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Research Article

PATIENT MONITORING SYSTEM USING IOT

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ABSTRACT

In this 21st century the health survey shows us the death of many people due to bad lifestyle, pressure and many other things. One of the reasons for the death of patients is also the lack of availability of doctors at all the time. The doctor to patient ratio is very less in India. So the doctors cannot be available in every area specially doctors are not available in rural areas. But the improvement in technology, has the solution of almost every problem. Our proposed system measures couple of parameters of human body and send the results to the doctor. Our proposed system has Temperature sensor and pulse sensor in it which is used to measure the temperature and pulse of the patient. The sensors detect the values of pulse and temperature of the patient and process it using the arduino uno which is the micro controller used in this project. The micro controller processes the data and display the values on the LCD as well as upload the data on the cloud as well by using the ESP8266 Wi-fi Module. Doctor can see the data from the cloud anytime and from anywhere he/she wants. Each patient's has a unique id that helps the doctor to maintain the record of the patient and can provide proper treatment according to the result.

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INTRODUCTION

In a developing country like India, lack of proper medical facilities has been a major concern, especially in remote villages. Lack of proper medical treatment & diagnosis in rural areas, is mainly due to the poor doctor to patient ratio. In order to increase the patient care efficacy, there arises a need to improve the patient monitoring system in a more effective way. The main drawback in the current patient monitoring system is the requirement of the physical presence of the doctor in the vicinity of the patient, which is not possible at all times. Hence it becomes necessary to develop a system which does not demand the doctor's presence for patient monitoring. Owing to the advancements in Bio-instrumentation and telecommunications technologies, it has become feasible to design a monitoring system to acquire, record, display and transmit the physiological signals from the human body to any location. The proposed patient monitoring system enables doctors to monitor vital bio-signals such as Heart rate and body temperature.

The clinical output of the bio signals are then published to the LCD and also on cloud. The system has couple of sensors i.e temperature sensor and pulse sensor which measures the body parameter of the patient that are temperature and heart rate. Sensors sense the values of parameters send them to the

Arduino Uno, which is a micro controller used in this system. Arduino processes the values and displays the data instantly on the LCD display connected with it. It also sends the data to the cloud which is Thing Speak in this system. The data to the cloud is send with the help of ESP8266 Wi-Fi module. The doctor can view the result on the cloud from anywhere he/she wants. Every patient has been allotted a unique ID so the doctor and even the patient don't get confused and all the values are saved on the cloud. This system can be very helpful for the continuous monitoring of the patient. Doctor can give advice to the patient from phone. This system has a low cost of implementation.

LITERATURE REVIEW

Literature review for remote patient monitoring system using-IoT cloud based contains the previous research on patient monitoring system. Based on the literature review, it is to increase the knowledge and give deeper understanding of the proposed system.

Problem Statement

The lack of availability of doctors due to doctor to patient ratio, the patient cannot get advice from the doctors anytime they want. But in today's world the problems are rising rapidly.

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S. No.	Project Title	Author	Project Description
1	Smart Health Monitoring System Using IoT For Assisted Living Of Senior And Challenged People[1]	R.Nivetha, S.Preeti,P.Priyadharshani,J.Naskath	A low power wearable IoT system for active and assisted living healthcare applications.
2	Internet of Thing[IoT] Based Health Monitoring System Snd Challenges[2]	M.Sathya,S.Madhan,K.Jayanti	The compact sensors with IoT will make a huge impact on every patient's life that even though we are away from home and physician
3	Health Monitoring System Using IoT[3]	A. Selvanayakam,A. C. Varishnee,M. Kalaivan,G G. Ranjithkumar	Monitor the patient's temperature and unconsciousness and sends the mail using IoT
4	Patient Health Monitoring System Using IoT[4]	Prashant Patil, Rohan Waichal, Utkarsh Kumbhar, Vaidhai Gadkari	Monitors patient's temperature and sends the sms to the doctor via bluetooth or wi-fi
5	Heathcare Monitoring System Using Raspberry Pi And IoT [5]	E.N Ganesh, Ajay Singh	A monitoring system using sensors and raspberry pi as the processor and data aggregator.
6	A Wearable Remote Monitoring System using Raspberry Pi[6]	TamilSelvan.P	A patient monitoring system using raspberry pi that contains sensors like temperature, ECG, and GSM module used is SIM300 which takes the data from sensor and uses raspberry pi as the processor sends the data on the cloud using GSM SIM300 module from where the doctor can see the data
7	A bluetooth Enabled Mobile Intelligent Remote Healthcare Monitoring System[7]	M. Tounsi, Basit Qureshi	A simple monitoring system using the technology of bluetooth to transfer the data values

