IoT based Weather monitoring system

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School of Computer Science and Engineering

DECLARATION

We hereby declare that the project entitled **IoT based Weather monitoring system** submitted by us to the School of Computer Science and Engineering, VIT University, Vellore-14 has not been submitted and will not be submitted, either in part or in full of this institute or of any other institute or university.

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CERTIFICATE

The project report entitled "**IoT Based Weather Monitoring System**" was prepared and submitted by **Gurtavrein Singh (19BCE2101), C S Sahil (19BCE2094) and Astha Nihar(18BCE2223).** It has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** in VIT University, India.

Guide
Dr.Sathiya Kumar C

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LIST OF ABBREVIATIONS

Abbreviation	Expansion
IDE	integrated development environment
NodeMCU	Node MicroController Unit
ESP8266	electronic stability program
IFTTT	if this then that

ABSTRACT

We have made this project for monitoring weather conditions using an IoT system . The problem was to get accurate results of only the region required . This project aims to solve that . We calculate conditions like rainfall , humidity and temperature in this project. Using DHT11 for temp and humidity , KG004 rain drop sensor for rain condition ESP8266 / Node MCU for Wifi Connectivity we have done this project.

CHAPTER 1

INTRODUCTION

1.1. Theoretical Background

The internet of Things (IoT) is viewed as an innovation and financial wave in the worldwide data industry after the Internet. The IoT is a wise system which associates all things to the Internet with the end goal of trading data and conveying through the data detecting gadgets as per concurred conventions. It accomplishes the objective of keen recognizing, finding, following, observing, and overseeing things . It is an augmentation and extension of an Internet-based system, which grows the correspondence from human and human to human and things or things and things. When the objects like environment equipped with sensor devices, microcontrollers and various software applications becomes a self-protecting and self monitoring environment and it is also called as smart environment. In such environment when some event occurs the alarm or LED alerts automatically.Initially the sensor devices are deployed in environment to detect the parameters (e.g., Temperature, Humidity and CO etc.)while the data acquisition, computation and controlling action (e.g., the variations in the temperature and CO levels with respect to the specified levels). Sensor devices are placed at different locations to collect the data to predict the behaviour of a particular area of interest.

1.2. Motivation

The primary motivation behind taking up this project is the large utility of wireless weather monitoring in varied areas ranging from agricultural growth and development to industrial development. Weather variables like temperature, humidity ,rainfall are sensed by sensors and further sent to the ThingSpeak cloud. Sensing the weather has been important to man over the centuries. The winds and other weather variables are of equal concern and can have an even greater impact on our modern, high-tech lifestyle. A weather station is that facility on land or sea, which has instruments and devices for observing and measuring atmospheric parameters to provide the information for weather forecasts Modern weather monitoring systems and networks are designed to make the measurements necessary to track these movements in a cost effective manner.

1.3. Aim of the proposed Work

The main aim of this project is to design and implement an efficient monitoring system through which the required parameters are monitored remotely using the internet and the data gathered from the sensors are stored in the cloud and to project the estimated trend on the web browser. A solution for monitoring the temperature, humidity and rainfall i.e., any parameter value crossing its threshold value ranges.

1.4. Objective(s) of the proposed work

The objective of this project is to design and implement portable weather stations.This weather station helps us to determine 3 parameters namely temperature and humidity using the DHT11 and rain condition using the KG004 rain drop sensor. NodeMCU has been used to interface the sensors and the WIFI module embedded inside the NodeMCU helps in connecting with the ThingSpeak cloud. The ThingSpeak Cloud has been used for IoT analytics and visualizing the telemetric data. IFTTT has also been employed to create a notification whenever the raindrop sensor receives a positive signal.

