

# IOT Based Patient Monitoring System

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**Abstract**—The proposed system is used to monitor the physical parameters of the patients. This provides continuous monitoring to the patients which is an essential to give a perfect care to the patients. Some patients may need continuous care and support by the medical experts while the others may not; for those who need it, the proposed system will work to fulfill the requirement with the help of sensor assisted network and IOT cloud tools for data storage and monitoring. Processes like recording the temperature and heart beat of the patients, storing of the data, connecting with the receiver end and finally providing immediate treatment will help to avoid deaths of many patients. The proposed project analysis the size of the system, privacy concerns for the data storing and sharing and eventual treatment.

**Keywords**—monitoring, continuous care, sensor,IOT cloud, immediate treatment

## I. INTRODUCTION

Patients in the hospital or in a serious health issues can face abnormal functioning of their body system. The physical parameters such as body temperature and heart beat rate are Significant indicators of human health. Monitoring those parameters will help us to find whether the patient is in good condition or not. Health monitoring is the major problem in today's world. Due to lack of proper health monitoring, patient suffer from serious health issues. Many people are forced to a situation of tremendous health hazards as an effect of not receiving treatment at the correct time when they needed it. The main objective of this project is to have the Continuous monitoring system if the health condition of any

patient is abnormal then it has the capability to detect The abnormal signs with the help of sensors attached to The X.

This system has many Advantages but the main benefit is the result can be Viewed by the doctor in real time at any place. A patient health monitoring system is an extension of a hospital medical System where a Patient's vital body state can be monitored remotely. Traditionally the detection systems were only found in hospitals and were characterized by huge and complex circuitry which required high power

Consumption. Continuous advances in the semiconductor technology industry have led to sensors and microcontrollers that are smaller in size, faster in operation, low in power consumption And affordable in cost. This has further seen development in the remote monitoring of vital life signs Of patients especially the elderly.

The proposed patient monitoring system is a sensor assisted and a cloud based system with effective monitoring of the necessary physical parameters of the patients and stores records the data which is monitored at the patient end and sends it to the receiver end using cloud technology. The receiver end reacts according to the data received and in case of an emergency condition, the patient is expected to press the panic button associated with the system which send an alert email to the doctors or clinical persons at the receiver end. The cloud tools like Thingspeak and IFTTT are used here with additional processes included in the respective sites.

## II. LITERATURE REVIEW

The famous methods of monitoring the patients is by using sensors that are capable of sensing the patient's parameters and recording those data using suitable microcontrollers. The heartbeat sensor counts the heartbeat for specific interval of time and estimates beats per minutes while the temperature is measured by the temperature sensor. These data are read by the microcontroller as the input requires wi-fi connection for communicating those data to the receiver end. Many different systems have employed various monitoring methods.

## III. PREVIOUS WORKS OF THE PAPER

The previous work of this paper include monitoring the patient using temperature, heart beat ,blood pressure, Electro cardio gram sensors and raspberry pi for processing. But in

this system, no data visualization was interfaced. Previously, there was also a smartphone based patient monitoring system. A mobile device regulated Arduino based health surveillance system in which the data was recorded in the form of analog inputs which was further converted into a digital signal and used Bluetooth for transmitting the quantities. But the module was not covering a larger area.

#### IV. PROPOSED SYSTEM

The IOT based patient monitoring system is very useful for monitoring the patient's conditions continuously and recording the data about the patients and sending those data to the receiver end i.e the medical persons so as to provide them previous record about the patients conditions and ensure deep monitoring of every patients. Also, the panic button that is present in this patient monitoring system at the transmitter end can be used by them in case of any emergencies to let the doctors know that they need some attention. The block diagram for the patient monitoring system is shown in Fig.1.

The below representation *fig.1* shows what happens at the patient end. The temperature and the pulse rate sensor senses the temperature and the heart beat of the patients and sends the input to the Arduino. The Arduino process and send the data to the wifi module which is used to communicate with the Cloud tool for recording the monitored data.

##### A. Thingspeak and IFTTT cloud platforms

a) The IOT based cloud tools like Thingspeak and IFTTT are used to perform the internet based activities. The thingspeakcloud is used to control the system over the internet. Create channels in thingspeak for pulse rate and panic condition as depicted in the fig.2. And the IFTTT is used to connect to the Emails when there is a panic condition. The wifi module is for the communication of the data over the internet. Pulse rate and body temperature readings are recorded over

ThingSpeak and google sheets so that patient health can be monitored from anywhere in the world over internet.

