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IOT Based Human Health Monitoring System

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Abstract -The main objective of the project was to design a remote healthcare system. It's comprised of three parts. The first part being, detection of patient's vitals using sensors, second for sending data to cloud storage and the last part was providing the detected data for remoteviewing. Remote viewing of the data enables a doctor, guardian to monitor a patient's health progress away from hospital premises. The Internet of Things (IOT) concepts have been widely used to interconnect the available medical resources and offer smart, reliable, and effective healthcare service to the patients. Health monitoring for active and assisted living is one of the paradigms that can use the IOT advantages to improve the patient's lifestyle. In this project, I have presented an IOT architecture customized for healthcare applications.The aim of the project was to come up with a Remote Health Monitoring System that can be made with locally available sensors with a view to making it affordable if it were to be mass produced.Hence the proposed architecture collects the sensor data through microcontroller and analyzed for remote viewing. Feedback actions based on the analyzed data can be sent back to the doctor through SMS alerts in case of any emergencies.

Key Words:Internet Of Things (IOT), Patient Health Monitoring, GSM Module, Heart Beat Sensor, Glucometer, TemperatureSensor .

1.INTRODUCTION

In this age of Internet of Things (IOT), even now longer waiting time and longer patient monitoring system are common issues. The patients have to wait in the hospitals and diagnostic centres for hours for fasting glucose test, oral glucose tolerance test and blood pressure check-up. It has become a necessity to develop smart health monitoring system for the patients, which can be used for daily routine monitoring. Alongside of monitoring, the system should be able to analyse the patients' current health status and contact the patients' doctors and family members in emergency basis whenever the health condition is deteriorating. Enormous amount of solutions for patient monitoring has been developed till today. With the help of Internet of things these solutions can solve the patient monitoring problem easily and remotely while helping massive number of people in the world. In this paper, we have highlighted our system, which is able to provide an automatic monitoring and alert giving system-using sensors, for the patients suffering from diseases. We have studied and compared current implemented systems and explored the gaps in different systems in order to make a better solution for patients. The continuous health monitoring system of any individual using Internet of Things (IOT) and technology has become a foremost requirement these days. In the area of healthcare, these systems need to be easy to use for the user patients and faster to analyse the data. Besides, the system should be able to monitor the health condition of patients anytime, anywhere.

In this advanced time, people are using all the smart devices and technology for any problem, but still they need to go to the physicians to diagnose their health conditions manually. Smart solutions for this problem can reduce stress related to journey, save time to meet the doctor and save cost for the patient rather than manual support at clinic. However, the smart health care system should provide better service for remote health care. Our system and architecture are designed for individual patients or hospitals for monitoring and measuring different parameters and risk factors for patients.
Along with tracking down the previous health monitoring data, our system alsoelements easy visualization of patient data.
Another major concern of this system is analysing the data and identifying risk levels for the individual patient. Aside from all these features, our system provides alert to doctors and family members based on the analysed result and identified risk level of any patient.
In this paper we will discuss our solution based on patient's food intake, sugar level, heart pulse, and exercise status, risk status with conjunction to SMS and email services, various sensors, parameters for patient's data analysis that implements the drawbacks of most of the existing systems.
Rest of the paper is organised as follows: Section 2 describes state-of-art heath status monitoring system related methods, Section 3 presents the proposed model, Section 4 depicts the experimental results and discussion and major findings based on the experimental result. Finally, section 5 concludes the paper with future research leads.

1.2. LITERATURE REVIEW

A number of reviews on the subject of Wireless Sensorstechniques were done in the past either as part of research papers/technical reports on IOT based Health Monitoring System.

(a) First System Here, researcher designed health monitoring system using ATmega8 microcontroller with Wireless Body Area Sensor Network (WBASN). In this work, the sensors which are used here are Temperature sensor, Blood pressure sensor, Heart beat sensor. These sensors are placed on human body which are helps to monitor the health condition without disturbing the daily schedule of the patient and these health related parameters are then forwarded to physician's server using long range wireless technology GSM. Health monitoring system consists of sensors, microcontroller, LCD display and GSM modem to transmit or receive health related data to or from the doctor. Similarly, at hospital same GSM modem is used. Hence, GSM modem helps in the establishment of network between patient's server and doctor's server. LCD(Liquid Crystal Display) display is providing to show the instant result to the patient. Here researcher used LM34 as temperature sensor, IR LED and red LED is used for heart rate monitoring and Pressure transducer or the sensor based onpiezo-electrical material is used to measure the systolic BP and diastolic BP. Microcontroller reads data as given by the temperature sensor, blood pressure sensor and heart rate sensor and processing it gives the output in the form of digital and it getsdirectly display on LCD or it gets transmitted to the doctor's server through GSM modem. This system gives exact and instant result with high accuracy which gets directly display on LCD. It takes max 4-5 sec to monitor the doctor's server using GSM wireless technology .This system takes small amount of time to know the health condition of patient and then delivers the report to the doctor.