CHAPTER 2

Overview of the Proposed System

2.1 Introduction

This weather station helps us to determine 3 parameters namely temperature and humidity using the DHT11 and rain condition using the KG004 rain drop sensor.NodeMCU has been used to interface the sensors and the WIFI module embedded inside the NodeMCU helps in connecting with the ThingSpeak cloud

2.2 Framework, Architecture or Module for the Proposed System(with explanation)

Temperature,Humidity were detected by DHT11 sensor and rain value was detected by KG004.This data was send to the system via NodeMCU.NodeMCU sent this data to Think Speak cloud which showed the data graphically(Fig 5)

NodeMCU is used as a wifi module , the values of temperature , humidity and raindrop are sent to ThingSpeak Cloud service where the graphs for analysis is produced.

IFTTT is used further to send a notification to the user of the detection.

2.3 Proposed System Model

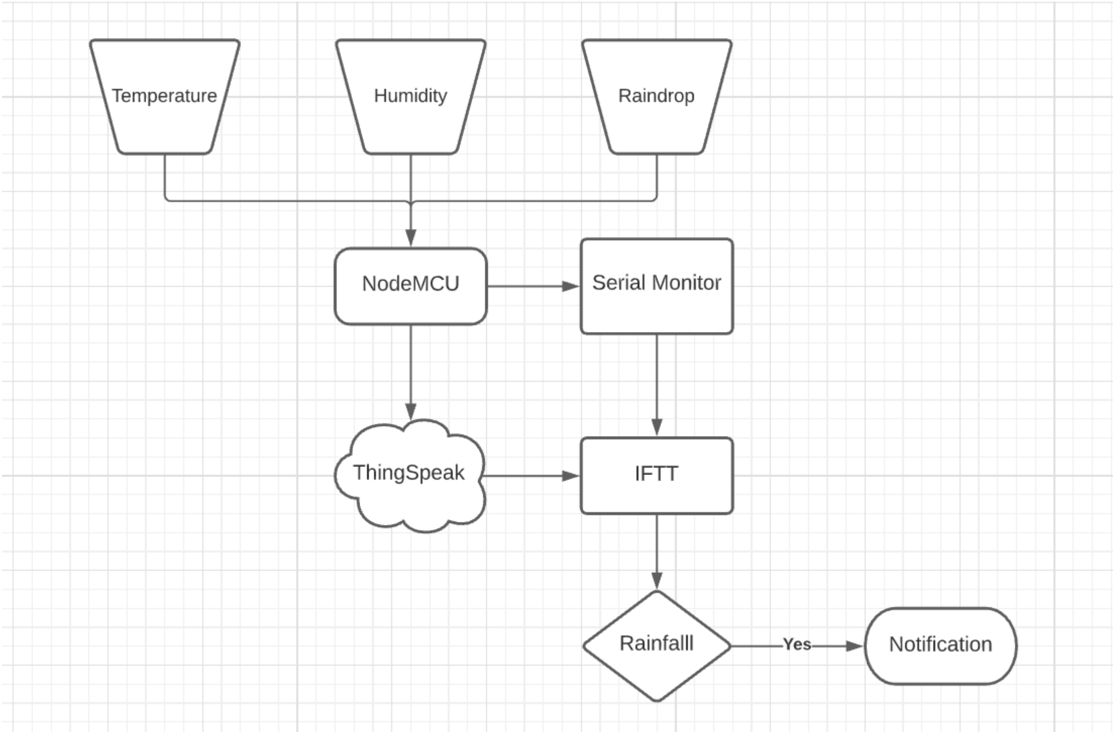


Fig 1.Flowchart

CHAPTER 3

Proposed System Analysis and Design

3.1. Introduction

3.1.1. System Requirements

H/W Requirements

- DHT11 for temp and humidity
- KG004 rain drop sensor for rain condition
- ESP8266 / Node MCU for Wifi Connectivity
- LED light
- Wires
- Bread Board
- USB cable

