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Wireless Patient Monitoring System Using IOT

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ABSTRACT: -*In this project IOT based system is designed and developed for remote patient monitoring. The primary function of this system is to monitor the patient's body and display the vital stats of patient to the doctor on their mobile or laptop through internet.*

In hospitals, where patient's body temperature and all other parameters are need to be constantly monitored, is usually done by doctor or other paramedical staff by constantly observing the temperature and maintaining a record of it. It is very tedious method. In this proposed system, a gateway which works as a brain of the IOT module continuously reads patient's body parameters through some sensors. And the data is directly sent through Wi-Fi or Ethernet modem interfaced to gateway under TCP IP protocol to a dedicated IP on the cloud via networked wireless modem environment which can be monitored or controlled in mobile app or laptop via internet by doctor.

Keywords: -Internet Of Things, Raspberry Pi ,TCP IP, Arduino.

INTRODUCTION

The monitoring of vital physiological signals has proven to be one of the most efficient ways for continuous and remote tracking of the health status of patients. Electrocardiogram monitors are often used in many medical service centers and hospitals to diagnose and monitor a person's health status by measuring their cardiac activity.

Electrocardiogram, pulse rate, temperature, blood pressure monitors etc.are often used in many medical institutions and hospitals to diagnose and monitor a patient's health status by measuring their vitals. An ECG is a non-invasive monitor, which can be utilized to evaluate the heart's electrical activity, measure the rate and regularity of heartbeats, the position of the chambers, identify any damage to the heart and investigate the effect of drugs and devices used to regulate the heart.

This procedure is extensively used for monitoring people with (or susceptible to) impairments in their cardiac activity. In addition, during surgical procedures, the electroencephalogram (EEG) is measured along with the ECG to track the consciousness level of a patient under anaesthetics. Other physiological parameters such as oxygen saturation in haemoglobin, electromyography, body temperature, heart rate and blood pressure similarly provide vital information about the health of the patient, when continuously monitored.

Although the system works perfect as of now, there does exist some shortcoming problems in this present system. Currently there are number of health monitoring systems available in hospitals which can be used only when the patient is on bed. The patient is monitored on the bed and the data is transferred to the PC via wired connections. Such systems fail when the distance between system and monitoring device is more. Also these systems cannot be used for personal use due to its high price and maintenance. The other problems with these systems are that they are not capable of transmitting data continuously along with the range limitations of different wireless technologies used in the systems.

So to overcome these limitations we have proposed a new IOT solution which is able to transmit the parameters of patient continuously and over long distance wirelessly. Due to which we would be able attend the patient immediately and thus developing a system that can constantly measure the patient's vitals along with an alarm and corrective measure option for the doctors, just one click away. This can really provide quick service and be beneficial in saving a lot of lives.

LITERATURE SURVEY

1) Liu Y presented the design and implementation of a Virtual Medical Centre (VMC) for home care. The system is dedicated to provide telematic home monitoring of asthma and heart cared at their homes and community. The modular form of this design allows the system to be modified for other applications. The communication infrastructure of this system is based on the existing phone lines and PSTN. Interfacing is done via a personal instrument and DECT technology that offer a high degree of automation and mobility.

2) JaieeSitaramAdivarekar'sPatient Monitoring System Using GSM Technology published, reviews the product Patient Monitoring System Using GSM which is innovated to enable remote monitoring of patients. The key objective of developing patient monitoring systems is to reduce health care costs by reducing emergency room and physician office visits, hospitalizations, and diagnostic testing procedures. Many new wireless transmission protocols and technologies adapt easily to new applications. Some technologies and protocols most applicable to RPM include Bluetooth, ZigBee, Mobile phone protocols, Wi-Fi, WI-Max and Radio frequency identification (RFID). We are able to transmit the data which is sensed from remote patient to the server PC by using wireless transmission technology ZigBee. Using ZigBee at receiver the data is received and displayed on the PC of doctor. Also if doctor is not present in campus he will receive SMS on his mobile phone in case any parameter of the patient goes beyond the normal range

PROPOSED WORK

In this proposed work, an Internet of Things solution for patient health monitoring system is to be designed. In normal hospitals, the doctors are not available 24 hours which results in less experienced medical staff in the hospital to monitor the patient's vitals. This process has proved fatal in many cases where the lack of proper understanding of the various medical monitoring system outputs, by the medical staff has led to many regrets. Our system gives the doctor a complete access to the patient's vitals irrespective of his location.

We employ AD8232 (ECG sensor), Pulse rate sensor, DHT11 (Perspiration and temperature sensor) for collecting patient's vitals and provide them to the IOT gateway. The IOT gateway in this project is Arduino UNO as it has provision for both analog and digital sensor interfacing with inbuilt 8bit ADC. It used atmega328P IC as microcontroller. Arduino UNO is a microcontroller which works on 5V power supply and 16 MHz Quartz Crystal oscillator. The sensor data are calibrated in the Arduino IDE and .ino files.

