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IOT BASED HEALTH MONITORING SYSTEM

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Abstract

The Internet of Things could be a game-changer for the healthcare industry. It is transforming healthcare industry by increasing efficiency, lowering costs and put the focus back on better patient care. IoT in Healthcare is a heterogeneous computing, wirelessly communicating system of apps and devices that connects patients and health providers to diagnose, monitor, track and store vital statistics and medical information.. It is very important to monitor various medical parameters and post operational days. Hence the latest trend in Healthcare communication method using IOT is adapted. Internet of things serves as a catalyst for the healthcare and plays prominent role in wide range of healthcare applications. In this project the PIC18F46K22 microcontroller is used as a gateway to communicate to the various sensors such as temperature sensor and pulse oximeter sensor. The microcontroller picks up the sensor data and sends it to the network through Wi-Fi and hence provides real time monitoring of the health care parameters for doctors. The data can be accessed anytime by the doctor. The controller is also connected with buzzer to alert the caretaker about variation in sensor output.. This system is efficient with low power consumption capability, easy setup, high performance and time to time response.

Keywords: Internet of Things, PIC microcontroller, ESP8266 Wi-Fi module, Temperature sensor, Pulse oximeter sensor.

1. INTRODUCTION

Internet of things (IOT) is a fast growing, a user-friendly technology which allows everything to is connected and also allows effective communication between the connected "things." The Internet of Things, likewise called The Internet of Objects, alludes to a remote system between items, as a rule, the system will be remote and self-designing, for example, family unit machines. The term "Internet of Things" has come to describe some technologies and research disciplines that enable the Internet to reach out into the real world of physical objects. IOT has top five applications are Traffic monitoring, Healthcare, Security, Transport and logistics, and Daily life. E-Health recognized as the most important and promising for these applications due to its potential for health monitoring of chronic illnesses, lifesaving in emergency situations, and its ability to provide round the clock healthcare to rural and disadvantaged areas. As one of the consequences of such mechanical merging, the therapeutic range has benefitted from recent advances in sensors outline and remote correspondence advances. In particular, the constant miniaturization of electrical devices has empowered the development of e-health monitoring. These incorporate different sorts of therapeutic and non-medicinal sensors inserted in cell phones, wearable gadgets in, close by the patient's bodies, filling in as critical components of remote body zone systems, or WBAN in short. Late years have seen a quick advancement of cell phones sensors, body sensors, and remote correspondences, which make a path for productive wellbeing observing. The human services errands are accordingly moved from traditional clinical environment to pervasive easy to use environment. Likewise, the scope of

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observing subjects could be fundamentally extended, shifting from the patients at critical care, e.g., in an emergency vehicle, to those with incessant maladies. Specifically, the body sensors conveyed in, close to the human body, too as the setting mindful sensors like the ones inserted in cell phones, can be utilized to gauge the basic wellbeing parameters or key signs, for example, pulse, temperature, circulatory strain. Besides, other IOT sensors conveyed in warm homes or at healing facility rooms may give extra profitable data about nature where the observed patient found. For example, the temperature, the level of moistness, the lighting and additionally some patients sweat which can be measured by cutting edge shrewd beds and so forth, permitting the medical stuff to accomplish more precise analysis and hence convey more effective treatment.

2. PROBLEM DEFINITION

In today's social insurance framework for patients who stays in home during post operational days checking is done either via overseer/ medical caretaker. Ceaseless observing may not be accomplished by this system, on the grounds that anything can change in wellbeing parameter inside of part of seconds and amid that time if guardian/attendant is not in the premises causes more noteworthy harm. So with this innovation created period where web administers the world gives a thought to add to another keen health awareness framework where time to

time constant checking of the patient is accomplished.

3. PROPOSED SYSTEM

The main idea of the designed system is to continuous monitoring of the patients over internet. The Proposed System architecture for IOT Healthcare is as shown in the Figure.1 The model consists of PIC18F46K22 Microcontroller, Temperature sensor(DS18B20), Pulse Oxi meter Sensor(TCRT1000), Liquid Crystal Display(16x2), GSM MODEM, Piezo Electric Buzzer, Wi- Fi Module, Max232, GSM Modem, 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).The Microcontroller is connected to GSM Modem which provides information to doctor/caretaker when the heart rate is greater than 90 or less than 60 and when the temperature is less than 20 or greater than 35. During this time the buzzer turns on and alerts the caretaker. LCD is connected to microcontroller to display the transaction process and healthcare data. And the user interface html webpage will automatically refresh for every 15 seconds hence patient health status is continuously sent to the doctor. Hence continuous monitoring of patient data is achieved.

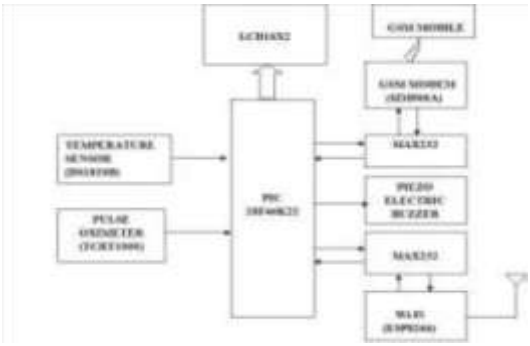

Figure.1 Block diagram of proposed system.

