Real-Time Healthcare using IoT

Shehbaz Sayyed[1] Ashna Sushilan[2] Sayali Nagpure[3]
[1,2,3]Department of Computer Engineering

Abstract— The fast development of Internet of Things (IoT) technology makes it possible for connecting different smart objects together through the use of Internet and providing more data interoperability methods for application purpose. Recent research shows more potential applications of IoT in information intensive industrial sectors such as health care services. Nowadays health care industry is to provide better health care to people anytime and anywhere in the world in a more economic and patient friendly manner. IoT based health care technologies allow the users to perform biometric and medical applications where body monitoring is needed by using different sensors. This information can be used to monitor in real time the state of a patient from anywhere around the world using Arduino Board. The Arduino analyses the data in real time and determines whether the person needs external help. When anomalies are detected or a threshold is reached, the monitoring system automatically transmits the information to the doctor's workstation. Thus we are proposing a survey system which will perform these tasks by means of IoT, microcontrollers and semiconductors, sensors by means of Cloud platform.

Key words: Internet of Things, Healthcare, Arduino, Micro-Controller, Sensor, Cloud

I. Introduction

In India, due to vast population and geographical diversities it is difficult for doctors to reach the remote locations to monitor the patients and it is even a problem for the patients to reach the hospital for the treatment on time. In many rural areas around the country proper equipments and functionalities are not sufficient for the treatment and observation of patients.

To solve this problem the system is being proposed to access real-time data that is being fetched from various portable sensors and transmitted to the cloud through the Arduino board. This data can be then accessed by the doctor to monitor the patients from remote locations and in a cost effective manner.

In the proposed system we present healthcare monitoring system. Under the critical situations some patients need to be monitored carefully in time and also need to be monitored continuously to keep a track on their condition.

During such situation the doctor can monitor the readings of the sensors attached to the patients body without being present nearby to the patient.

The sensor readings will be stored in the cloud using the Arduino micro-controller which can be accessed by the doctor using a workstation/Android device from anywhere.

II. Motivation

The main reason for the motivation of the proposed system is to improve the quality of healthcare services during emergency medical services, by delivering biomedical readings information of patient at the point-of-care to doctors/physicians is critical. Doctors need to keep track on the condition of the patient from time-to-time under such circumstances. This proposed system includes a healthcare monitoring system implemented by low cost hardware component as well as GUI platform. This proposed system covers a live monitoring system for hospital or nursing home for patients under critical conditions. This system support live transmission of patients sensor readings to the doctor which can be accessed anytime from anywhere using a workstation/Android device.

We are motivated to use this system to improve the doctor-patient interaction. With this system we overcome the drawbacks that exist in delivering the emergency services to the patients. We developed this multi-purpose system with low cost hardware.

III. Literature Survey

This section describes the work done carried out by the various researchers so far in the field of on the real-time healthcare management using Iot.

X.D.Wu et.al. has proposed the system in which the efforts has been taken to improve the clinical data environment for medical researchers to obtain more patients data conveniently, but it is not enough to support diagnosing, especially in emergency medical services, when more data need to be accessed quickly across organizations to coordinate group activities. Health Level 7 (HL7) provides the application-level standard for clinic data exchanging of network protocol. However it is still difficult for practising purpose[2].

C.He et.al. has developed a cloud platform in the system to handle heterogeneous physiological signal data to provide personalized healthcare services. In the related research, clinical data heterogeneity is still the main obstacle that hinders the clinic data integration and interoperation[3].

R. S. H. Istepanaian et.al. has used IoT technology to support medical consultations among rural patients, health workers, and urban city specialists. With the use of IoT, M-health concept, which is defined as mobile computing, medical sensors, and communication technologies for healthcare, attracts more and more researchers applying mobile communication technology and IoT in healthcare service[4].

Charalampos Doukas et.al. proposed a system in which mobile healthcare systems focus towards achieving two specific goals: the availability of e-health applications and medical information anywhere and any-time and the invisibility of computing[5].

IV. Architectural Design

The Fig.1 is the overall architecture of the proposed system. The system consists of three main categories Data acquisition, Data processing and Data communication. First in Data acquisition part the system will take the input from the patients body using sensors like Temperature sensor and Pulse rate sensor. These sensors are attached to the Arduino microcontroller. In data processing part, these readings from the sensor are fetched by the Arduino micro-controller which is processed by the micro-controller and further passed on for storage. In the next stage i.e. data communication, the Arduino micro-controller is attached with the Ethernet shield which further transfers the received data to the Cloud through the Internet for storing and publishing the data. These data stored in the Cloud can be retrieved through the application present at the doctors end. This application is used by the doctor to monitor the readings from anywhere. This is a real-time application which can obtain live readings of the sensors attached to the patients body.

