this paper, a health monitoring system is established using cloud computing with security. It aims at providing a wireless, reliable health monitoring and warning system. Several devices in the market including RaspberryPi are used. The vital sign reading from the chosen device is value-added by further analyzes for

providing real-time warnings. These systems can provide proactive health related alert. The real-time message exchange between RaspberryPi and web server is employed to logically connect both sub-systems. The heart rate, body temperature and blood pressure are the chosen vital signs for reflecting the patient's health by comparing with the ranges defined by the nurses or the doctors. Here an attempt to develop an innovative approach for handling privacy in the current service oriented model is presented. .

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