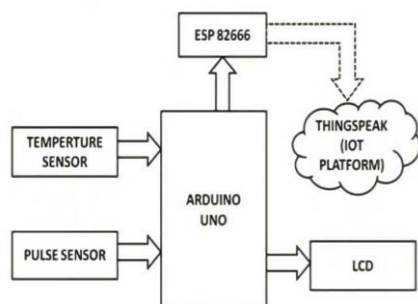


Fig.1. Block diagram of the patient monitoring system using Arduino

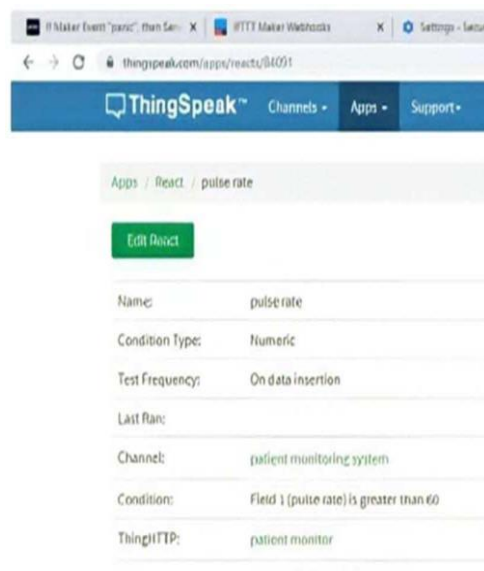


Fig.2. Creating channels in thing speak cloud platform

*Create channels:* After logging in to the thingspeak, create channels for two process as of patient information and panic condition.

c) *Thingspeak HTTP app :* Using the tjingHTTP app of the server, trigger the IFTTT applets for emails. The URL that is copied from the IFTTT webhooks is pasted here for triggering. Fix the channel information with normal values and call /trigger the channel using the unique channel ID when the recorded data is abnormal which inturn trigger the IFTTT to let us know the condition through email. Make the channel to react for panic condition by selecting "react each time the condition is met" and choosing the condition on which we need a react.

##### B. Creating webhooks:

Select for webhooks in the IFTTT applets and create a documentation for patient information. Click on "if this" in the applet and search for Webhooks. Then click on "then that" and search for Google sheets. What happens here is, as the Webhooks is for patient information, new rows will be added in the Google spreadsheet of the given mail IDs as shown in *fig.3*.for storing the data each time the information is recorded.

In the same way when the patient presses the In the same way when the patient presses the panic button, the information is sent to the webhook as in the *fig.4*. which triggers the "if this...then that" applet by selecting the G-mail as the option. So emails will be sent to the receiver end when there is a panic condition and the patient presses the panic button.

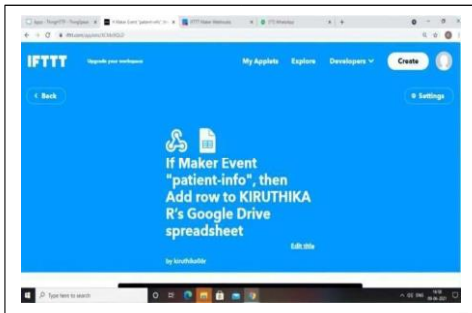


Fig.3.Creating Webhooks in the IFTTT for patient information

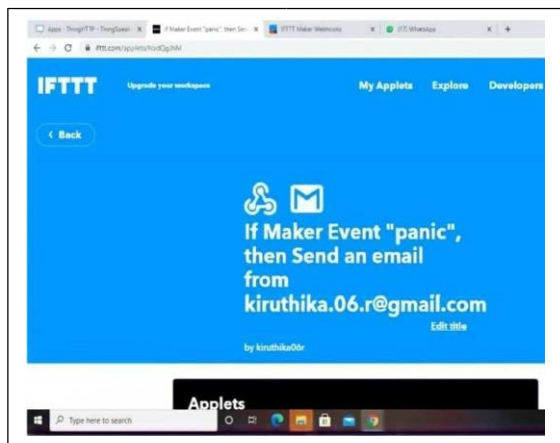


Fig . 4. Creating Webhooks for panic condition to send email

After clicking on the finish button, the work with IFTTT is almost complete. There will be two Webhooks and applets created out of which one is for the information of the patients and the other is for the panic condition. The patient information include two columns for temperature and heart beat rate. We can log in t the thingspeak and IFTTT whenever needed and check the conditions of the patient's parameters using the data that stored in the google spreadsheet via cloud platform. *fig.5.* shows how the final page of the IFTTT would look like after finishing all the step up works that are associated with it. One main reason for choosing IFTTT as the cloud platform is that more than 20 Email IDs can be linked to it which increases chances of accessing data from anywhere in the world. Anyone can login using the linked mail ID and access the patient monitoring system.

## V.SIMULATION RESULTS

The IOT Based Patient Health Monitoring System using ESP8266 & Arduino. Pulse Sensor and LM35 Temperature Sensors measure BPM & Environmental Temperature respectively. The Arduino processes the code and displays it to 16\*2 LCD Display. ESP8266 Wi-Fi module connects to Wi-Fi and sends the data to IOT device server. The IOT server used here is Thing Speak. Finally, the data can be

monitored from any part of the world by logging the Thing Speak channel.