(b) Second System using same system, health parameters are sending by using RFID reader, Bluetooth, GSM and UMTS. This system gives facility to monitor the blood pressure of patient. The health parameter directly sends to the doctor using GSM and UTMS. Here, video guide is used. This video guide feature serves the patients age and his blood pressure correctly. This system consists of three parts: Touchpad, remote server and reading of the Tag ID and BPM. For reading the Tag ID and BPM, use a microcontroller unit (MCU) as a kernel. The client touchpad receive the blood pressure measurement (BPM) data a RFID through Bluetooth. Client touchpad send the data to the health parameter. Also, these health parameters are directly send to remote data center and remote data center to the doctor using GSM and UMTS wireless technology. Data gets transmitted in the form of the packets. This system helps to store previous data. Similarly, it takes less time to monitor the blood pressure of the patient.

(c) Third System shows the blood pressure monitoring system using microcontroller. This system includes motor control unit, Microcontroller ATmega328, LCD display. The pressure sensor is directly connected to the cuff, which is inflated or deflated via a motor and valve. ON and OFF switches of motor are controlled by the microcontroller at correct time. Due to changes in the ON andOFF switches of the motor, the wrist cuff gets inflated and deflated; this pressure is measured by the pressure sensor. Pressure sensor generates the health parameter in the analog sensor. The processing of analog sensor is done with the help of the microcontroller and gives digital output which is displayed on the LCD or on the Personal computer using RS232. Magneto resistive RAM (MRAM) stores the value of systolic and diastolic blood pressure and is directly connected to the microcontroller. Similarly, here no need havepumped the cuff by hand; all the system is controlled by the microcontroller. It is not required to calculate or observe blood pressure manually. Time consumption is very less compared to old system.

PROPOSED SYSTEM

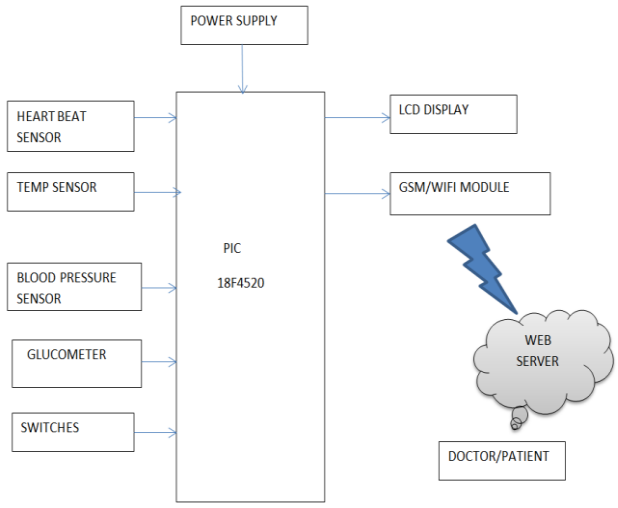

Fig -1: Block Diagram

To run the system first we need to connect microcontroller with the power supply as microcontroller is the main control unit. In input side, we have heartbeat sensor, TEMP SENSOR and some manual buttons. On the other hand, output is shown in the LCD display. Moreover, GSM Module helps to send data in the cloud and when the data gets uploaded, we can check the output by using Laptop or Computer by log in to the server. First of all, a finger is placed in the heartbeat sensor and push button is also pressed so that the system can read data. After that, it shows result in the LCD display. Also, by pressing another push button, it can upload the output in webpage and APP and send text message through GSM module. Similar process is done with the HEART BEAT sensor. For this case, by pressing push button, data is send through GSM module and shows the ECG curve in the Web page and the APPs. This is all about the block diagram which shows the entire process of hardware.

2.1PIC 18F4520 microcontroller:

Data Memory up to 4k bytesn Data register map - with 12-bit address bus 000-FFF

- Divided into 256-byte banks
- There are total of F banks
- Half of bank 0 and half ofbank 15 form a virtual (oraccess) bank that is accessibleno matter which bank isselected – this selection isdone via 8-bits
- Program memory is 16-bits wide accessed through a separate program data bus and address bus inside the PIC18.
- Program memory stores the program and also static data in the system.
- On-chip External
- On-chip program memory is either PROM or EEPROM.
- The PROM version is called OTP (one-time programmable) (PIC18C) The EEPROM version is called Flash memory (PIC18F).
- Maximum size for program memory is 2M n Program memory addresses are 21-bit address starting at location 0x000000

Fig -2: PIC18f4520

2.2Heart Beat Sensor/Blood Pressure Sensor:

Blood Pressure & Pulse reading are shown on display with serial out for external projects of embedded circuit processing and display. It shows Systolic, Diastolic and Pulse Readings. Compact design fits over your wrist like a watch. Easy to use wrist style eliminates pumping.