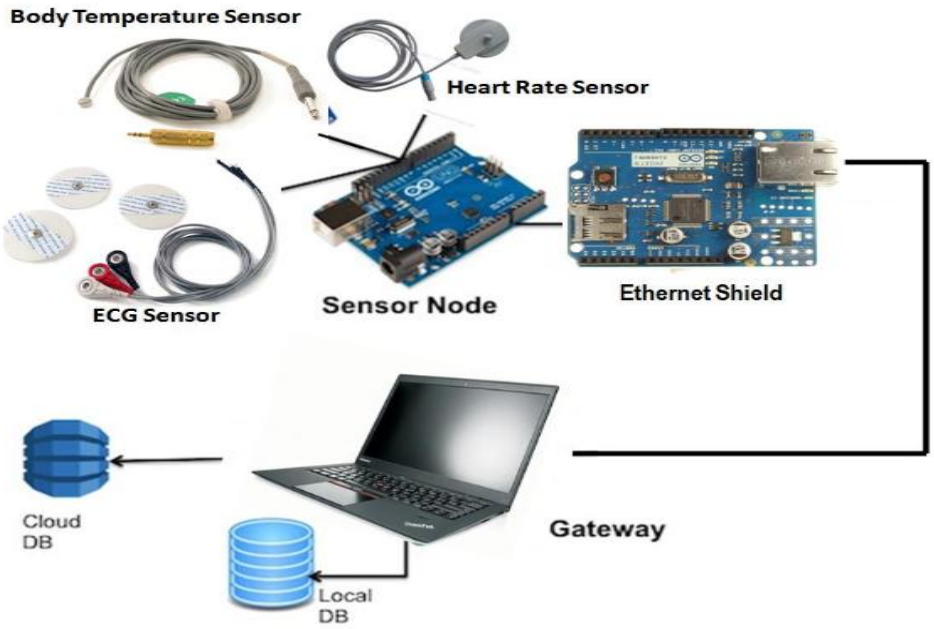
We have used a pub-sub client library which is enables a publish-subscribe mechanism for MQTT protocol which is required for transmission of data on the cloud. The MQTT protocol uses only 2bytes of memory whereas HTTP uses 2kbmemory for data transmission. The cloud server which we use is an AWS cloud. The Arduino does not provide any inbuilt provision for internet thus including an Ethernet shield.

The data transfer between the Ethernet shield and Arduino is done using I2C protocol. The Arduino can use both LAN connection and ESP8266 for internet access. The sensor data can be accessed using various virtual MQTT clients by publishing and subscribing to a specific topic i.e. the sensor name. Along with the virtual clients, real client webpages can also be developed. The sensor data can be seen on this webpage directly on a local or global server.

To introduce the concept of local server and data security we use Raspberry Pi as a server. Raspberry Pi is a microprocessor working on LINUX which is also known as a credit card size computer. We have used Raspberry Pi 2B to create a local server and storage of data. We then use apache server to create a local server. Apache server enables raspberry pi to create a VPN network using FTP and SMTP protocol.

Once the server is created, we can use the IP address assigned to the raspberry pi to access the webpage and data. Using a VPN server insures the data security as only one authorized person at a time can view the patient's data. Thus we have interfaced sensors to Arduino Uno as gateway which is used to upload data on internet and raspberry pi is used to fetch the data from the internet and create a local VPN server.

BLOCK DIAGRAM



HARDWARE DEVELOPED

DIY processors and controllers along with biomedical sensors comprise the total hardware of the project. For actuating a device online, a 5 volt relay module has been assembled. The hardware selection depends on the level of smart automation to be done. The involvement of hardware may range from Arduino mini and Raspberry Pi 0 to Arduino Uno and Raspberry Pi 3. Also the sensor selection is based on the requirement of data which might include both digital and analog sensors.

