IOT Based on Smart System for Medical Health Care Monitoring Sensors

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Abstract:

Now a day's providing health care services is very important for people specially who suffering with chronic diseases. A health care smart network system is used to prevent delays in the arrival of patients particularly in accidents and emergency situations. The integration of the wireless sensor networks and cloud computing will create a new generation of technology in many aspects such as patient monitoring of an health care smart network system. It helps in eliminating manual data collection and making health care easier for patients. In this system, we are using wireless sensor networks which measure patients physical parameters and their information is providing real-time data gathering. Lot of data from sensors patients generate a large amounts of data requires a scalable storage and processing. These sensors data is then transmitted onto the cloud database. This is later on transmitted to the designed webpage.

Keywords:

Wireless Sensor Networks; cloud computing; Internet of Things (IoT); data mining.

1. INTRODUCTION:

Wireless Sensor Networks are spatially distributed autonomous sensor (or) collection of nodes. These networks help in monitoring physical environment conditions and cooperatively pass the data through the network. Wireless Sensor Network is having capabilities to observing and forwarding raw sensor readings. These are sensing a wide range of domains application such as health monitoring, military application, underwater and climate monitoring network applications.

In this WSNs having many challenges are data transmission capabilities, limited computing power and memory capacity. By using cloud computing the sensors efficiency can be improved. Cloud computing provides on-demand network access computing resources which are the services, applications, networks and system. In this cloud computing technology has more advantages such as highly auto-mated, fast services providing, low cost, huge storage capacity and flexibility. Deploying the four models of cloud computing are community, hybrid cloud, public, private and these are according to the NIST (National Institute of Standards and Technology). In cloud's features are enable to customers to build, deploy and test their applications on servers using different multiple operating systems and infrastructures.

It offers unlimited data storage in cloud computing. Users and organizations that are using this technology are not concerned with the size of their files. To obtain customers more flexibility in cloud services are offers three different types of services is Platform as a service (PaaS), Infrastructure as a service (IaaS), and software as a service (SaaS).Internet of Things is interconnected with things/devices or physical objects which are embedded with electronics, sensors, network connectivity and software that enables to collect and exchange data. This architectural framework it allows data exchange and direct integration between computer based systems and the physical world this resulting in improved accuracy, efficiency, and economic benefits. This technology can activate only there is need to send data or read or to make a decision. Internet of Things works on machine –to-machine communications and it covers variety of domains, protocols and applications.

In this paper focus on idea of integrates the cloud computing and wireless sensor networks. These sensors are connected to patient's body, these help in collecting data and transmitting data onto the cloud which are responsible for receiving, storing processing and distributing the transmitted data. Data mining technique can extract the information to make appropriate medical decision is based on patient's condition and their medical historical data.

11. RELATED WORK:

Hwang et al. [5] this paper presents interesting business models in cloud computing is based on performing the decryption and encryption technique. Cloud provides an information that is stored in encrypted form after this completions of computation operations all data should be deleted. In this paper there is no discussion about security part while sending and receiving operations between user and cloud provider. Fortino et al. [7] the combination of both cloud computing and WSNs provides an improvement of processing infrastructure, scalable storage data, analysis of body sensor data. This paper presents architecture of the cloud computing the data management and monitoring sensors infrastructure. Google App Engine (GAE) is one of the cloud computing techniques to implement system on hosting and develop web
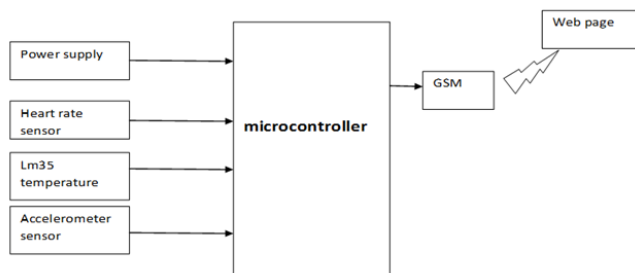

Figure 1: Block diagram

III. SYSTEM ARCHITECTURE:

As shown in figure 1, the system architecture of health care sensors which are temperature sensor, heart rate sensor, and accelerometer sensor are connected to a microcontroller.

A. Temperature Sensor:

In this temperature sensor (LM35) is a precision IC temperature sensor and its output is proportional to temperature. This LM35 sensor can be measure more accurately than a thermistor. In this sensor circuitry is sealed and it does not subjected to oxidation. This sensor device is providing an analog output. LM35 sensor consists of three terminals are power supply pin, output pin, and ground pin. 4-20v is applied in power supply. Output pin connection is given to microcontroller and last pin is grounded. Temperature sensor posses low self heating.