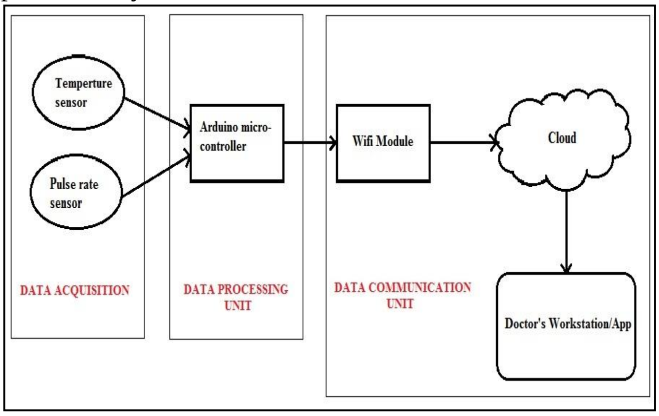

Fig. 1: System Architecture

V. AREA OF PROJECT

A. Internet of Things:

The Internet of Things, also called The Internet of Objects, refers to a wireless network between objects. By embedding short-range mobile transceivers into a wide array of additional gadgets and everyday items, enabling new forms of communication between people and things, and between things themselves. Advancements in Internet of Things(IoT) technologies present enormous potential for the high quality and more convenient health care servicing. By employing these technologies in the activities of health care servicing, doctors are able to access different kinds of data resources online [1] quickly and easily, helping to make emergency medical decisions and reducing cost in the process. Its a global network infrastructure, linking physical and virtual objects using cloud computing, data capture, and network communications. It allows devices to communicate with each other, access information on the Internet, store and retrieve data, and interact with users, creating smart, pervasive and always connected environments.

Main Components of System are:

1) Arduino micro-controller:

Arduino [10] is a micro-controller which is open source electronics to make things more flexible and more accessible to develop the multi-disciplinary projects. Arduino only runs C/C++ code, which is compiled into machine code. C/C++ are high-level programming language and are easy to learn and use. Arduino is one of the most established platforms on the market and the board is open source, which means that anyone could buy the parts separately, download the schematic and build it at home. As the board is open source there has come many different variants of the main board. Arduino Nano is the smallest board, which has very low power consumption and could be used for applications that do not require a lot of expansion capabilities. The Arduino UNO is one popular development board in the Arduino family.

The Arduino micro controllers are low cost, flexible and suitable for a wide variety of applications. In recent Arduino in used rather than PIC microcontroller. It is used because of their low cost, wide availability, large collection of application notes, availability of open source developer tool, and because of its easy programming. Data collected from various sensors is sent to the local pc through Arduino.

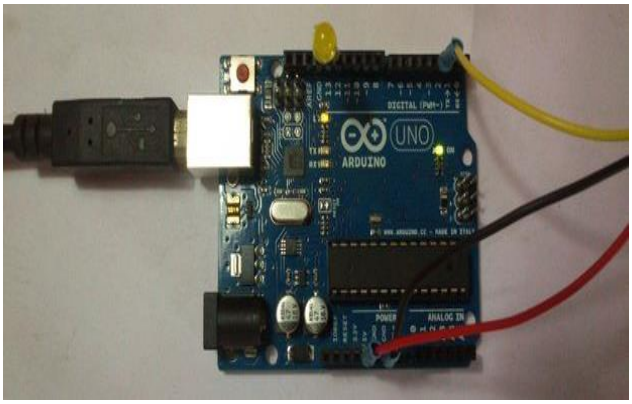

Fig. 2: Arduino Microcontroller (UNO)

a) Temperature sensor:

Body temperature depends upon the place in the body at which the measurement is made, and the time of day and level of activity of the person. This sensor allows you to measure body temperature. Different parts of the body have different temperatures.

b) Pulse rate measurement sensor

Pulse oximetry a noninvasive method of indicating the arterial oxygen saturation of functional hemoglobin. Oxygen saturation is defined as the measurement of the amount of oxygen dissolved in blood, based on the detection of Hemoglobin and Deoxyhemoglobin.

2) Wifi-Module:

USR-WIFI232-D2 Wi-Fi Module is an embedded 802.11 b/g/n Wi-Fi module, which supports serial to LAN/Wi-Fi, LAN to Wi-Fi or LAN to LAN transmission. The module can realize bidirectional transparent data transmission between COM and TCP/IP network interface.