SOFTWARE DEVELOPED

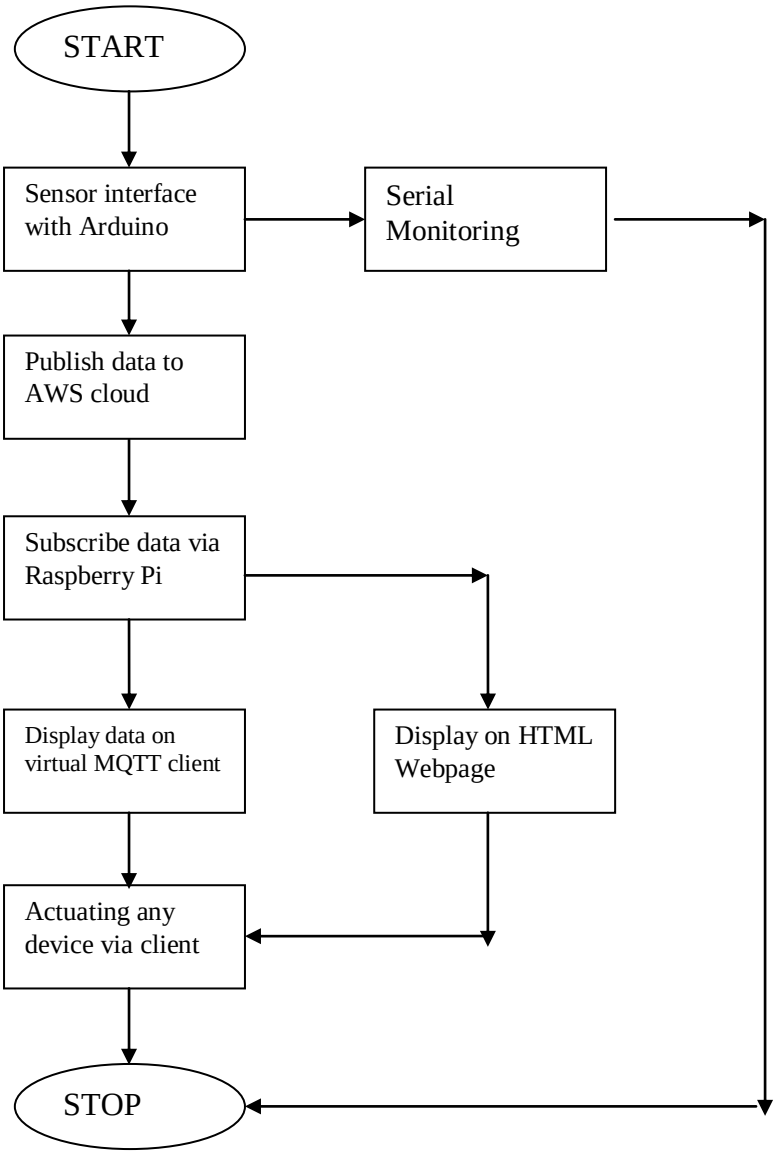
Arduino IDE is an arduino compatible development environment used for programming data acquisition from the sensors. Arduino has provisions for code development and debugging along with code compilation. MQTT client subscription and publishing code is developed and the data is broadcasted using apache server installed on Raspberry Pi.

Algorithm for Wireless Patient Monitoring System using IOT is given below:

ALGORITHM:

Step 1: Interface analog sensors and digital sensors to the respective pins on Arduino.
Step 2: Upload the .ino file in the Arduino and mount the Ethernet shield on to the Arduino.
Step 3: Connect the Arduino to the internet.
Step 4: Use virtual clients My MQTT and MQTT Lens to monitor the pseudo data.
Step 5: Create a webpage using .js and .html.
Step 6: Boot the raspberry pi with raspbian operating system.
Step 7: Using Xming, provide the raspberry pi with the router SSID using SSH forwarding.
Step 8: Connect raspberry pi to the internet.
Step 9: Install the GPIO library.
Step 10: Install the apache server on raspberry pi.
Step 11: Store the HTML files and all corresponding JavaScript files in the apache root directory in the html folder.
Step 12: Use the local IP address assigned to the Raspberry Pi by the router to access the data on the VPN server.

FLOWCHART:



CONCLUSION

From the above design we can conclude that we are able to transmit the data which is sensed remotely across the globe by using IOT.

The leads of the ECG sensor must be stick properly to the patient, at RL LA RA positions of human body so that we get accurate ECG. MQTT enables data to be sent at a faster rate and provides a real time data transmission. Using IOT the data is received and displayed on the computers of the concerned doctors. Also if doctor is not present in campus, he will receive notification on his mobile phone along with alarm conditions.

ACKNOWLEGMENT

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REFERENCES

[1] IEEE Transactions on Biomedical Circuits and Systems. "A Wireless Biomedical Signal Interface System-on-Chip for Body Sensor Networks" Vol. 4, No. 2, April 2010.

[2] International Journal of Innovative Technology and Exploring Engineering (IJITEE). "Wireless Stand-alone Real Time Remote Patient Health Monitoring System" ISSN: 2278-3075, Volume-3, Issuse-7, December 2013.

[3] International Journal References of Advanced Research in Computer and Communication Engineering "Wireless Interactive System for Patient Healthcare Monitoring using Android Mobile" Vol. 3, Issue 2, February 2014.

[4] International Journal of Mathematics and Computer Research. "Patient Monitoring System Using GSM Technology" Vol. 1, Issue 2, March 2013.