B. Heart Rate Sensor:

Heart rate sensor is also refers as ECG sensor. The number of heart beat is heart rate per unit of time and its commonly expressed beats per minute. Usually heart beat range in adults 60 to 100 times a minute. To know our heart rate is important it shows a person fitness and health condition. So you can measure the heart rate at any spot on body if you feel like pulse with touching your fingers. Heart rate can easily determine. This sensor is inter-link with microcontroller is based on hear rate measurement system it uses an optical sensor which measures the alternation in blood volume at figure tips with each heart beats per unit of time. It consists of an infrared light is passed through finger tip and photodiode sense the portion of light that is reflected back to the microcontroller. These reflected light intensity is depends on blood volume. There is a Small change in amplitude of reflected light that can be converted into pulse. Then microcontroller counted the pulses to determine the heart rate.

C. Accelerometer Sensor:

Accelerometer sensor is MEMs device that integrates mechanical elements, actuators, sensors, and electronics assessing balance and detect the definite abnormalities in the giants. In range of 40 to 60Hz for human motion sensing and inter connection between the microcontroller and this sensor. It allows single package and complex electromechanical systems are

manufactured by using batch fabrication techniques due to increasing in reliability and decreasing the cost.

D. Microcontroller:

Microcontroller programmer is hardware device and accompanied with software that transfers the machine language code to microcontroller. Compiler converts code which is written in languages like assembly, java, c, c ++ etc to machine level language code and it is stored in a hex file. It acts as interface between Pc and target controller.

E. Web page:

IoT devices are extract the sensors data and these information is pass through a gateway method. It depends on type of protocols they support, and network gateways can implemented completely in both combination of hardware and software or either in hardware/software only, with call back URL. Stores the data in cloud and it display senced data to send a notification to user.
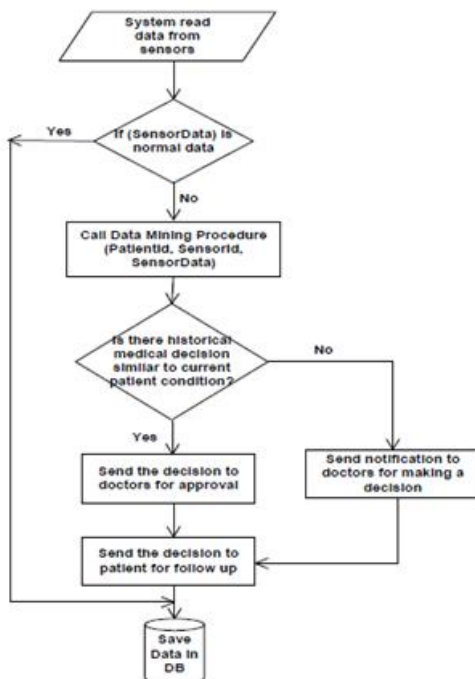
Decision making process:

Fig. 2: decision making process

This system read the data from sensors which are collecting the patient's body. Check the sensors data normal or abnormal conditions if data is normal then saved in data base management system to populate patients previous data, whether it is in abnormal condition it goes to data mining call procedure to verify the patient Id, sensor data. There is an historical data is similar to patient current condition then send a message to patients for follow up the suggestions. In case patients current condition is not similar to historical data then make a decision and send a message to patients for emergency treatment.

Following are some examples:
Example 1:
If patient Id = "100002" & h-rate< "150" & > "60" & TEMP> "40'' = "set status is Abnormal" & Make a Decision & (send messages to doctors and patients).

Example 2:
If patient Id = "100004" & h-rate< "148" & > " 60" & TEMP> "38.7" = " set status is Abnormal" & make a decision & (send notifications to patients and doctors).