This monitoring system is the solution of some problem in the medical field. Traditional patient monitoring methods, are typically expensive and of low range. This prototype is suitable for patient monitoring in real-time.

Proposed Solution

The sensors are connected to a microcontroller which is programmed to collect data from the sensors. The data collected by the microcontroller is sent to the Thing Speak cloud via Wi-Fi module.

The sensors sense the data of temperature and pulse of the patient and then give the data to the microcontroller. The microcontroller takes the data collected from sensors and displays it on the LCD screen and the data is also displayed on the cloud. The Arduino is connected to the Wi-Fi module. The Wi-Fi module gets the internet connectivity and then displays data on cloud which was collected by Arduino. Doctor can see the data on cloud from anywhere and anytime he wants and provide prescription to the patient.

Block Diagram & Circuit Diagram

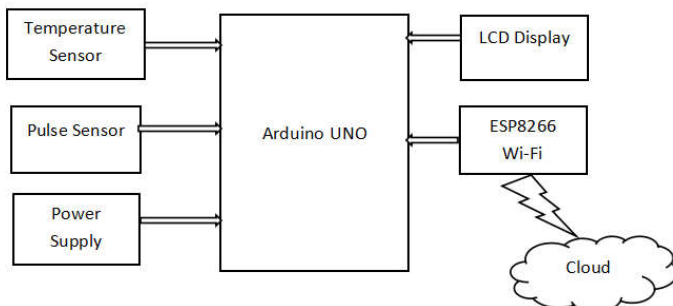


Fig 1 Block Diagram

Block diagram Fig. 1 shows the entire work flow of the proposed prototype. It elaborates the working of the prototype. LM35 sensor, pulse sensor and transfers the reading to Arduino Uno which displays it on the LCD Screen as a visual output near the prototype. It uses Wi-Fi module esp8266 module to transfer the data and make it visible remotely on the Thing Speak Cloud.

Further, for better understanding the block diagram has been divided into two parts.

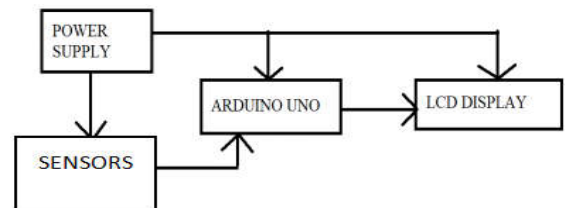


Fig. 2 Block Diagram showing patient monitoring and LCD displaying

Block diagram represented in Fig. 2 shows that the power supply is given to temperature sensor and pulse sensor, Arduino Uno and LCD display after which sensors sense the data and then give it to Arduino microcontroller which further displays it on the LCD display.

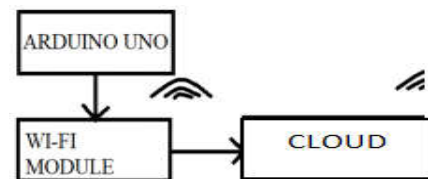


Fig 3 Block diagram of sending data to ThingSpeak Cloud

The block diagram Fig. 3 shows that the Arduino module is connected to Wi-Fi module. Arduino sends the data to be the cloud. The data through Wi-Fi module is shown on the Thing Speak Cloud.