Features

- Intelligent automatic compression and decompression
- Easy to operate, switching button to start measuring
- 60 store groups memory measurements
- Can read single or all measures
- 3 minutes automatic power saving device
- Intelligent device debugging, automatic power to detect
- Local tests for : wrist circumference as 135-195mm

Fig -3: Heart Beat Sensor

2.3Glucometer:

Glucometers, also known as glucose meters, are highly sophisticated, requiring only a single drop of blood, and are conveniently sized and portable. They are small enough to take with you on-the-go, and based on your comfort level, can be used anywhere at any time. Whether you have type 1 or type 2 diabetes, at-home blood-sugar monitoring devices called glucometers can give you valuable information about whether your blood sugar is too low or too high, or in a good range for you. These portable electronic devices provide you with instant feedback and let you know immediately what your blood sugar is. Regular monitoring is a particularly helpful way to manage your diabetes and help control your blood sugar, so it's important to know how to properly use the device.

Fig -4: Glucometer

2.4Temperature Sensor (LM35):

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. For example at 30 degree celcius it will output 300mV at linear scale.

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration

or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range.

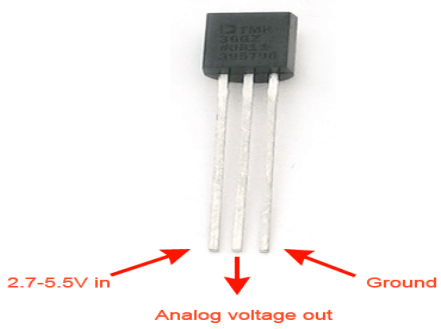

Fig -5: Temp Sensor(LM35)

2.5 GSM module:

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller

using the RS232 to TTL converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger of the USB to Serial Adapter. Then you can open Putty or any other terminal software and open a connection to that COM port at 9600 baud rate, which is the default baud rate of this modem. Once a serial connection is open through the computer or your microcontroller you can start sending the AT commands.

Fig -6: GSM Module

2.6LCD Display:

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

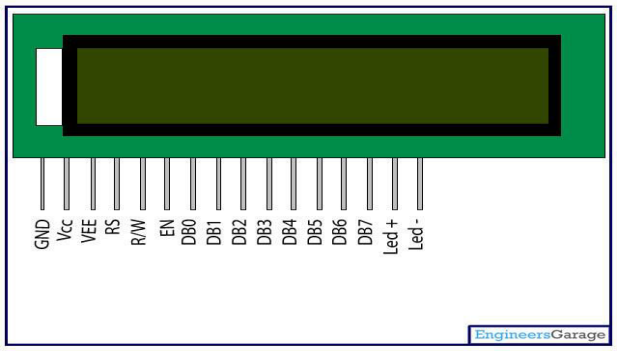

Fig -7: LCD Display

2.7 IOT Platform:

a) Use the Thinkspeak platform to send data to the cloud from any Internet-enabled device.

b) You can then configure actions and alerts based on your real-time data and unlock the value of your data through visual tools.

c) Use the Thinkspeak offers a platform for developers that enable them to easily capture sensors data and turn it into useful information.

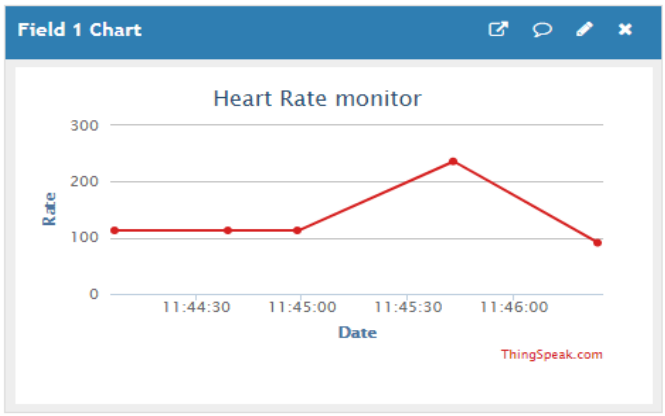

Fig -8: Heart Rate Monitor OnThingsspeak

3. CONCLUSIONS

The Internet of Things is considered now as one of the feasible solutions for any remote value tracking especially in thefield of health monitoring. It facilitates that the individual prosperity parameter data is secured inside the cloud, stays in the hospital are reduced for conventional routine examinations and most important that the health can be monitored and disease diagnosed by any doctor at any distance. In this paper, an IOT based health monitoring system was developed. The system monitored body temperature, pulse rate and sugar level, which are also displayed on a LCD. These sensor values are then sent to a medical server using wireless

communication. These data are then received in an authorized personalssmart phone with IOT platform. With the values received the doctor then diagnose the disease and the state of health of the patient.

Due to the importance of observing medical patient, continuous remote monitoring is necessary. Our project work is giving the opportunity to monitor patient continuously by using the web and apps service along with live monitor and mobile message service. This paper also compared the early aged medical system between present time health monitoring. The present time represents the time reducing; reduce health care cost especially for rural area people.

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