This system algorithm is responsible for the data before storing in the cloud that will be encrypted. In this different types of encryption algorithms are there to developing the data security and cloud provide users.
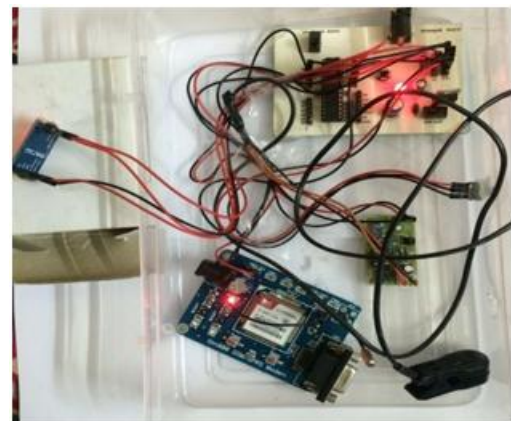
IV. EXPERIMENTAL RESULTS:

Fig 3:

Sensors are sensing the data to collect from patients and these data can be transmitted through the microcontroller. This microcontroller is responsible for the gathering data pass through the wireless communication channels to a platform services which are hosted on to cloud .this system as many platform services. Storing sensors data are responsible for the many storage services, data mining technique is used to make a medical decisions are based on patients historical data. Cloud environment significant the security and privacy factors for patients data. These all information data can be displayed in web page.
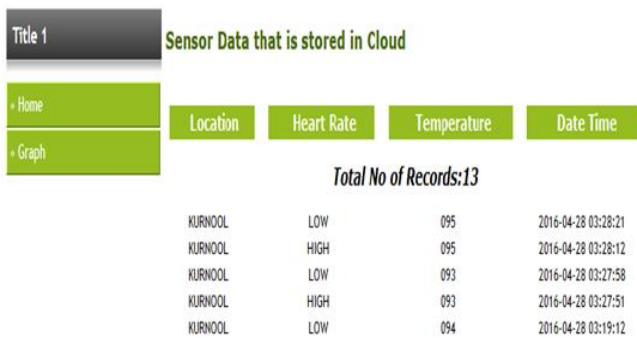

Fig. 4: display of sensors data

Displayed data in web page is real time data collecting from sensors. Webpage needs call back URL, in that title 1 is sensor data that is stored in cloud, tabular columns are shows that patients' location, inserted time and date.
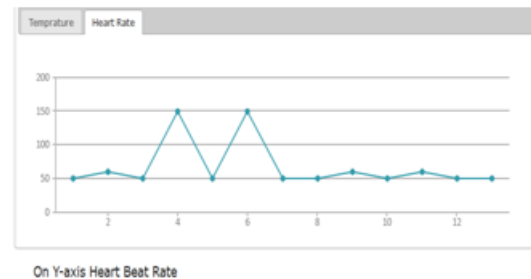

Fig 5: temperature sensor graph

Table 1: Temperature Monitoring For Different Patients

Name	Patient Id	Sensor Id	Sensor data	Insert date
S1	100004	TEMP	38	12:00:00 PM
S2	100008	TEMP	40	10:05:00 AM
S3	100009	TEMP	38.5	02:00:00 PM
S4	100006	TEMP	36	01:02:00 AM
S5	100007	TEMP	39.3	05:03:00 PM

Table 2: Temperature Sensor for One Patient

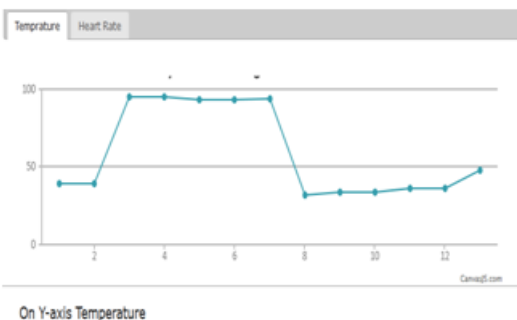| Patient Id	Sensor Id	Sensor data	Insert date
100001	TEMP	39	10:00:00 PM
100001	TEMP	40	12:05:00 AM
100001	TEMP	36	11:00:00 AM

Fig 6: heart rate sensor graph

As shown in figure 5: it is a graphical representation of temperature sensor which is plotted on y-axis. These sensors data information collected from one patient in different times. Table 1: shows that effectiveness of using this temperature monitoring sensors by collecting this information from different patients. Table 2: represents the patients name, identification, insert date and time, sensors data and making decisions easily during this system functions. In figure 6: its represents the heart beat rate which is plotted on y-axis in the form of low, high, and normal conditions.

V. CONCLUSION:

Health monitoring system is a technology that integrates both cloud computing and Wireless Sensor Network (WSN).by using patient health monitoring sensors cost is reduced and it also increases the performance. Data mining technique helps to extract the information which is collected from patients. Based on historical data, this system provides for real time gathering data and decision making process. By this, manual data entering is eliminated. This system can be extended by adding more sensors.

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