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4. HARDWARE DESCRIPTION

A) PIC18F46K22 microcontroller:

The PIC18F46K22 is a PIC family microcontroller from Microchip Company. It has 64Kbytes of Flash memory
and 1024 bytes of EEPROM. The key element of the PIC18F46K22 microcontroller is Low-control because of
proficient XLP innovation joined and provides high performance hence best suited microcontroller for embedded systems applications.PIC18F46K22 is 40pin plastic dual-in-line package. The main feature is high performance RISC CPU, Adaptable oscillator structure, and Extreme low power management with XLP

B) 16X2 Liquid Crystal Display (LCD)

Liquid crystal display is very important device in embedded system. Now days it is very common for screen
industry to use LCD replacing Cathode Ray Tubes (CRT). Pixels are used for most flexible ones.

C) GSM Modem

GSM MODEM operates by accepting the SIM card to the subscribed mobile operator. i.e., just like a cellular phone. When GSM MODEM allows PC to communicate over the mobile network when connected to the computer. It operates over network to send and receive message. In order to control modems computer use AT commands similarly GSM uses AT commands in order to send, receive, write or delete messages.

D) Wi-Fi Module (ESP8266)

ESP8266 offers a self-standing Wi-Fi networking with TCP/IP protocol stack which can give Wi-Fi connection to any microcontroller.. ESP8266 when connected on-board it has storage and processing capabilities hence can be easily connected to the sensors based on the application.

E) Temperature Sensor (DS18S20)

DS18S20 is 1-wire digital thermometer which gives measurement of 9-bit Celsius temperature and incorporates alert capacity with client programmable trigger focuses. It contains central processor with only one data line for establishing communication. Operates at the temperature ranges from -10^0C to $+85^0$C.

F) Pulse Oximeter Sensor

Pulse oxi metry is a simple technique to monitor the amount of haemoglobin that is oxygen saturated. Oximeter measures number of hearts beat per unit of time which is usually conveyed in bits per minute(Bpm). In the project MCP6004 based pulse oximeter is designed and TCRT1000 reflective IR optical sensor is used for

Photoplethysmography (PPG). Using TCRT1000 simplifies the process since both emitter and detector are arranged side by side. This technique is used to measure heart rate since change in blood volume is synchronous to heart beat.

G) MAX232

Max232 is a dual driver/receiver which converts TTL level to RS232 level. These receivers usually as the threshold of 1.3v. When Max-232 IC receives the TTL level it converts it in to voltage levels i.e. logic 0 changes to voltages between +3 and +15v and logic1 changes to voltages between -3 and -15v.

H) Piezo Electric Buzzer

Buzzer is an electronic device used to produce sound. In the project the buzzer is used to alert the caretaker during extreme condition. This sound indicates that the patient health is in risk.

5. SOFTWARE DESCRIPTION

A) Embedded C Programming

The language extension of C Programming is Embedded C, which was developed in order to address the common issues between C extensions for different embedded systems.

B) MPLAB IDE v8.92

MPLAB Integrated development environment is a software program runs on the Personal Computer for embedded microcontroller design.

C) Proteus 7.0 ISIS Professional

Proteus 7.0 is a Virtual System Modelling grew by Labcenter Electronics this was basically developed to cosimulate the microcontroller based designs which integrate animated components, circuit simulation and microprocessor models.

D) DIPTRACE

Dip trace is an advanced design tool for schematic diagrams and printed circuit boards. It offers several
modules like schematic design editor PCB layout editor, component editor, pattern editor and shape-based auto router for easy design.

E) Hi-Tech C Compiler

HI-TECH C Compiler provides denser code and excellent performance on PIC family Microcontrollers by implementing a whole program compilation method (Omniscient Code Generation). This compiler integrates the Microchip MPLAB Integrated development environment and also compatible with debuggers & emulators of Microchip.

F) Hyper text mark-up language

Html is an institutionalized framework for labeling content documents to accomplish text style, shading, realistic, and hyperlink consequences for World Wide Web pages. The paged developed using this language acts has a doctor interface where the Patient heart rate and temperature
readings can be visualized in real-time.

RESULTS

Following process goes on step by step when hardware is powered.

Step1: SIM detection process is performed and SIM detected is indicated on LCD display has "SIM PRESENT".

Step2: Configuring of Wi-Fi is done and is indicated on LCD display has "CONFIGURE WIFI" on first line and

after configuration process done is indicated by "OK" message on second line of LCD display.

Step3: IP address and port number is requested and displayed on LCD display has "ip : 192.168.4.1" on 1st line and "port is :80K" on 2nd line.

Step4: Then configuration settings is complete and system comes to online and LCD display changes to "IOT

HEALTH CARE".

Step5: Temperature is measured and indicated on second line of LCD display has "TEMPERATURE NO DEG" where NO indicates corresponding value.

Step6: Next step is synchronizing of heart rate and it is indicated on LCD display has "SYNC HEARTRATE".

Step7: Then Pulse count start for 15seconds and indicated on LCD display has "PULSE: NO" in first line and total

calculated heart rate in second line "HEARTRATE NO BPM" NO indicates measured value.

Step8: Now the message has to be sent to the doctor through Wi-Fi cloud which is indicated has "OK" in second line of LCD display.

The message sent to the doctor's mobile phone is as shown in the figure2(c).

Figure. 2(c): Message sent to doctor

CONCLUSION

This Paper presents the importance of the Healthcare through IOT devices. This Paper focus on how to deal with health issues to the people who are residing in the remote areas or away from the doctors. The IOT provides the lifeline to such people. Through this paper significant efforts are made to synchronize data from the sensors to the cloud and can be accessed through mobile application. The data so obtained are carefully analyzed and according to this patients are diagnosed from different geographical locations. All the details related IOT framework are mentioned step by step. This Paper

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