

Secured Smart Healthcare Monitoring System based on Internet of Things (IOT)

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Abstract:- In modern world, technology is playing a major role in healthcare and in almost all fields not only for sensor devices but also in communication. Internet of things plays prominent role in wide range of healthcare applications and it serves as a catalyst for the healthcare. Smart devices and wireless sensor networks are used for real time analysis of various health parameters of patients, the design and implementation of an e-health monitoring network system is done. The main aim is to develop a set of modules which can facilitate the diagnosis for the doctors through tele-monitoring of patients. To monitor the health parameters of the patient remotely, the set of various sensors are used. These sensors are used to sense the data and then that data will be sent to the server using wifi module. The patients are monitored by the doctor in real time on the basis of the data received through the server. For any future obstacles and for easy access and processing for planning and prediction, this architecture is used to store the medical history of the patient on cloud and hence for monitoring single patient particularly at home as well as in hospitals and public healthcare units.

Keywords- Remote health monitoring, IOT, android app, Temperature sensor, Breathing sensor, Heartbeat sensor, ecg sensor.

I. INTRODUCTION

In recent days we have seen a rising growth in variable sensors and today various devices are available for personal healthcare, fitness and activity awareness. There are many clinical applications in remote health care monitoring systems for restoring patient data, organise and clinical access to patients health information. Internet serves for many purposes like educations, finance, business, industries, entertainments, social networking, shopping, e-commerce. The new mega trend of internet is Internet of Things.

Imagining a world where many objects can sense, communicate and share information over a particular internet protocol or public networks. The various objects are interconnected to collect the data at regular meantime, analyse and used to begin required action, providing an perceptive network for analyzing, planning and decision making. This is the world of Internet of Things. The IOT is generally considered as relating objects to the internet and using those objects for remote monitoring. IOT is creating

a excellent invisible network which can be programmed, controlled and sensed. The products developed based on IOT include embedded technology which allows them to exchange information with each other. The entire concept of IOT stands on sensors, gateway and wireless network which enables users to communicate and access the information. In proposed system the client information is got by the sensor and sent to the cloud through the wifi and permitting just approved client to get to the information.

II. RELATED WORK

Moeen Hassanaliyagh proposed the system architecture for remote health monitoring system whose major components are data acquisition, data transmission and cloud processing. Data is acquired by multiple wearable sensors which measures physiological parameters such as ecg, body temperature, heart rate and breath rate. Data received is transferred to concentrator using short range radio such as zigbee or low power Bluetooth. Sensors in the system form IOT based architecture so that individual sensor data can be accessed through the internet via concentrator[6][7]. Cloud processor has three separate components: storage, analytics and visualization[2].

Jubi Rana proposed remote health monitoring system for elderly people during their post operational days. The system focuses on collection on various health parameters of the patients and generates alert to care takers or doctors so that immediate action could be taken in case of emergencies.[4]

Soumya Kanti Datta used the approach e-health monitoring which is highly suitable for the patients with unstable physiologic regulatory systems and high risk of developing life threatening condition. They have categorised the architecture into three layers based on the functionality of the components being used. First layer is Perception layer at the bottom consist of sensors which collect data. Then Middleware and APIs layer is the pivotal layer consisting of various APIs(application programming interfaces). The third layer is e-health application and service layer is a terminal layer offering outsourcing services for the monitored data.[3]

Bhoomika.B.K proposed smart health care monitoring system which includes temperature sensor and pulse oximeter sensor. Microcontroller PIC18F46K22 is used to fetch the sensor data and send to the cloud through the wi-fi protocol. GSM modem is used to send warning messages to doctor in case of emergencies.[1]

Shilpa Srivastava proposed secured model for Indian e-health system which simultaneously utilizes the authorisation and authentication principle along with the consideration of different situations.[5]

III. PROPOSED APPROACH

The proposed system has got four main modules the first module consists of healthcare sensing, data transmission, cloud processing and front end application. The system includes various sensors, raspberry pi, aurdino uno, regulated power supply. Raspberry pi is small as the size of a credit card, it works as if a normal computer at a relatively low price. It has inbuilt wifi module and four USB ports which are not available in microcontroller. The proposed system shown in fig1.includes different sensors like temperature sensor to measure human body temperature, heartbeat sensor to measure the heart beat rate, breathing sensor to measure breathing rate and ecg sensor. The measured sensor data is picked up by raspberry pi 3 and sent to cloud using wifi module and warning message is sent to doctor if there is emergency. Then doctor can check the patient status through the mobile application logging into it using password.

Raspberry pi can only take digital data, but the data received from sensors are analog so aurdino uno is used to convert sensor data from analog to digital and send it back to the raspberry pi. The sensor data is sent to the cloud using UART(universal asynchronous receiver/transmitter) which is a computer hardware device for asynchronous serial communication in which the data format and transmission speeds are configurable. The electric signalling levels and methods are handled by a driver circuit external to UART. It takes bytes of data and transmits the individual bits in a sequential order.

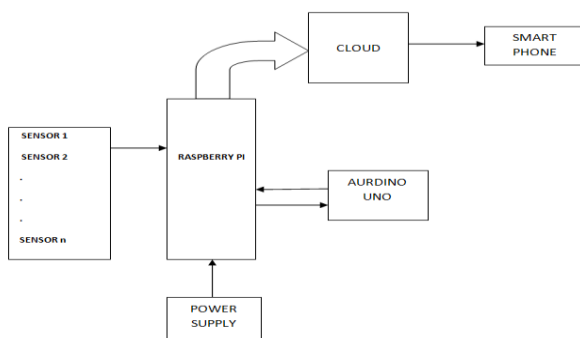


Fig 1. Proposed block diagram of healthcare system

IV. METHODOLOGY

The system architecture is divided into three parts. Each of these parts are seen as distinct systems combined to form a health monitoring system. The flow chart of the proposed system is shown in fig 2.

