International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

IOT based Healthcare Monitoring along with Medicine Remainder

Aravam Babu[1], K. B. Pavan Kumar[2]

[1]Assistant Professor, Department of Electronics and Communication Engineering, Mother Theresa Institute of Engineering and Technology, Melumoi, Palamaner, Chittoor(Dt), Andhra Pradesh-517408

[2]Assistant Professor, Department of Electronics and Communication Engineering, Mother Theresa Institute of Engineering and Technology, Melumoi, Palamaner, Chittoor(Dt), Andhra Pradesh-517408

Abstract: ***This project provides the development of arduino based monitoring using wireless network sensors by using heartbeat sensor, temperature and humidity sensor along with an added benefit of medicine remainder using GSM module. By this we can easily provide real time information available for both guardians and doctors by using internet and we can also send normal messages at the critical situations, both can be done by using GSM module. In India more than 2 million people are dying because of heart attacks per year and the main reason behind this factor is that they are not getting proper support at that particular time of incidence. To give them timely and proper help at instance we have to do continuous monitoring of health of the patients. But the fixed monitoring system can be used when the patient only lying on the bed and these systems are highly complex and they are available only in the ICU's of the hospitals. This particular system is developed for the home use purpose for patients, need not to be in critical condition , but they require continuous monitoring by doctor or family. In any critical situation such as high/low heart rate or high/low temperature the buzzer will ring to intimate his surrounding persons of the patient and an alert SMS is sent to that particular doctor's and family members mobile numbers. So, we can save many lives by providing them quick service.***

Keywords: Embedded systems, Arduino, Internet Of Things, Wireless sensor networks, patient's health parameters

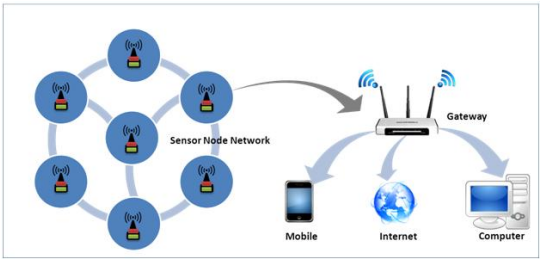
1. Introduction

Due to the gradual development of the world, health monitoring systems is used in many fields such as Hospital, homecare, military, training and sports etc. This health monitoring system can be used by many patients, who require daily check-up of health parameters. Normally it is difficult to keep concentration on continuous monitoring of patients itself manually. Basically the heart rate values varied based in the age and health of the patients. The average heartbeat per minute for 25-year old ranges between 60-135 bpm while for a 60-year old it is around between 55-125 bpm. Patients are not well known with the traditional manual devices that are available in the market. And the maintaining of those devices also not a easy task by the patients as they have many limits in maintenance due to their heavy cost, size of instruments and mobility of the patients. So, researchers designed many systems as portable devices. Different platforms of microcontrollers are used to design the system based on the performance required. Different Biomedical sensors like temperature sensor, humidity sensor, heartbeat sensor, blood pressure sensor are used for monitoring the health condition which is integrated on the single microcontroller. The change based on the code will be notified to the guardians and doctors automatically by using a link for a particular website and also by offline messages. This notification would help to take an appropriate action at instance of time. This would save patients from the future health problem which would arise. This would also help for patient concern doctor to take an appropriate action at proper time.

2. Wireless Sensor Network

Wireless Sensor Network (WSN) refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions and organizing the collected data at a central location. WSNs measure environmental conditions and also body parameters like temperature, sound, pollution levels, humidity, wind, and so on. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. The sensor networks for medical applications can be of several types: implanted, wearable, and environment-embedded. Wearable devices are used on the body surface of a human or just at close proximity of the user. Possible applications include body position measurement, location of persons, overall monitoring of ill patients in hospitals and at homes. Body-area networks can collect information about an individual's health, fitness, and energy expenditure. The WSN stretched its importance when it started using IOT as its interface.



