RESEARCH ARTICLE OPEN ACCESS

Personalized Health Monitoring System Using IOT and Cloud

S. Ramamoorthy
Assistant Professor
Department of Computer Science and Engineering
SCSVMV University
India

ABSTRACT

The main focus of the method is to implement a prototype model for the real time patient monitoring system. The proposed method is used to measure the physical parameters like body temperature, heart beat rate, and oxygen level monitoring with the help of sensors. Conventionally there are number of techniques available for the ICU patient's health monitoring system with wired communication technology. In this system the patient health is continuously monitored and the acquired data is transmitted to wired or wireless sensor networks. The health sensors supports for analysing the input from the patient and the results of all the parameters are stored in the cloud database. In the cloud database both the patient details and the doctor details are stored. If any abnormality felt by the patient indications will send to the medical officials and as well the patients if they need to have any suggestions from the doctor they can have it. The implementation of the system is achieved by the advanced ARDUINO microcontroller and simulation results are obtained.

Keywords:- ICU, IOT, Arduino

I. INTRODUCTION TO IOT

Internet of Things represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purposes. Some also use the term *industrial Internet* interchangeably with IOT. This refers primarily to commercial applications of IOT technology in the world of manufacturing

Internet of things is defined as Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts. It can be considered the Future of Internet , where every object is connected to other objects. Every object is given a unique identity in the network. This allows remote access of devices through the network, anytime and at any location. IOT enabled objects communicate with each other, access information over the Internet, and interact with users creating smart , pervasive and always connected environments. IOT also enables machine to machine (M2M) communication which allows machines being controlled by the Internet and by other machines. This can revolutionize the way technology is used, as machine takes control of machines overcoming the constraints that people face while communicating with digital systems.

APPLICATION OF IOT:

1. Receiving warnings on your phone or wearable device when IOT networks detect some physical danger is detected nearby.

2. Automatic ordering of groceries and other home supplies.

3. Automatic tracking of exercise habits and other day-to-day personal activity including goal tracking and regular progress reports.

INTRODUCTION TO CLOUD:

Cloud computing is a type of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., computer networks, servers, storage, applications and services), which can be rapidly provisioned and released with minimal management.

THINGSPEAK:

"Thing Speak" is an open source Internet Of Things (IOT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates.

II. RELATED WORK

All the related works that have been done by other researchers that are related to the current research problem are as follows:

A Health-IOT Platform Based on the Integration of Intelligent Packaging, Unobtrusive Bio-Sensor, and Intelligent Medicine Box.

1(a): A Health-IOT Platform Based on the Integration of Intelligent Packaging, Unobtrusive Bio-Sensor, and Intelligent Medicine Box In-home healthcare services based on the Internet-of-Things (IOT) have great business potential; however, a comprehensive platform is still missing. In this paper, an intelligent home-based platform, the iHome Health-IOT, is proposed and implemented. In particular, the platform involves an open-platform-based intelligent medicine box (iMedBox) with enhanced connectivity and interchangeability for the integration of devices and services; intelligent pharmaceutical packaging (iMed Pack) with communication capability enabled by passive radio-frequency identification (RFID) and actuation capability enabled by functional materials; and a flexible and wearable bio-medical sensor device (Bio-Patch) enabled by the state-of-the-art inkjet printing technology and system-on-chip. The proposed platform seamlessly fuses IOT devices (e.g., wearable sensors and intelligent medicine packages) with in-home healthcare services (e.g., telemedicine) for an improved user experience and service efficiency. The feasibility of the implemented iHome Health- IOT platform has been proven in field trials.

Disadvantage: In this project only medical data's are collected and tells the information to the patient. It doesn't give the health care based information

(b) Bhoomika.B.K, Dr. K N Muralidhara developed a system monitoring the patients over internet. The model consists of PIC18F46K2 Microcontroller Temperature sensor, Pulse Oximeter Sensor (TCRT1000), Liquid Crystal Display (16x2), GSM MODEM, Piezo Electric Buzzer, Wi-Fi Module, Max232, GSM Modem, and Regulated Power Supply. In this system PIC18F46K22 Microcontroller collects the data from the sensors and sends the data through Wi-Fi Protocol. The Protected data sent can be accessed anytime by the doctors by typing the corresponding unique IP address in any of the

Internet Browser at the end user device (ex: Laptop, Desktop, Tablet, Mobile phone).