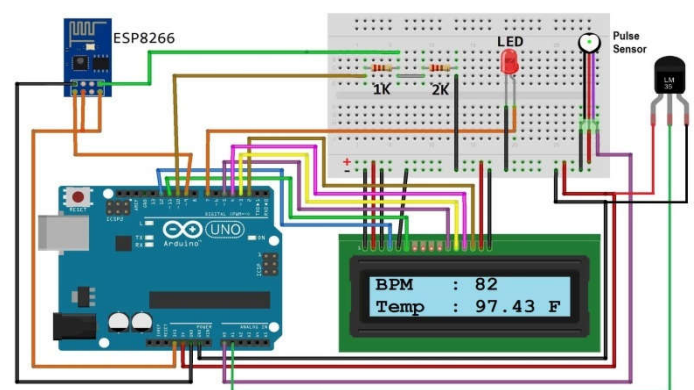


Fig 4 Circuit Diagram

Main component of this system is Arduino microcontroller. The power required for the Arduino Uno board and Wi-Fi module for the operation is 3.3V and the power required by sensors and LCD display is 5V which is DC. The Arduino is powered by connecting it to laptop using USB cable. The remaining components in circuit draw power from Arduino board. As, the power supply is given to the circuit, the files are loaded by the Arduino board and some message is displayed on

the LCD screen and sensing of data from temperature sensor which is LM 35 and pulse sensor is started. The sensors senses the data and transfers it to the Arduino board. The built-in analog to digital converter channel in Arduino board converts the analog output sensed by Arduino into digital value. The ADC channel in Arduino board is of 10 bit, there are 0 to 1023 digitized values.

The output is first shown on the LCD screen and then it is passed to the Wi-Fi module that is ESP8266. The Wi-Fi module makes the connection to any of the internet access point. The Wi-Fi module is connected to ThingSpeak platform and transfers the data to it.

The data on ThingSpeak Cloud can be viewed by the user and Doctor from anywhere and anytime. The data on the cloud is the real time data.

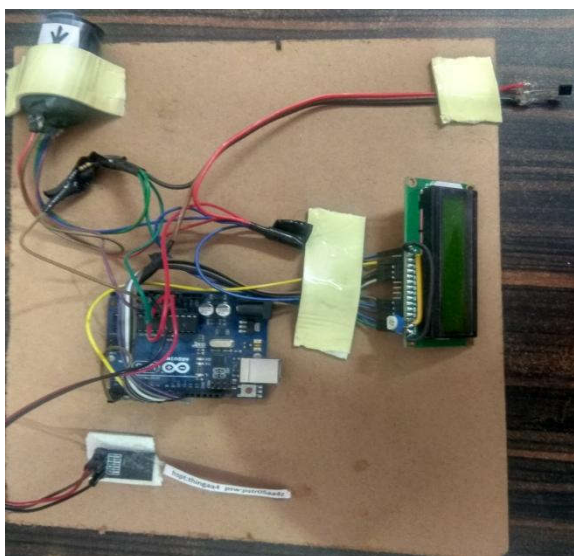


Fig 5 Designed Circuit

Functionality of each block

Temperature Sensor: Temperature sensor is a device which is used to sense or measure the temperature of the patient. In this system the temperature sensor which is used is LM35, which is known for its precision. This sensor does not require any external calibration because it is inherently calibrated. In this system LM35 is connected with the Arduino micro controller, which processes its output and displays it on an LCD as well as uploads it to the cloud using an esp8266 wi-fi module. The operating range of LM35 is -40 to 110 (in Celsius). The maximum amount of voltage that can be supplied to this sensor is $30V$ and the accuracy of the sensor is $(\pm) 0.5$.

