

A Secure System for Patient Health Monitoring

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Abstract—The internet of things(IOT) has been improved widely in various fields, in which many devices are connected together. Every device produce a lot of data inturn these data are interconnected to the internet. These devices are developed to be unreliable and vulnerable to many threats because these devices are connected over network remotely. Wearable sensors are developed to sense the required parameters from patients body and send to the server. In this paper we discussing about data storage, data processing and retrieving data efficiently from these devices. These collected data will be stored in the server .The “Thingspeak” named new cloud which is used in this system to place the data in the server. Later these data can be retrieved by logging in to Thinspeak android application at remote places.

Keywords—Wearable sensors ,IOT, cloud, Thingspeak

I. INTRODUCTION

Remote patient monitoring is a technology to enable monitoring of patients outside of conventional clinical settings , which may increase access to care and decrease healthcare delivery costs. Incorporating remote patient monitoring in disease management can significantly improve an individual's quality of life. It allows patients to maintain independence, prevent complications, and minimize personal costs. Remote patient monitoring facilitates these goals by delivering care right to the home. In addition, patients and their family members feel comfort knowing that they are being monitored and will be supported if a problem arises. This is particularly important when patients are managing complex self care processes. Key features of Remote patient monitoring, like remote monitoring and trend analysis of physiological parameters, enable early detection of deterioration; thereby, reducing number of emergency department visits, hospitalizations, and duration of hospital stays. The need for wireless mobility in healthcare facilitates the adoption of remote patient monitoring both in community and institutional settings. The time saved as a result of remote patient monitoring implementation increases efficiency, and allows healthcare providers to allocate more time to remotely educate and communicate with patients. A sensor is a device, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to the server. Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. By using these sensors we can measure parameters of human body such as pulse rate, temperature rate, pressure rate. By using these sensors, usage of large equipment to measure these parameters have been reduced. These sensors can be attached to patients either as wearable sensor and also these sensors can attached inside the patients body. These sensors sense the data from patients body and

stores it in the server.”Thingspeak” named cloud which is used to store the data which is sensed by the sensors attached to patients body. By logging into Thinspeak cloud with appropriate credentials, a account will be created in the Thinspeak server. After logging into the Thingspeak server we have to create channels for every individual by selecting the number of fields based on the patients health requirements. Every patient will have unique channel ID and name .While creating a creating channel we can set the channel as private view:only authorized individual can view the patients health records,public view:everyone can view the patients health records whoever has a account in the Thingspeak server. These collected data will be displayed in the graphical manner. By using Thingspeak android application we can view the patients health records remotely by logging into Thingspeak android application. The previous data values can also be monitored by downloading the data import/export values which will be displayed in the excel sheet. Therefore efficient patient health records are obtained by using this system.

II. PROPOSED DESIGN

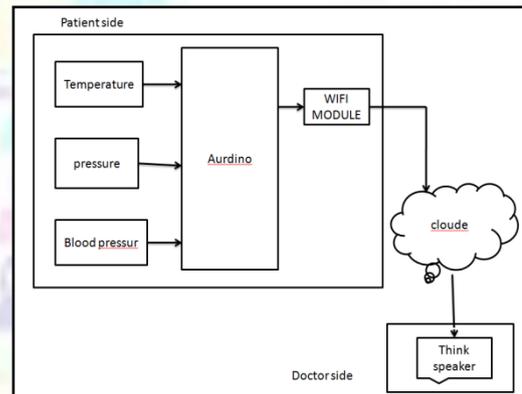


Fig 1: system Block diagram

The proposed model consists of two kits where one kit containing temperature sensor, pressure sensor, pulse sensor which are connected to arduino board .Ardino board intun is connected to wifi module, this entire kit is placed near the patient. The other kit is Thingspeak android application will maintained by the care taker or authorized users like specialists or doctors. Cloud is used to store the data collected from the sensors. Temperature sensor has three pins 5v,GND,Output. So the 5v of temperature sensor is connected to 5v pin of arduino, gnd of temp sensor is connected to the gnd pin of arduino and output of voltage is given to the analog input pin of arduino. So through the output pin of temperature sensor the values are sent to the arduino. BP sensor consists of three pins.5v,Tx,GND. This sensor uses UART communication. So the 5v of BP sensor is connected to 5v pin of arduino, gnd of BP sensor is connected to the gnd pin of arduino and Tx is given to the analog input pin of arduino. So through the Tx pin of BP

sensor the values are sent to the arduino Pulse sensor consists of three pins.5v,Output,GND.This sensor uses UART communication. So the 5v of Pulse sensor is connected to 5v pin of arduino,gnd of Pulse sensor is connected to the gnd pin of arduino and output is given to the analog input pin of arduino. So through the output pin of Pulse sensor the values are sent to the arduino. These values are dumped on arduino microcontroller which is connected to wifimodule which helps in storing these values in to the cloud.By logging in to Thinspeak android application we can view the parameters sensed by the sensors from patients body in the graphical manner .Every 15 seconds the data will be updated in the cloud. If any abnormal conditions are observed in the graph then the patient can be provided with the required prescription. These values can also be monitored remotely in the Thingspeak android applications.