A. Healthcare Sensing

Health information of patients are measured in rural areas where there is no access to medical professionals and vitals measuring equipment. The measuring of these health parameters have to be done by the patient using the system. The system consists of various sensors like temperature sensor, heartbeat sensor, breathing sensor and ecg to measure body temperature, heart rate, breath rate and ecg respectively. Raspberry pi is used to fetch the sensor data and send to cloud.

B. Data transmission and cloud processing

The sensor data is sent to the cloud by UART in sequential order. The data present in the cloud is secured so that only the authorized medical professionals can access the information. The values of the individual parameters are stored separately on the cloud. When these parameter values are abnormal then the alert message will be sent to notify the doctor.

C. Front end application

The front end application will serve as a splasher for medical professionals to check up reports of their patients. Medical professionals are also notified by this front end application to monitor critical patients. They are allowed to login to the application through suitable password and check the patient's status and take immediate action in case of emergency.

The proposed system focuses on collection of patient's various vital health parameters and generates alert message to care takers and doctors so that immediate action can be taken in case of critical conditions. The stored in cloud can be accessed by the authorised medical professionals via internet from anywhere anytime. cloud has high processing power, large amount of storage which can be scaled according to application needs.

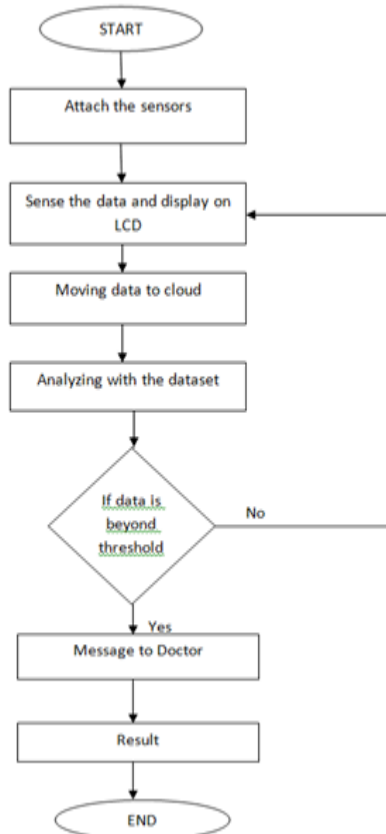


Fig 2. Flow chart showing the flow of events in the system

IV. RESULTS

The set up of the designed system is shown in the fig.5(a). when the hardware is powered then the sensors connected to the hardware, sense the data of the patient.

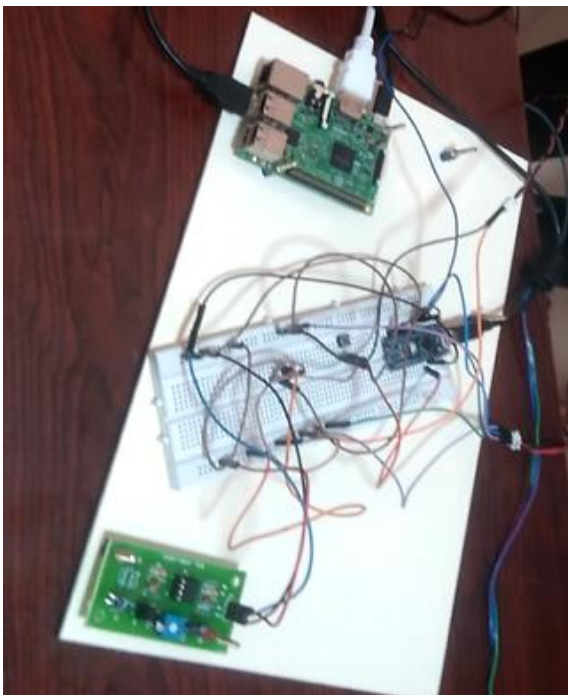


Fig (5a). Figure shows the set up of the designed system.

For example, the sensors will be fixed to the patient. When the temperature value and the breath rates are abnormal, then warning message is sent to the doctors mobile is as shown in fig 5(b).

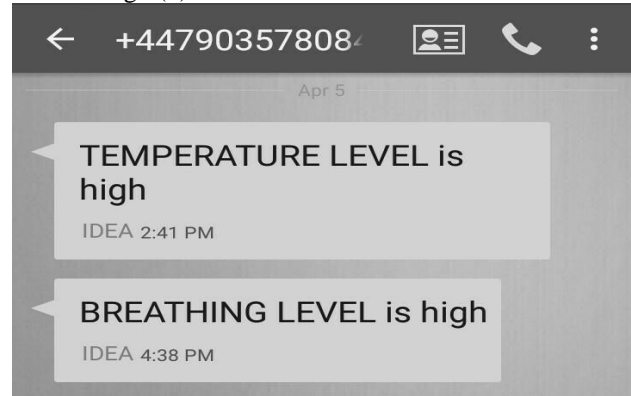


Fig 5(b). Message sent to the doctors phone during extreme condition.

V. CONCLUSION

With the wide use of internet technology, the goal of the proposed system is to establish a system which would communicate through internet of better health. Fast internet access and sharing of information by authenticated users is permitted by the cloud. This system helps the doctor to analyze patient data and provide right intervention at the right time to the right patient. The main aim is to develop smart healthcare system which provides high quality and low cost healthcare services to the patients. Doctor can view the patient health parameter by logging into mobile application and monitor remotely by providing suitable precautionary measures.

Various research proposals are observed for various application fields including home healthcare, emergency healthcare, assistive healthcare, tele medicine as well as sharing, storage, and processing of large medical resources.

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