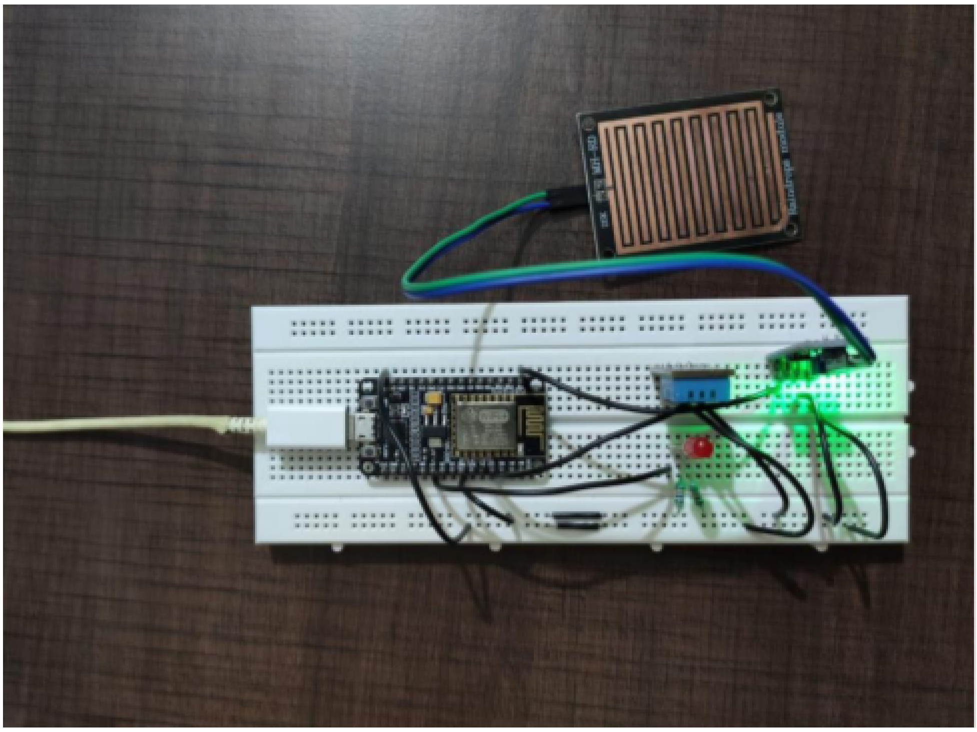


Fig 2 Hardware without rain detected

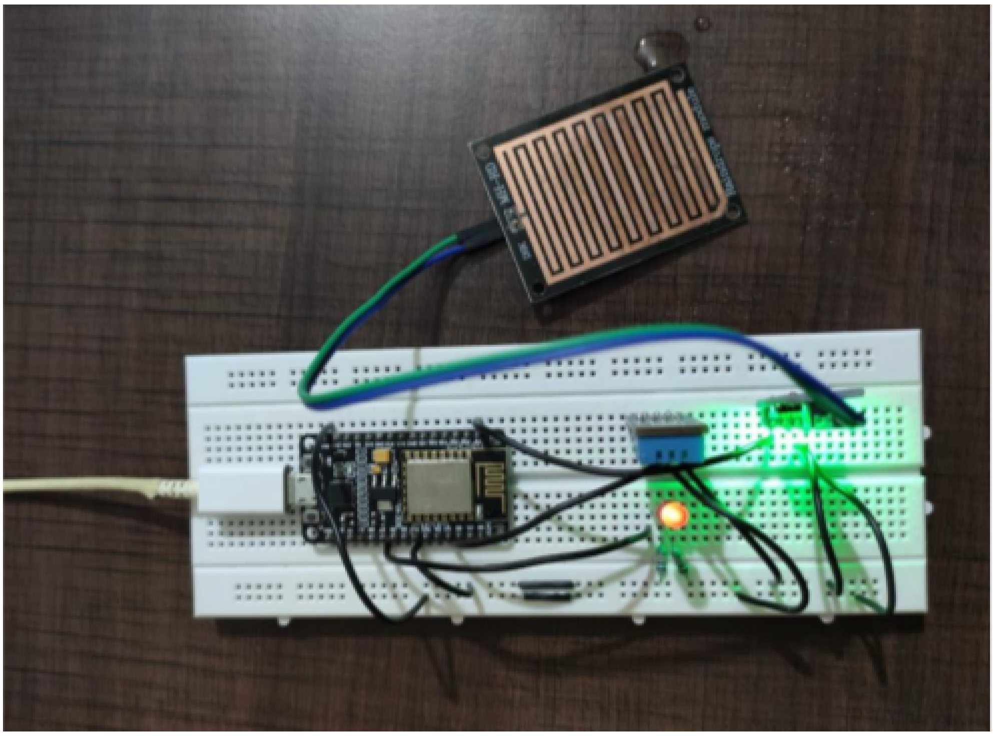


Fig 3 Hardware with rain detected

S/W Requirements

- Arduino IDE
- ThinkSpeak cloud (https://thingspeak.com/)
- IFTTT (https://ifttt.com/home)

3.2. Design Approach

First we made the hardware model with all the components.Then we implemented the project in code and uploaded it on NodeMCU.Then made an account on Think Speak Cloud and gor API key and added it in code. Another account on IFTTT was made and was linked to Think Speak Cloud.

3.3. Code

```
#include <ESP8266WiFi.h>                                        // NodeMCU Library

#include <DHT.h>                                        // DHT Sensor Library

#include <ThingSpeak.h>                                        // ThingSpeak Library
```