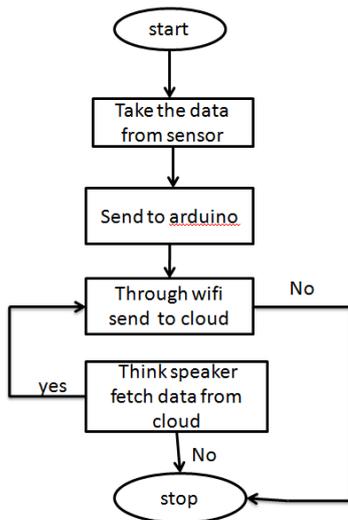


Fig 2: Flow chart for proposed design

In Fig 2 data is fetched from sensor and sent to arduino . Collected data through wifi it sends to cloud .The e data is stored in cloud when ever want to retrieve data through think speaker fetch the data. If not fetching data it is not connected to wifi. If connected fetches the data from the cloud.

III. PATIENT MONITORING COMPONENT

A.ARDUINOIDE.



Fig 3:Aurdino Uno Board

Arduino is an open source computer hardware and software company. project and can be designs and entre model can be used and project can be made. The project's products are distributed as open-source hardware and software.

Audunio board contains of-



Fig 4: USB cable

- Connect the USB cable to the USB connection and system.
- barrel jack be powered directly from the AC mains power supply.
- voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.
- The crystal oscillator helps Arduino board in dealing with time .
- Reset button in Arduino board help start the program from the beginning.
- 3.3V is used for output volt.
- 5V is used for output volt.
- GND pins on the Arduino which can be used to ground of the circute
- Vin use for extranal power supply.
- Analog pin uses five pins AO through AS.
- This LED glows up light up when you plug your Arduino into a power source to indicate that your board is powered up correctly.
- TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by board .
- RX flashes during the receiving process.
- AREF set an external reference voltage as upper limit for analog input pins.

B. TEMPERATURE SENSORS

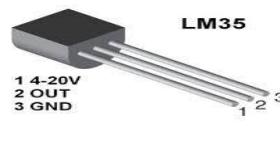
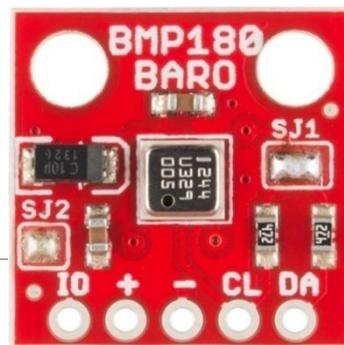


Fig 5:Temperature sensor

Connection of temperature sensor to Arduino board.The LM35 is easily applied in the same way as other integrated-circuit temperature sensors. LM35 will check body temperature of the patient weather patient will have fever or not . Temperature sensor with its output proportional to the temperature (in °C). Temperature range is from -55°C to 150°C.



C.BLOOD PRESSURE

F. THINK SPEAKER



Fig 8 : Think speaker emblem

ThingSpeak is an IoT platform that uses channels to store data sent cloud and fetch the data. With the settings or to create a channel, and then send and retrieve data to and from the channel. You can make your channels public to share data. Using the REST API calls such as GET, POST, PUT, and DELETE, you can create a channel and update its feed, update an existing channel, clear a channel feed, and delete a channel. REST API calls to create and update ThingSpeak channels and charts. This will show in graphical representation.

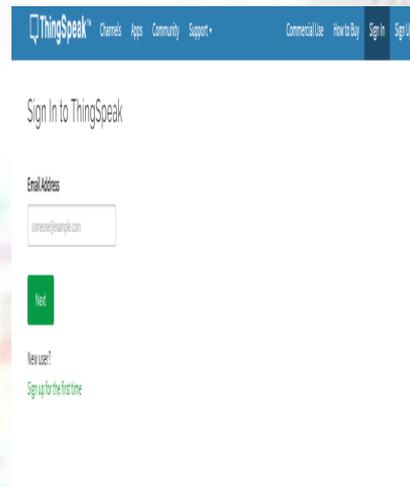


Fig 9: login page

Fig 9 represents the login page .To login the page most important thing we need is email id and password. From this we can access from where ever we are through mobile and also with laptop , desktop etc.

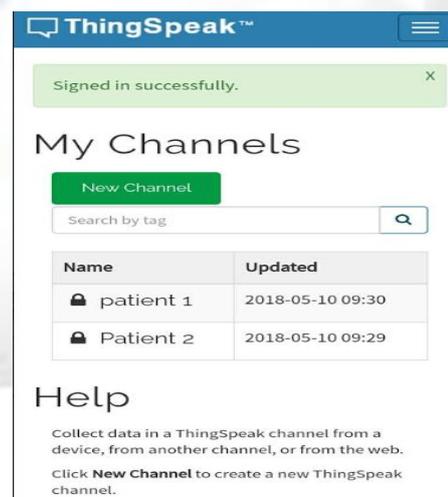


Fig 10: My channels

Fig 10 we have made two unique channels and named them as patient – 1,2. There are have private, public etc. Where are the private only caretaker or a doctor see it where the

Fig 6: BP Sensor

The BMP180 Breakout Board breaks out five connections from the IC. The four pins you need are labeled +, -, CL, and DA. and the fifth pin input and output pin for low voltage process.It will check the body temperature depending upon weather. It ranges between 80 to 120. Sensor will read the body pressure value .This tell the range weather it is low BP or high BP.