3. Internet of Things

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or manmade object that can be assigned an IP address and provided with the ability to transfer data over a network. For the intelligence and interconnection, IoT devices are equipped with embedded sensors, actuators, processors, and transceivers. IoT is not a single technology; rather it is an agglomeration of various technologies that work together in tandem. Sensors and actuators are devices, which help in interacting with the physical environment. The word "sensor" can be often replaced by " WSN" . The data collected by the sensors has to be stored and processed intelligently in order to derive useful inferences from it. The storage and processing of data can be done on the edge of the network itself or in a remote server. If any preprocessing of data is possible, then it is typically done at either the sensor or some other proximate device. The processed data is then typically sent to a remote server. Now, after processing the received data, some action needs to be taken on the basis of the derived inferences. The nature of actions can be diverse. We can directly modify the physical world through actuators. Or we may do something virtually.

4. Literature Survey

A number of surveys is carried away either by researchers and many technicians by using wireless sensor network along with Internet of Things. There we got many research papers and technical reports based on healthcare monitoring using IoT.

1) Heart rate exhibiting direct proportional characteristics with change in blood volume during heartbeat can be measured by modelling an analog and digital manipulation scheme. A model of single microcontroller chip based heartbeat counter, capable of data storage and suitable for remote communication via Bluetooth, would be designed and implemented and checked for contrast with a commercial heartbeat per minute (BPM) counter. This is also provided with a LCD to display the values of heart rate. This paper proposes a design and implementation of a single microcontroller based heart rate measuring device that integrates most of the key features of the aforementioned devices and models. The device is compact in size, energy efficient, portable, capable of data storage and well suited for communicating with an external remote device via Bluetooth and cellular communication in case of a medical emergency. The designed device is based on analysing the change in reflected light after manually projecting infrared light into suitable parts such as fingertip, wrist or temple area of head. It also has automatic calibration system to measure the heart rate of both infants and adults.

2) Second System using same system, health parameters are sent by using RFID reader, Bluetooth and Wi-Fi. This system gives facility to monitor the blood pressure of patient. The health parameter directly sends to the doctor using Wi-Fi. 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 data to RFID through Bluetooth. Client touchpad send the data to the health parameter. Also, these health parameters are directly send to remote data centre and remote data centre to the doctor using Wi-Fi 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.

3) Third system is simpler but useful, Sometimes patients forget to take the medicine at the required time of medicines. And sometimes patient also forgets which medicine She/he have to take at required time. And it is difficult for Doctor/Compounder to monitor patients around the clock. To avoid this problem, they have made this medicine reminder system for patients using Arduino. Medication alarm time is also feed in arduino's internal eeprom to save from lose data after light failure. And real time is continuously checked with saved Arduino's internal eeprom time. If any match occurs, LCD shows medication group name and buzzer starts beeping continuously. Buzzer is directly connected to arduino for medication time indication. In this system we have used Arduino for controlling the whole system. Working of this project is very simple. In this system ds1307 real time clock chip is used for running the time accurate and to prevent the time after light failure by using 3 volt li-on battery connected with this real time clock chip at any pins of arduino.

5. Related Work

In the circuit the processing unit /brain of the system is arduino uno, the microcontroller used in arduino uno are Atmega328.then the main components include temperature and humidity sensor, heartbeat sensor, RTC, LCD, GSM module and buzzer.

Heart beat sensor - The Heart Beat Sensor is designed to provide analog output of heart beat when a finger is placed on it. When the Heart detector starts working, the top most LED will starts flashing with every heart beat. It functions on the principle of light modulation by blood flow through the nerves of the finger at every pulse (photophlethysmography). The output of this sensor is connected to arduino directly to measure the heart beat. The module output mode, analog output mode is simple. The more easy way to monitor the heart rate is to use a Heartbeat

Sensor. It comes in different shapes and sizes and allows an instant way to measure the heart beat. The arduino converts the analog quantity output into digital numbers.

DHT11 (Temperature sensor) - DHT11 digital temperature and humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity. The module has high reliability and excellent long-term stability. This sensor is calibrated to provide output in ^{o}C. The sensor includes a resistive sense of wet components and an NTC temperature measurement devices and connected with a high-performance 8-bit microcontroller. So, the output of the module is digital quantity. Then it is directly connected to the arduino. The limits are given to the temperature based on patient's condition and patient's location.

