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Healthcare Management and Monitoring System using Internet-of-Things (IoT)

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Abstract— According to research, there are many people died monthly due to the only carelessness of their health. This is because they don't have time for themselves and they forget about their caring of health due to a busy life. The reason behind to build this project is the increasing world of technology and people forget their health checkup which is needed to be done weekly or monthly . We all know that internet of things make our life easier. So, we have decided to implement an internet of things based healthcare project for people who are busy. That busy people provide them all the personal information about their health on their mobile and they can check their all historical health data. The best part of this project is that it can be used by everyone. Now a days, the IOT Based Health Care System for is cheapest healthcare device based on the IOT platform for the patients and doctors. The solution is given for measurement of body parameters like Temperature, Moisture, and Heartbeat. It also detects the body condition and location of the patients. In this project we are using different sensors and different modules for performing a different type of functions and the Thing speak Cloud service is used for storing all the data in the cloud, it gives security and facility of accessing all the data at any time which is very useful for the doctors at the time of treatment. This system also generates an alert when it required that means at the time of any critical conditions.

Keywords: IOT; Remote Healthcare Monitoring, cloud, big data, arduino, sensors.

I INTRODUCTION

Recent technological improvements in wireless communications, low power processors, and electronic devices are making the *Internet of Things* a reality. In the IOT vision, every single object on Earth can be identified, addressable, controlled, and monitored via .Internet of Things (IOT) refers to a recent paradigm that has rapidly gain in the area of modern wireless telecommunications. IOT is used in health care system to provide better healthcare services to people at any time anywhere in an affordable and patient friendly manner. The healthcare system is going to change from a traditional approach to a modernized patient centred approach. In the traditional way the doctors play the major role. For necessary diagnosis and advising they need to visit the patients. There are two basic problems related to this approach. Firstly, the healthcare professionals must be a the patient remains admitted in the hospital, wired to bedside biomedical instruments, for a long period of time. In order to solve these two problems the patient oriented approach has been received and other problem is keeping track of the health status of the patient at home is a difficult task. Specially old age patients should be periodically monitored and their loved ones need to be informed about their health status from time to time at remote location.

So we propose an innovative system that automated this task with ease. The main focus of the system is to monitor patient at remote location .This system is used to measure the physical parameters like body temperature, heart beat rate, and oxygen level monitoring with the help of biosensors. There are number of techniques available for the ICU patient's health monitoring system with wired communication technology. In the novel system the patient health is continuously monitored and the acquired data is transmitted to an using Wi-Fi module. Embedded processor supports for analysing the input from the patient and the results of all the parameters are stored in the cloud. If any abnormality felt by the patient indications will send to the medical officials. The implementation of the system is achieved by the advanced ARDUINO microcontroller and simulation results are obtained. This system gives us the development of microcontroller based system for wireless heartbeat and temperature monitoring using Wi-Fi module .Thus IOT based patient health tracking system effectively uses internet to monitor patient health stats and save lives. For implementing this system we are using Things Speak. Things Speak is an open source Internet of Things (IOT) application and API to store and retrieve data from things using HTTP protocol over the internet or via a Local Area Network .Things Speak enables the creation of sensor logging applications

II LITERATURE SURVEY

There are many reviews on the subject of Healthcare Monitoring and Management System using IOT were done in the past either as part of research papers/technical reports on

IOT based Health Monitoring System.

1)   In first System Here, They are designed health monitoring system using ATmega8 microcontroller with Wireless Body Area Sensor Network (WBASN). In this paper, the different sensors are used they are Temperature sensor, Blood pressure sensor, Heart beat sensor. These different sensors are placed on human body they are helps to monitor the health condition without disturbing the daily schedule of the patient and these health. LCD display and GSM modem are used to transmit or receive health related data to or from the doctor. This system takes small amount of time to know the health condition of patient and then delivers the report to the doctor.

2) The second system, health parameters are send to the different modules .The modules are RFID reader, Bluetooth, GSM and UMTS. This system monitors the blood pressure of patient. Using GSM and UTMS the health parameters are directly send to the doctors. In this system video guide is used. This video guide feature gives the patients age and pressure correctly.

3) Third System is the blood pressure monitoring system using microcontroller. In This systems motor control unit, Microcontroller ATmega328, LCD displays are used. Cuff is directly connected to the pressure sensor, cuff is a inflated or deflated via a motor and value. Microcontroller controlled the ON and OFF switches of motor at a correct time. Due to changes in the ON and OFF switches of the motor, the wrist cuff gets inflated and deflated; this pressure is measured by the pressure sensor.

III SYSTEM ARCHITECTURE

The IoT Based Health Care Management System consists of Arduino Controller which manages the controlling between sensors, PC Interface and Internet. The Arduino along with wifi module esp8266 works as the bridge between Sensor networks (Hardware) and Internet Network (Software). The sensors used in the systems are Body Temperature sensor LM35, Moisture sensor, Heart rate sensor (External Space maker), LCD Display for monitoring the status of sensor parameters.
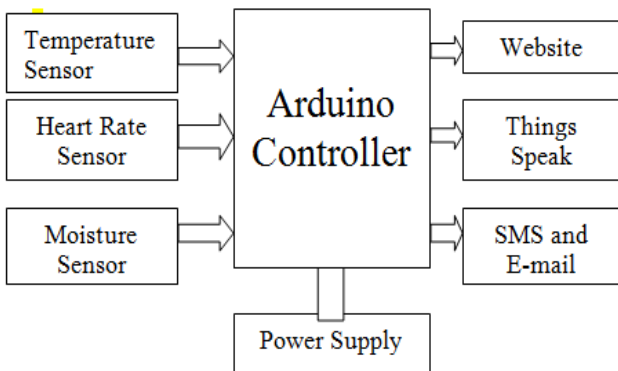

Figure 1: Block Diagram of Healthcare System.