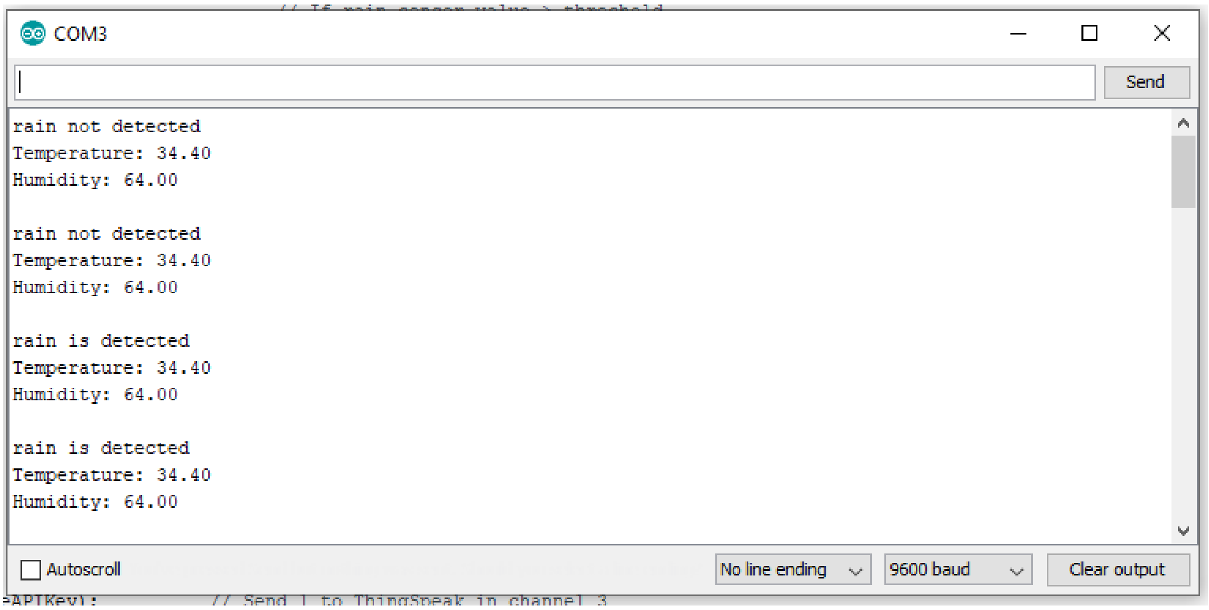
```
DHT dht(D3, DHT11);                                        // Declaring D3 as dht pin
WiFiClient client;                                         // WiFi client object for ThingSpeak
long myChannelNumber = 1329952;                            // ThingSpeak channel
const char myWriteAPIKey[] = "6VV6XWM95QSWP4AO";           // ThingSpeak write key
int sensorPin = A0;                                        // Raindrop sensor input pin
int enable2 = 13;                                          // Raindrop sensor output led pin
int sensorValue2 = 0;                                      // Variable to store the value coming from Raindrop sensor
bool flag = false;                                         // Boolean to save rain status
 void setup() {
   pinMode(enable2, OUTPUT);                               // Setting led pin as output
  Serial.begin(9600);                                      // Initializing baud rate
 WiFi.begin("81", "81waheguru1430");                       // Connect to WiFi using given id and password
 while (WiFi.status() != WL_CONNECTED)                     // WiFi getting connected
  {
delay(500);
Serial.print("..");
  }
  Serial.println();
  Serial.println("NodeMCU is connected!");
  Serial.println(WiFi.localIP());                          // Print IP connected
  dht.begin();                                             // Connect to dht sensor
  ThingSpeak.begin(client);                                // Connect to ThingSpeak
 }
void loop() {
  sensorValue2 = analogRead(sensorPin);                    // Reading Raindrop sensor value
  sensorValue2 = constrain(sensorValue2, 0, 1023);         // Limiting the range of values
  sensorValue2 = map(sensorValue2, 0 , 1023, 1023, 0);     // Invert the range
  if (sensorValue2 >= 20)                                  // If rain sensor value > threshold
  {
```

```
Serial.println("rain is detected ");                      // Print on serial monitor that rain detected

digitalWrite(enable2, HIGH);                                  // Light the LED on board