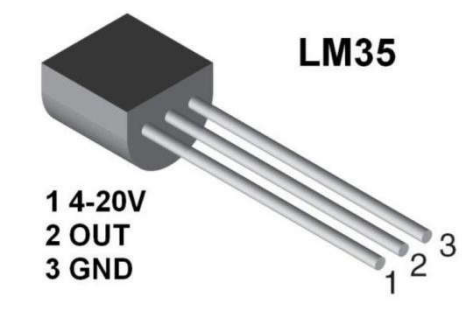


Fig 6 Temperature Sensor

Arduino UNO: The Arduino Uno is a popular board. The size of board is small and is full of features. The power supply is given to it by the laptop using an USB connection. It supplies power to gas sensor, Wi-Fi module and LCD display. It collects the data from the gas sensor and processes it further. When the power is given to it it loads the required libraries.

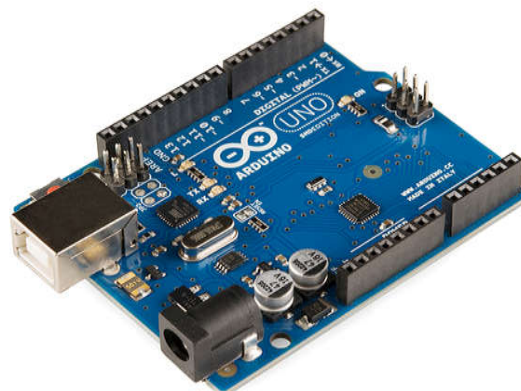


Fig 7 Arduino Uno

Pulse Sensor: Pulse sensor is device which is used to measure the heart beat of a person. It is attached to the finger of the patient to measure his/her heartbeat. In this system pulse sensor is attached to the micro controller named Arduino. This pulse sensor can graph the patient's pulse in real time.

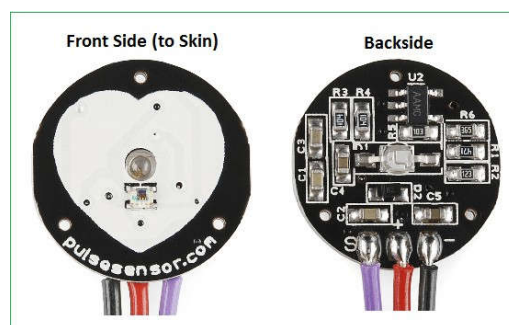


Fig 8 Pulse Sensor

LCD Display: The LCD display is used to show the values read by Arduino Uno board from the temperature sensor LM35 and pulse sensor. The data pins of LCD are connected to microcontroller board to receive the data and display it.

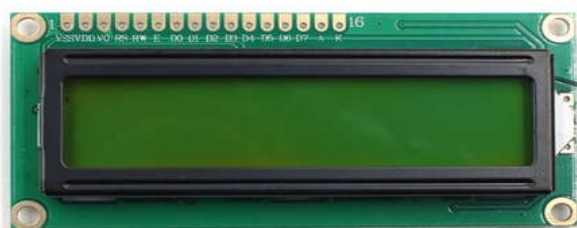


Fig 9 LCD Module

ESP8266 MODULE: The Wi-Fi module ESP8266 is used to establish a connection to any of the available Internet access point, and the transfer the data from the sensors to the ThingSpeak platform through the Wi-Fi access available to it. The ESP8266 Wi-Fi module is a stand-alone system on chip based with a built-in stack protocol TCP/IP that provides Wi-Fi network access to microcontroller. The Wi-Fi module is can either host an application or turn off the loading of Wi-Fi network functions coming from any other processor you are using. Each module of ESP8266 is pre-programmed with AT

commands. So, you can just connect it to an Arduino device. The data to the cloud is uploaded by it.