The controller will collect the data from sensors and it will send it over Internet via ESP8266 wi-fi module, also the parameters are displayed on PC base user interface. The .Net based user interface is used for monitoring, analysing and controlling the Health parameters. If the parameters shows values above certain level it will notify doctor via SMS and mail. The Thing speak based cloud network is used for analysis of sensor parameters. And the graphs are used to monitor health of a person.

IV DESIGN AND IMPLEMENTATION

This health monitoring system consists of many Health Monitoring sensors. They are temperature sensor, moisture sensors and heart beat rate sensors are considered in this paper. Sensors are used for sensing health care data collection. The Health Monitoring sensors are touched by human to sample the physiological signals of the patient. Arduino is officially registered device under Internet of Things Foundation. Hence it is being chosen for implementation in this proposed system. The sensor values are recorded using the Arduino programming for Intel Galileo Gen2. It is also possible to interface the physical world such as I2C, GPRS/GSM and sensors with IOT proxy   Figure 2 shows the Temperature sensor and Figure 3 shows the heart beat sensor and a Figure 4 shoes moisture sensor in the proposed work. PCB antenna is connected with ATWIN Quad-band GPRS/GSM [13] shield. It comes with Industry standard interface. It is an ultra compact and high quality wireless module base on the Infineon UCL2 platform. This is an SMT package with small dimension, low power consumption, quadband (AT139) and dual-band (AT139D) module. It can provide with voice, SMS, Fax, data applications for physicians.

Sensors are used in this system they are as follows:
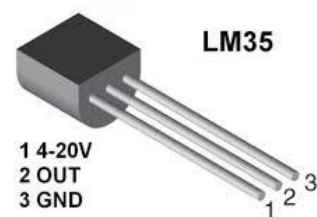
A)LM35 Temperature sensor

Figure 2: Temperature Sensor

LM35 is a very low cost and easily available Sensor. Main advantage of LM35 is that it is linear i.e. $10mv/°C$ which means for every degree rise in temperature the output of LM35 will rise by 10mv. So if the output of LM35 is 220mv/0.22V the temperature will be 22°C. So if room temperature is 32°C then the output of LM35 will be 320mv i.e. 0.32V. LM35 can also be directly connected to Arduino. The output of LM35 temperature can also be given to comparator circuit and can be used for over temperature indication or by using a simple relay can be used as a temperature

controller. LM35 Temperature Sensor which is a semiconductor based sensor. LM35 is an integrated analog temperature sensor whose electrical output is proportional to Degree Centigrade. LM35 Sensor does not require any external calibration or trimming to provide typical accuracies. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

Features of LM35 Temperature Sensor:

- Calibrated directly in Degree Celsius (Centigrade)
- Linear at 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee-able (at a25°C)
- Rated for full -55°C to a 150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 mA current drain
- Low self-heating, 0.08°C instill air
- Non-linearity only 0.25°C typical
- Low impedance output, 0.1Ω for 1 mA load

B)Heart Rate Sensor

Figure 3: Heart Rate Sensor

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse. The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where heart pulse rate is to be monitored ,the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.

Features of Heart Rate Sensor:

- Microcontroller based SMD design
- Heat beat indication by LED
- Instant output digital signal for directly connecting to microcontroller

- Compact Size
- Working Voltage +5V DC

C) Moisture Sensor (SKU:SEN0114)

Figure 4: Moisture Sensor

Features of Moisture Sensor:

- Power supply: 3.3v or 5v
- Output voltage signal: 0~4.2v
- Current: 35mA
- Pin definition:
  - Analog output(Blue wire)
  - GND(Black wire)
  - Power(Red wire)
- Size: 60x20x5mm
- Value range:
  - 0 ~300 : dry soil
  - 300~700 : humid soil
  - 700~950 : in water

IOT patient monitoring has 3 sensors. First one is a temperature sensor, second is Heartbeat sensor and the third one is hmoisture sensor. This project is very useful since the doctor can monitor patient health parameters just by visiting website or URL. And nowadays many IOT apps are also being developed. So now the doctor or family members can monitor or track the patient health through the Android apps. To operate IOT based health monitoring system project, you need a WiFi connection. The microcontroller or the Arduino board connects to the Wi-Fi network using a Wi-Fi module. Arduino board also offers the connectivity of sensors to cloud with the Wi-Fi support through miniPCIeslot available; leading to IoT based health care system This project will not work without a working WiFi network. You can create a WiFi zone using a WiFi module or you can even create a WiFi zone using Hotspot on your smart phone. The Arduino UNO board continuously reads input from these 3 senses. Then it sends this data to the cloud by sending this data to a particular URL/IP address. Then this action of sending data to IP is repeated after a particular interval of time. For example in this project, we have sent data after every 30 seconds.The Arduino UNO board continuously reads input from these 3 senses. Then it sends this data to the cloud by sending this data

to a particular URL/IP address. Then this action of sending data to IP is repeated after a particular interval of time. For example in this project, we have sent data after every 30 seconds. The finger moisture readings are posted in "Thingspeak" cloud.

V CONCLUSION

Healthcare monitoring and management system using IoT implemented. This system offers the doctors to take advantage of the massive amount of healthcare data and provide right intervention to the right patient at the right time. Hence personalized care could be given to the patient. Arduino has acted as IoT agent in this paper and is used to deploy the health information of patients into the Thin speak Cloud. This remote monitoring system allows the doctor to monitor the health status of the patient remotely. This is efficient system which alerts about the patient health condition to his or her family members in the form of SMS and E-mail. Since the response time of the proposed system is less, it is suitable or real time alerting.

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