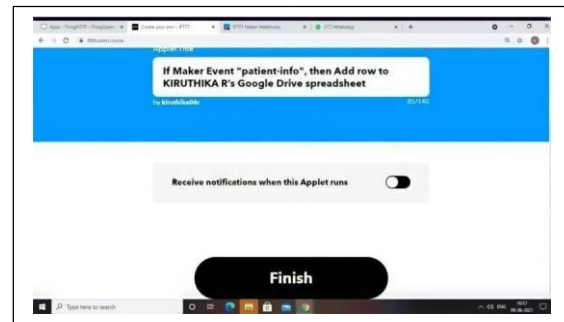


Fig . 5. Figure showing the final page of the IFTTT platform after creating

ThingSpeak is an open-source Internet of things (IO T) application and API to store and retrieve data from thingspeak using the HTTP protocol over the Internet or via a Local Area Network. This IOT device could read the pulse rate and measure the surrounding temperature. It continuously monitors the pulse rate and surrounding temperature and updates them to an IOT platform. Sign in to thingspeak and get started. Then a channel will be created. Two separate channels for patient monitoring for pulse rate and temperature sensor were created and the API key was noted. The ThingHTTP app of the server will be used for triggering the IFTTT Applet for data entry to google sheets and send emails. Login to IFTTT and create webhooks and documentation and note the URL. Go to my applets and use the +this and =that option. Choose action as add row to spreadsheet. Now the URL will be pasted in the new thingHTTP and include the channel ID and create react to trigger the URL.

The temperature sensor here is used to monitor the body temperature of the patient and send data to the wi-fi module; the Wi-fi module in turn processes to collbrate with the thingspeak and IFTTT to send those data to the doctor or the observer. Those data will be stored in the google drive of the accessing email id in the form of google spread sheets. The pulse rate sensor also does the same work of monitoring the patient's pulse and heart beat and sends the data to the receptor end . The temperature details of the patients are displayed on the LCD. If the temperature is above the normal range the red LED will be on as an indication of emergency. If the temperature is below the normal temperature range ,i.e., the patient's body is cold , the blue Light Emitting Diode will be in on condition from the Red-Green- Blur system of Light Emitting Diodes . In a similar way , the green light will be on for normal ranges .A panic button which is also connected to the system is at the transmitter end (patients) and they can be made use of when there is an emergency condition. As soon as the patient felt that he is in an emergency condition and presses the push button , an alert email will be send to the receiver end for immediate action or treatment. The thingspeak create

reaction to the thinghttp app each time the condition is met. The channel id will be given in the thinghttp react which calls the channel. The channel in turn will be linked with the webhooks created in IFTT platform with the help of the URL of the webhook. If the maker event is pulse rate(webhook description for pulse rate monitoring) then a row will be added to the spreadsheet in the google drive of the given mail id. Almost 20 mail ids can access these data and information about the patients from anywhere in the world if their mail addresses were given while creating trigger. Similarly, if the maker event is PANIC (webhook description for panic condition) then an alert email will be sent immediately to the receptor. The arduino board is coded and the code is uploaded. The timer for updating the data in the google drive can be specified in the arduino code. This gives a chance for continuously monitoring the patient's health condition. As soon as the simulation is on the temperature sensor senses the temperature of the patient and display it on the Liquid Crystal display screen. Fig.6. shows the simulation of the patient monitoring system in tinkercad. The serial monitor also shows

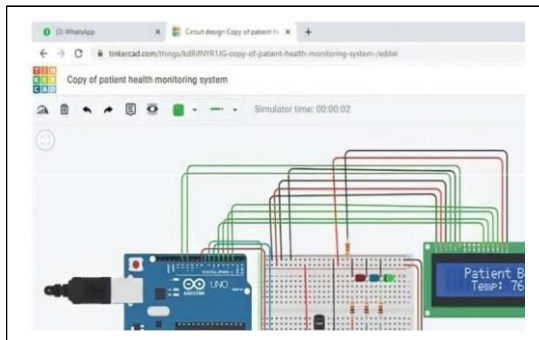


Fig. 6. Simulation of IOT based patient monitoring system using tinkercad

how it works. For the normal temperature range the serial monitor shows the coded string "The temperature is just perfect". And for the higher temperatures it displays "it is hot."; for lower temperatures it displays "it is cold".

## VI. CONCLUSION

Thus the proposed system works to monitor the patient continuously and provide immediate treatment to them when needed, overcoming some of the disadvantages of the existing system. We can add a Global positioning system module to the IOT based patient monitoring system using arduino and ESP8266 module. The Global Positioning system module will find out the location of the patient using the longitude and latitude and it will send the location to the cloud i.e IOT using the wifi module so that the doctors can find the position or location of the patients in case of any emergencies.

In hospital, very keen and careful monitoring of the patients at risk or emergency needs to be maintained for complete recovery of them. A biometric based monitoring system was developed with enhanced protection against security attacks but it failed in data transmission [1]. Another stepping into this advancement, a patient monitoring system based on internet of things was developed and designed with the help of raspberry Pi [2]. The development of internet of things concept have revolutionized the application of technological aspects to a great extent. It simply means transferring the data through a physical medium via internet using a suitable computer or software protocol and thus have made us develop more towards making our cities smarter [7].

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