(c) Thirumalasetty, S. Kolangiammal health monitoring system based on IOT is described. A health monitoring system comprises several sensors connected to a person and they communicate with a data aggregator and processing unit. The data aggregator and processing unit may be a specialized device and p.c. The aggregator unit has the responsibility of collecting each sensor data following strict sampling rate, it forms the Body In our design we have used an ARM7LPC2148 microcontroller as an aggregation. hospital computer used as a processing unit for our health monitoring system. The aggregator uses wired USB serial connection to communicate with the data processing unit. services be provided to the users based on this data. This system can receive valuable medical advice from the doctors for the patients and can set alarms or reminders for timely medications and appointments and graphic files. Shows the design of the Health monitoring system. The system consists of three parts: patient module, doctor's module server module. Server module consists of two units: local and remote. The remote unit enables storing and distributing the data to doctors and. The local unit deals with processing of collected information from the sensors connected to a patient. It processes the collected raw data to generate meaningful information that can be understood by specialists and doctors. It then displays the processed information and sends it to hospital servers, sensor data from hospital sever was continuously upload to webserver.

DRAWBACKS:

1. Limitation in the classical databases.
2. Lack of Global suggestion for the patient health,
3. Delayed responses for the given query.
4. Unable to handle the situation instantly.
5. No automated alerting system.
6. Local suggestion based treatments.
7. No personal connection between doctor and patient**.**

III. PROPOSED WORK

1. The proposed model, intend to use IOT based smart sensor to monitor patient health condition.
2. The cloud repository is used to store the details of the patient history and the doctor.
3. In this method we measure heart beat rate through the IOT sensors.
4. Any abnormal conditions of the patient are detected by the sensor can be handled remotely by the doctor.
5. Collaboration with online cloud facilitates IOT communication in an effective way.

ADVANTAGES

1. Continuous health monitoring system.
2. Global interaction and suggestions for the treatment.
3. Personal health care.
4. Instant solutions for the emergency cases.
5. Large storage media for the health data and references
6. High end recovery model for life care hospitals.

ARCHITECTURE WITH EXPLANATION:

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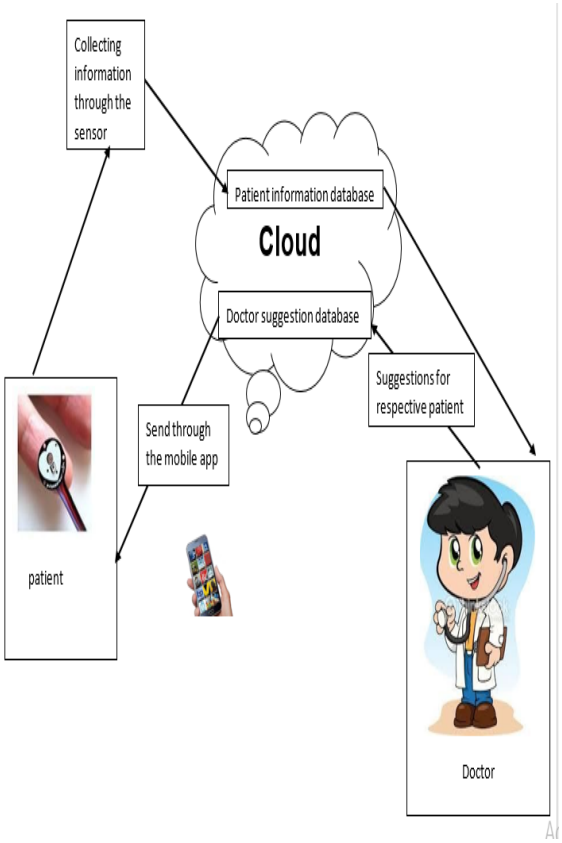


1. Collecting the patient data through the sensor.
2. Maintaining the patient history and the doctor details in the cloud [Thing speak].
3. If any abnormal condition is detected, the suggestions are given to the respective patient through the mobile application.

IV. MODULE DETAILS

ARDUINO UNO-BOARD:

1. Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software.
2. It consists of a circuit board, which can be programed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

Key Features of Arduino:

1. Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
2. You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
3. Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.

PC (WINDOWS 8.1):

1. Windows 8.1 introduced the Open MDM application programming interface, which allows IT administrators to control and secure devices using third-party mobile device management (MDM) software.
2. The OS also integrated OneDrive (formerly SkyDrive), Microsoft's cloud storage and file-sharing service, with its file system.