flag = true;                                      // Rain status is true

  }

  else                                            // If rain sensor value < threshold

  {

Serial.println("rain not detected ");                     // Print on serial monitor that rain detected

digitalWrite(enable2, LOW);                                   // Switch off the LED on board

flag = false;                                     // Rain status is false

  }

  float h = dht.readHumidity();                              // Reading and saving Humidity value

  float t = dht.readTemperature();                             // Reading and saving Temperature value

  Serial.println("Temperature: " + (String) t);                        // Printing these values on serial monitor

  Serial.println("Humidity: " + (String) h);

  Serial.println();

  // SENDING DATA TO THINGSPEAK

  if (flag == true) {                                  // If it is raining

ThingSpeak.writeField(myChannelNumber, 3, 1, myWriteAPIKey);            // Send 1 to ThingSpeak in channel 3

//delay(100);

ThingSpeak.writeField(myChannelNumber, 2, h, myWriteAPIKey);            // Send humidity value to ThingSpeak in
channel 2

//delay(100);

ThingSpeak.writeField(myChannelNumber, 1, t, myWriteAPIKey);            // Send temperature value to ThingSpeak in
channel 1

  }

  else {                                          // If it is not raining

  ThingSpeak.writeField(myChannelNumber, 3, 0, myWriteAPIKey);          // Send 0 to ThingSpeak in channel 3

  //delay(100);

  ThingSpeak.writeField(myChannelNumber, 2, h, myWriteAPIKey);          // Send humidity value to ThingSpeak in
channel 2

  //delay(100);
  ThingSpeak.writeField(myChannelNumber, 1, t, myWriteAPIKey);                    // Send temperature value to ThingSpeak in
channel 1

   }

 delay(1000);

 }
```

CHAPTER 4

RESULTS AND DISCUSSION

4.1. Sample Test Cases



```
rain not detected
Temperature: 34.40
Humidity: 64.00

rain not detected
Temperature: 34.40
Humidity: 64.00

rain is detected
Temperature: 34.40
Humidity: 64.00

rain is detected
Temperature: 34.40
Humidity: 64.00
```