RTC1307 (Real time clock) - RTC as the name recommends are clock modules. This IC is an 8 pin device using an I2C interface. The DS1307 is a low-power clock/calendar with 56 bytes of battery backup SRAM. The clock/calendar provides seconds, minutes, hours, day, date, month and year qualified data. The end date of each month is automatically adjusted, especially for months with less than 31 days. So this is the main element helps to use this system also as a **medicine remainder**. The provided push buttons will help us to set the time of the alarm. When that particular time is reached the buzzer will start giving sound along with LCD intimation.

LCD (Liquid Crystal Display) - Here, we are using 16x2 display. This is connected in 4-bit data mode with the arduino. The complete code will be able to explain here. Firstly, the name of the project will be displayed then date, time and temperature will be displayed, at that time the initialisation process will be carried away. Then it will tell to place the finger, then we have to place our finger in HBS it will measure heart beat for 15 seconds. The display of the HR and temperature is carried away. Then the data is uploaded to the website. If any dangerous conditions on HR (varied based on age and health condition) and temperature is happened, then the danger messages will be displayed as "HR is more/ HR is less and temp is more/temp is less". And for medicine remainder whenever the mode button is pressed then display shows the time and date, it will display variances until we set the alarm, at finally it displays "alarm is set". When the time is reached it will display to take medicine along with buzzer sound.

GSM (Global System for Mobile communication) module - GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. The main work of this module is to take the necessary data from the arduino based on the code given and to upload those data into website for every 2 minutes. It's another important task is to send the offline messages to the user (the numbers specified in code) at the dangerous situations. That message will help user to take action as fast as possible about the patient.

Buzzer - Buzzer is a device which gives sound when it get enable signal. The main work of buzzer is to intimate the patient details to himself and to surrounding guardians as nurses and care takers with beep sounds. In our project buzzer works include intimating the guardians during dangerous situations based on sensor details and it acts as a indicator to the medicine remainder.

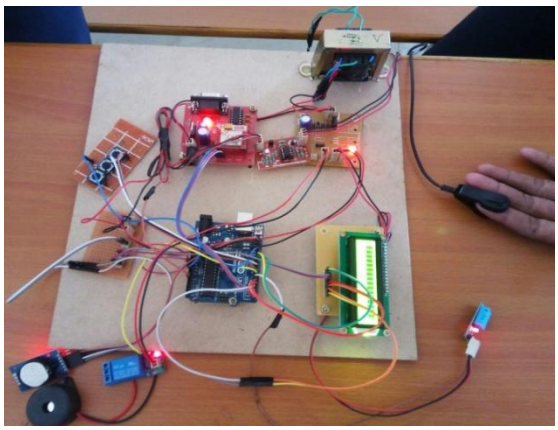
6. Conclusion

The conventional systems using are too complex and platform dependent. As we are using arduino, this is platform independent, a single software is enough to modify the code. As from previous papers, the available systems will be made for either HR or temperature or medicine remainder. But our system is combination of these three tasks. So, our system is useful for many tasks and is equal to three systems. So complexity and cost is also reduced.

Now a days, the available heart rate monitoring devices are so small, this may be the major drawback of our system. Our system size can be reduced, If we are using nanotechnology. The main advantage of this system is that it will transfer data in two minutes. The GSM module used will provide an efficient data transmission. The main thing is that we must use a SIM with some network, data balance and message balance. As it will transfer data to the website automatically, continuous monitoring is possible. If the user is in offline, the added advantage we are provided is sending offline messages during dangerous situations will help guardian/doctor to take immediate remedy towards the patient. And medicine remainder is helpful to take medicine at particular doctor specified timings.

7. Result

After power supply is ON. Then finger must be placed on HBS. Then data of the temperature and HR will be displayed on the LCD and the data will automatically upload into the website by using GSM module. If any dangerous limit reached then the buzzer will rung and an offline message is sent to the number that are specified in the code. The buzzer is also used as a indication for the medicine remainder.



References

[1] Saddam khan- www.google.com/ www.engineergarage.com/contribution/medicine-remainder-using-arduino/
[2] Sharma, Aaresh. California state university, Long Beach, proQuest Dissertations Publishing, 2017.

[3] Anusha, www.electronicshub.org/dht11-humidity-sensor-arduino/
[4] Tarun Agarwal, www.elpro
[5] cus.com/heart-beat-sensor-working-application/amp