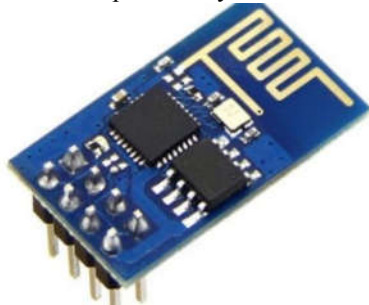


Fig 10 ESP8266 Module

RESULTS

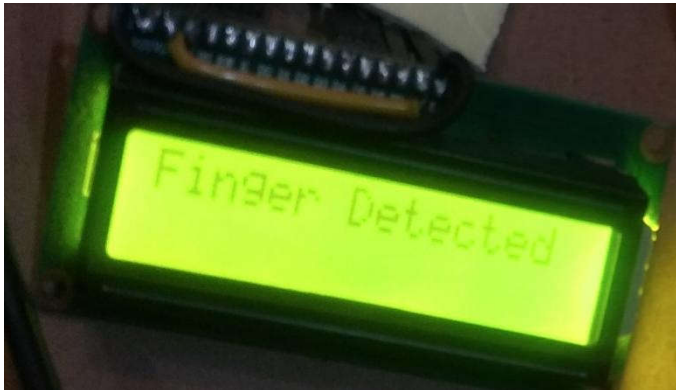


Fig 11 Turning on LCD Message

Fig. 10 shows the turning on message of the prototype. After 3 seconds of displaying the message Finger Detected it starts to find the Wi-Fi network using the esp8266 module. During the time while the Wi-Fi connection is establishes the LCD screen shows a message of connecting.... as shown in Fig. 11.



Fig 12 Connecting to Wi-Fi

When finger is detected the LCD Display the value of pulse sensor, body temperature of the patient. The values are displayed on the ThingSpeak Cloud. The data can be viewed in the form of graph. The graph will be updated every time the patient will put the finger in the sensor. The doctor can view the data on the Thing Speak anytime he/she wants.

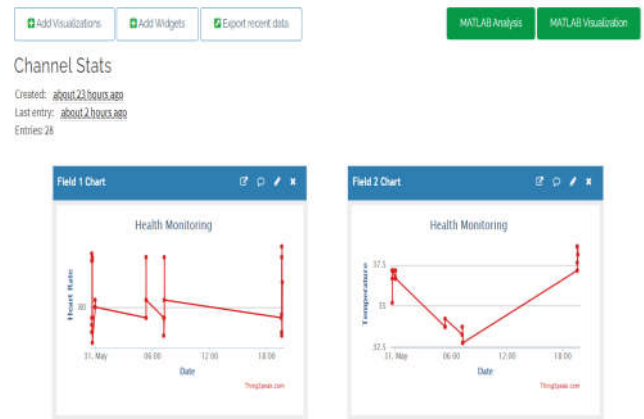


Fig 13 Output on Thing Speak

The Fig. 13 shows the output of the patient's health parameter's data, the report of the patient is also displayed on the LCD. The data is found to be accurate.

CONCLUSION

This Proposed system can be used in daily basis. This system can be very helpful in the rural areas where doctors are not easily available.. The cost of implementation of this proposed system is very low and it can be used anywhere. It is easy to use, so anybody can use it. The proposed health care system is based on internet of things. It stores the person sensitive information in to cloud and they ca check their sensitive information at any time and from anywhere with just internet connectivity. It measures the couple of body parameters of the patient like Temperature and pulse using the sensors and immediately display the result on the LCD, also the results are also uploaded to the cloud instantly using ESP8266 Wi-Fi module. The doctor can see the results on the cloud. These types of systems can make a great impact on every patient's life.

Future Scope

The advance version of this monitoring system can have more sensors included in it to measure other parameters of human body. The monitoring systems that are available in the market can be integrated. DBMS i.e Data Base Management System can be used for integrating this system. This will help in maintaining a proper database of the patient with all the details of the patient and their medical history as well. In future an alarm system can also be added in this proposed system, which will be used to alert the doctor in case of emergency, via SMS or Mail. Instruments like Defibrillator can be used for emergencies like Cardiac Arrest.

Acknowledgment

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