Fig 4.Serial monitor

4.2. Summary of the Result

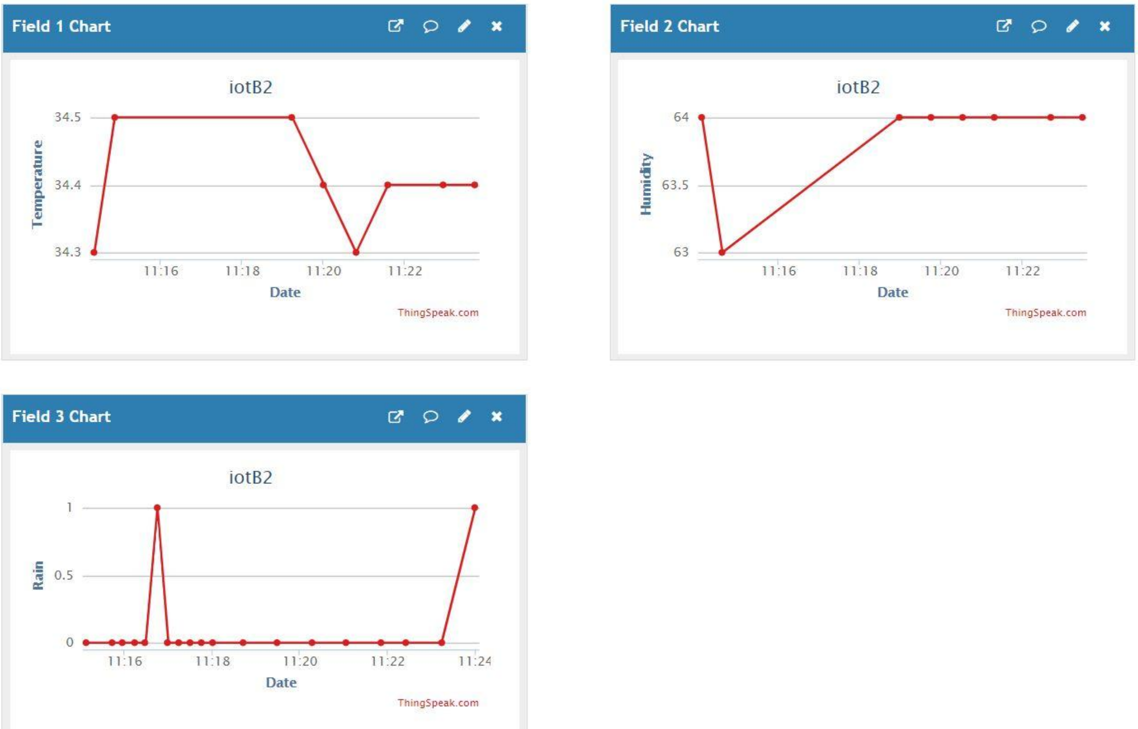
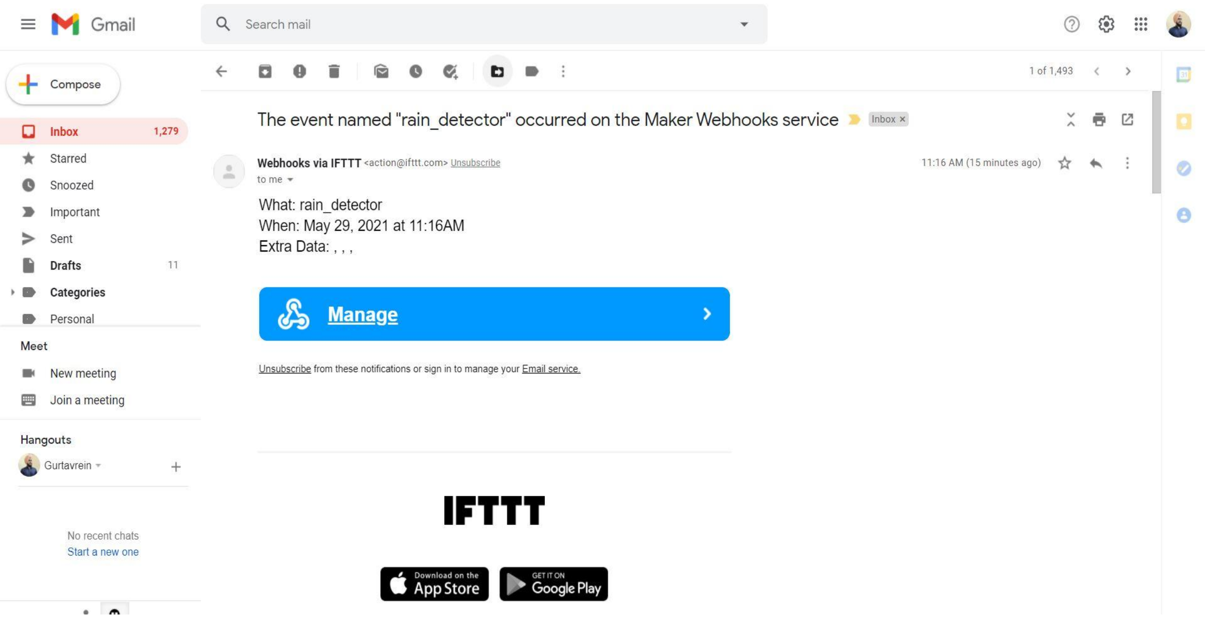