PULSE RATE SENSR (INVENTO):

1. Heart rate data can be really useful whether you're designing an exercise routine, studying your activity or anxiety levels or just want your shirt to blink with your heart beat. The problem is that heart rate can be difficult to measure.
2. The Pulse Sensor Amped is a plug-and-play heart-rate sensor for Arduino.
3. Simply clip the Pulse Sensor to your earlobe or fingertip and plug it into 3 *or* 5 Volt Arduino and you're ready to read heart rate.
4. It also carries an open-source program to display heart rate via diagrams in real time.

ARDUINO IDE:

1. The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus.
2. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

V. MOBILE APPLICATION

A mobile app is a software application developed specifically for use on small, wireless computing devices, such as smartphones and tablets, rather than desktop or laptop computers.

THINGSPEAK (Public cloud):

The Internet of Things (IOT) provides access to a broad range of embedded devices and web services. Thing Speak is an IOT platform that enables you to collect, store, analyse, visualize, and act on data from sensors or actuators, such as Arduino, Raspberry Pi, Beagle Bone Black, and other hardware.

VI. IMPLEMENTATION METHODOLOGY

1. Collecting the data through the sensor
2. Maintaining the patient history and the doctor in the cloud
3. Integration phase with the Arduino board
4. Monitoring and decision making process
5. Remedial measures over the response.

1.Collecting the data through the sensor:

1. IOT based Sensors are utilized to collect the patient health condition
2. The sensors are integrated with the Arduino board
3. The Pulse rate of the human body will be captured through the Sensor tied with the hand of the patient
4. The collected data will be shared to the respective server

1. Cloud Database:

1. The centralized cloud databases are used to store the patient details collected by the IOT based Sensors.
2. The Cloud Platform also allows the user to store the list of references related to the medical case studies.

3. Integration with Arduino:

1. The Arduino IDE allows the user to configure and set the logical alerts related to the patient health condition.
2. The Ardunio board and the cloud database will be interfaced through the available wifi connectivity.

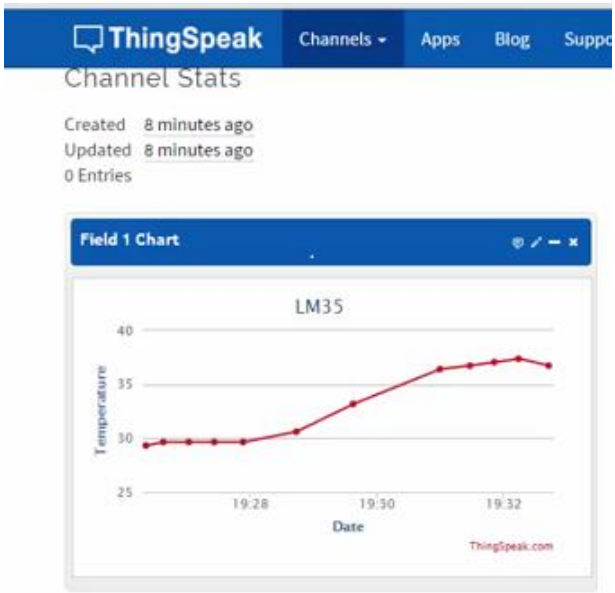
4. Monitor and Decision Making:

1. The current patient data will be compared with the pre-configured conditions of abnormal patient behavior.
2. This logical conditions are helpful to make the decision about the patient health condition.
3. The Automated Alerts triggered to alert the patient and the doctor to provide the suggestions about the patient health instantly.

5. Response to the Alert:

1. Based on the Alert directed by the IOT the patient either admit to the hospital (or) adhere to the instructions of the doctor immediately.
2. This Quick response will save the patient life.

SAMPLE SCREENSHOT RELATED TO OUTPUT:



VII. CONCLUSION

We develop a prototype model for smart health monitoring system that constantly monitors the patient health with the help of the sensors. This data is made available in the cloud through the real time feed over the internet. The internet of things refers to uniquely identifiable objects and their virtual representations in an internet like structure. Internet of Things also referred of objects which connects “Any Thing, Any Time from Any Place” which will be very popular in the coming years.

FUTURE ENHANCEMENT:

The system can be extended by adding more features like location access, linking the ambulance services, leading doctor's list and their specialities, hospitals and their special facilities etc., Doctors can create awareness about diseases and their symptoms through the mobile application. From the evaluation and the result obtained from analysis the system is better for patients and the doctor to improve their patients' medical evaluation.

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