D. PULSE SENSOR

There are three primary links in the beat sensor .They are red wire, dark wire and purple wire. Each of them should be associated with the Arduino board to reach. The red wire need to interface with +3V to +5V stick dark wire to GND (Ground) stick and purple wire to the information stick. A person's heartbeat is the sound based on the blood flow from one region to another. The number of times the heart beats per minute (BPM), is the heart beat rate and place it in the pulse to get output.



Fig 7: Heart beat sensor

E. WIFI MODULE



Fig 7: wifi module

ESP8266 is a low cost WiFi module suitable for adding WiFi. The ESP8266 requires 3.3V power do not power it with 5 volts!. The ESP8266 needs to communicate via serial at 3.3V and does not have 5V tolerant inputs, so you need level conversion to communicate with a 5V microcontroller to communicate we are using Arduino.

person is login with mail id only to get information just by the approved people who comprises of the exceptional API-Key and whereas out in the public anybody with the channel-ID can access to the information. Also, we can Import/Export the Data in excel sheet to see the complete details of about the patient .

IV. RESULT

Thingspeak server every last information that in this project is in a graphical representation containing an x-axis and y-axis speaking to the time and values respectively. It shows the sensed data with particular time and date.

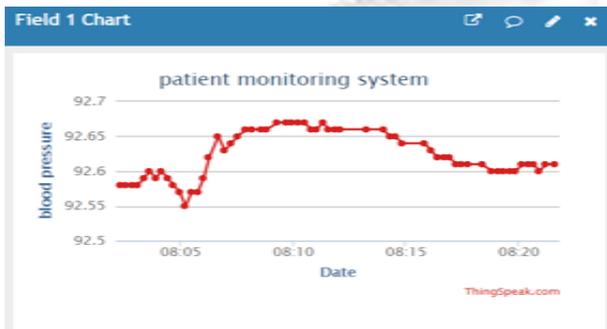


Fig 11: output for blood pressure

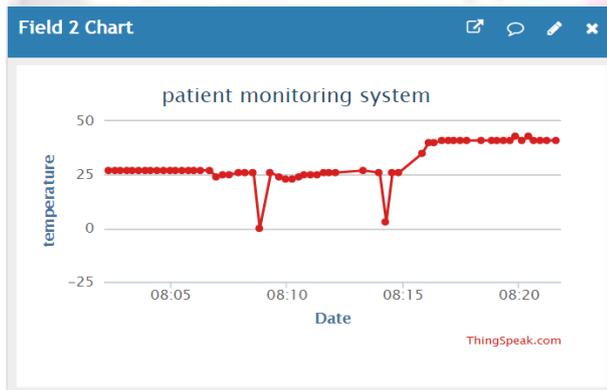


Fig 13: output for heartbeat

Test id	Test Case	Expected Output	Actual Output	Result
1	Temperature Sensor	Values Read by Microcontroller	Any Change, sends message to doctor	PASS
2	BP Sensor	Values Read by Microcontroller	Any Change, sends message to doctor	PASS
3	Pulse Sensor	Values Read by Microcontroller	Any Change, sends message to doctor	PASS
4	Connect	A new form will be displayed.	User going to connect through Wi-Fi module	PASS
5	Connected with device	Wi-Fi module is connected to the microcontroller	Wi-Fi module connected	PASS
6	Connected with think speaker	Wifi module will be connected to think speaker	App and microcontroller are connected	PASS

Fig 14: Test cases

	A	B	C	D	E
119	created_a	entry_id	field1	field2	field3
120	2018-05-0	1	91.78	25	50
121	2018-05-0	2	91.78	25	50
122	2018-05-0	3	91.79	22	50
123	2018-05-0	4	91.79	25	50
124	2018-05-0	5	91.78	25	50
125	2018-05-0	6	91.79	25	50
126	2018-05-0	7	91.79	25	50
127	2018-05-0	8	91.79	25	50
128	2018-05-0	9	91.79	25	50
129	2018-05-0	10	91.77	25	50
130	2018-05-0	11	91.75	25	50
131	2018-05-0	12	91.75	25	49
132	2018-05-0	13	91.76	25	48
133	2018-05-0	14	91.78	25	49
134	2018-05-0	13	91.78	25	49
135	2018-05-0	15	91.8	25	49

Fig 15: Tabulated results

V. CONCLUSION

This paper research study on the bases of health care condition and various ways to monitor patients health records in more secure and efficient way for better improvement in the medical field. By continuously monitoring the patients condition using the sensors and these values are updated every 15 seconds which can viewed in the graphical view in Thingspeak android application .By using this system we can frequently monitor patient conditions in more efficient and effective way.

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