Fig 5.ThinkSpeak



The event named "rain_detector" occurred on the Maker Webhooks service

Webhooks via IFTTT <action@ifttt.com> Unsubscribe
to me

11:16 AM (15 minutes ago)

What: rain_detector
When: May 29, 2021 at 11:16AM
Extra Data: , , ,

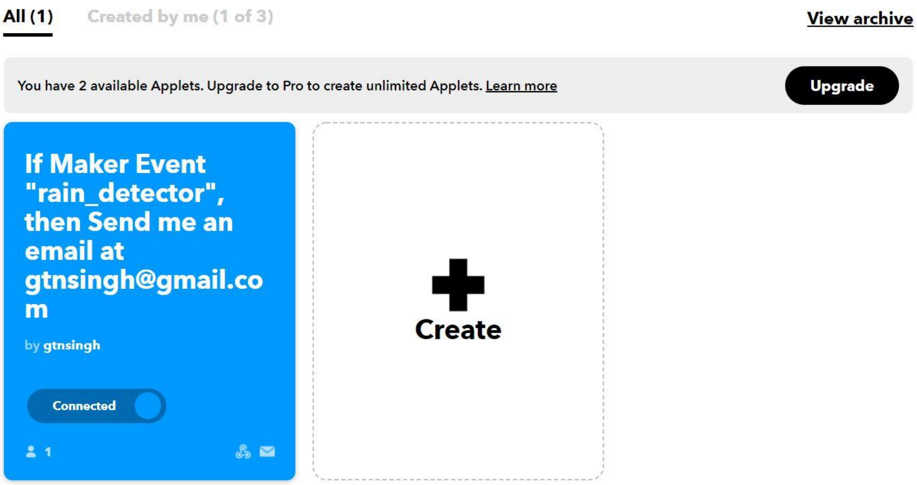
Manage

Unsubscribe from these notifications or sign in to manage your Email service.

IFTTT

Download on the App Store
GET IT ON Google Play

Fig 6.IFTTT email



All (1) Created by me (1 of 3) View archive

You have 2 available Applets. Upgrade to Pro to create unlimited Applets. Learn more

Upgrade

If Maker Event "rain_detector", then Send me an email at gtnsingh@gmail.com

by gtnsingh

Connected

1

Create

Fig 7. IFTTT applet

CHAPTER 5

CONCLUSIONS , LIMITATIONS AND SCOPE

This project aims to measure the various parameters like Temperature, Humidity, Rainfall and continuously monitor. The data can be stored online, which can be used to forecast weather and eventually analyze climate patterns, as well as for other meteorological purposes. The system uses a good combination of analog and digital sensors in wired and wireless modes of operation. Thus, a proof of concept for an Internet of Things device for a remote weather monitoring system has been established.

An alarm can be added to the circuit to notify the user in case of excess smoke conditions i.e. Smoke alarm. An SMS can be sent to clients notifying them with the temperature/humidity/smoke parameters.

CHAPTER 6

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