WIFI232 series product is used for convert data from RS232 to WIFI TCPIP,Two-way transparent transmission, user need not know the WIFI and TCPIP detail, update the product for WIFI control. All the convert work is done by the module, for users, the RS232 side is only as a serial device, at the WIFI side, for user is TCPIP Socket data. User can setup the work detail by sample settings, setup via inside web pages or RS232 port, the setup work need only do once, then it will save the setting forever.

Fig. 3: Wi-fi-Module USR-WIFI232-D2

3) *Parse Cloud:*

Parse cloud is used as a backend for application. It stores data in key value pairs of JSON.

Every application on parse has its own application key and client key. These IDs are used to map the application i.e. connecting front-end and back-end

VI. RESULTS

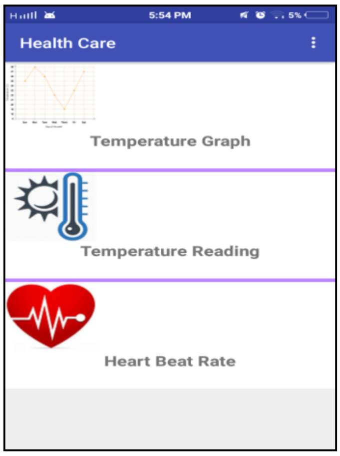

Fig. 4: Screenshot of Home screen of App

Fig. 5: Screenshot of Temprature Sensor Module

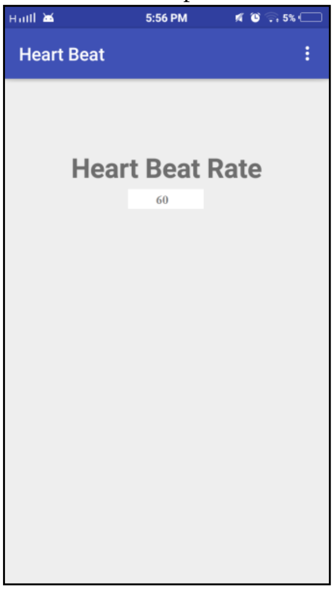

Fig. 6: Screenshot of Pulse-rate Sensor Module

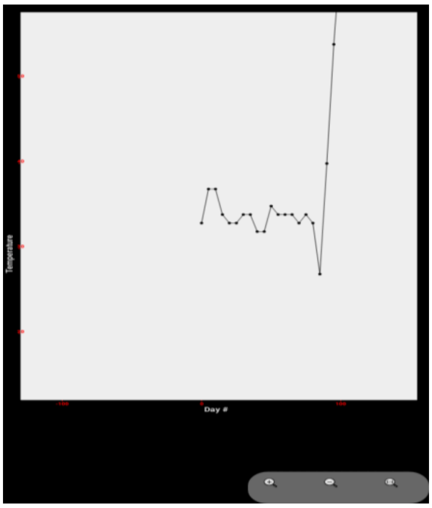

Fig. 7: Screenshot of Graphical Data

VII. DEVELOPED SYSTEM

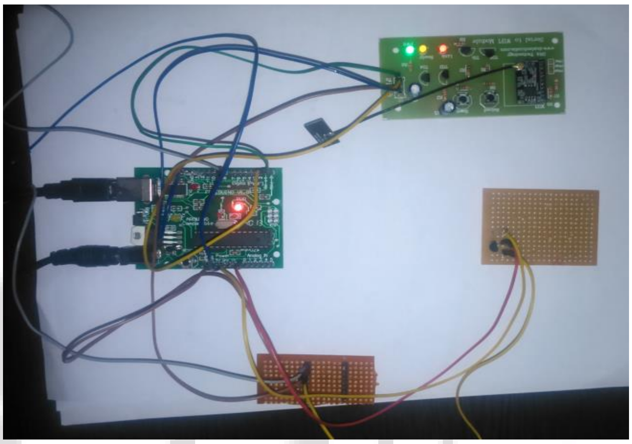

Fig. 8: Circuit

VIII. CONCLUSION

The sharing of medical information resources (electronic health data and corresponding processing applications) is a key factor playing an important role towards the successful adoption of pervasive or mobile healthcare systems. The goal is to provide a survey that will reflect the spectrum of the recent advances in m-health technologies and the role of the emerging mobile and network technologies in m-health systems and applications. one vision of the future is that IoT becomes a utility with increased sophistication in sensing, actuation, communications, control, and in creating knowledge from vast amounts of data. This will result in qualitatively different lifestyles from today.

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