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Rain Sensor Alarm Project

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Bachelor of Engineering

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Abstract

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This work focuses on using rain sensor, and it can be used in both everyday life and manufacturing.

The ultimate goal of this project is to detect rain using a rain sensor. We used a555 IC, which works like a timer, sending a pulse as its signal, which is then read by the buzzer. Everyone's life revolves around water.

Water conservation and good use are important. Here is a simple project that will sound an alarm when it rains, allowing us to take action to gather rainwater and store it for later use. We can increase the groundwater level with the aid of underwater recharge technologies by saving this rainwater and using it. When the rain detector senses rain, it sounds an alarm. The desired result was achieved in various aspects of using rainwater detectors in irrigation, home automation, electronics, vehicles, and other fields. Here is a low-cost rainwater detector circuit that is simple and effective.

Keywords: Rain Sensor, Pushbullet, Power supply, Photon, 555 Timer

Contents

List of Abbreviations

PCB: Printed Circuit Board.

IC: Integrated Circuit.

D0: Digital Input.

1 Introduction

Management of water resources and proper usage have become increasingly important in recent years. Rain sensor senses rain and sounds an alert so that we can save water to use for other purposes later. For example, there are several methods for conserving water harvesting which means is the process of collecting and storing rainwater instead of letting it wash off. Rainwater is collected from a roof-like surface and directed to a tank, cistern, deep pit (well, shaft, or borehole), aquifer, or reservoir via percolation, where it seeps down and replenishes ground water. The level of ground water can be raised by conserving groundwater and limiting water use.

The rain alarm is an application that detects rainwater and sounds an alarm when it is detected. This thesis describes a simple and reliable sensor module that may be available in the market at low cost.

There are so many types of rain sensors that it is crucial to know the differences in rain sensors in order to choose the ideal one. Some rain sensors are inexpensive, while others are long-lasting and resistant to wear and strain. It is essential to choose a suitable rain sensor for an automatic rain detection system. It is beneficial to be familiar with the various types of rain sensors available on the market and to understand their benefits and drawbacks.

2 Types of Rain Sensor

2.1 Resistive Rain Sensor

The rain sensor is a plate on which nickel is applied in the form of lines. It works on the principle of resistance. The resistance between each contact is extremely high when the sensor is dry (open circuit). When there is water on the board's surface, it forms a resistive connection across the two-copper strip. This difference in resistance enables the circuit to distinguish between dry and wet states allowing the sensor to detect rain. Resistive sensors are shown in Figures 1, 2 and 3.

Figure 1. Resistive Rain Sensor Kit [6].

Figure 2. Resistive Rain Detector [7].

Figure 3. Resistive Rain Sensor[7].

2.2 Capacitive Rain Sensor

Industrial, commercial, and weather telemetry applications all use capacitive RH sensors.

The top plate of this capacitive senses the change in capacitance when water is on the plate. Figure 4 shows capacitive rain sensor.

Figure 4. Capacitive Rain Sensor [8].

2.3 Mechanical Rain Sensor

Rainbird has created a well-designed rain sensor that detects rainwater by triggering an internal switch based on the mechanical weight idea. It is an easy and reliable technique to tell if it is raining or not. Mechanical rain sensor is shown in figure 5.

Figure 5. Rain sensor that works mechanically [9].

2.4 Optical Rain Sensor for Cars

They are small in size and are normally found behind the windshield of a car, usually directly behind the side mirror. Car optical rain sensor is shown in figure 6.

Figure 6. Optical Rain Sensors for Cars [10].

2.5 Rain Sensor with Sounds

The sound of rain is detected by this sensor. Rain falls on the platform, causing vibrations that are detected by the sensor. Figure 7 illustrates rain sensor with sound.

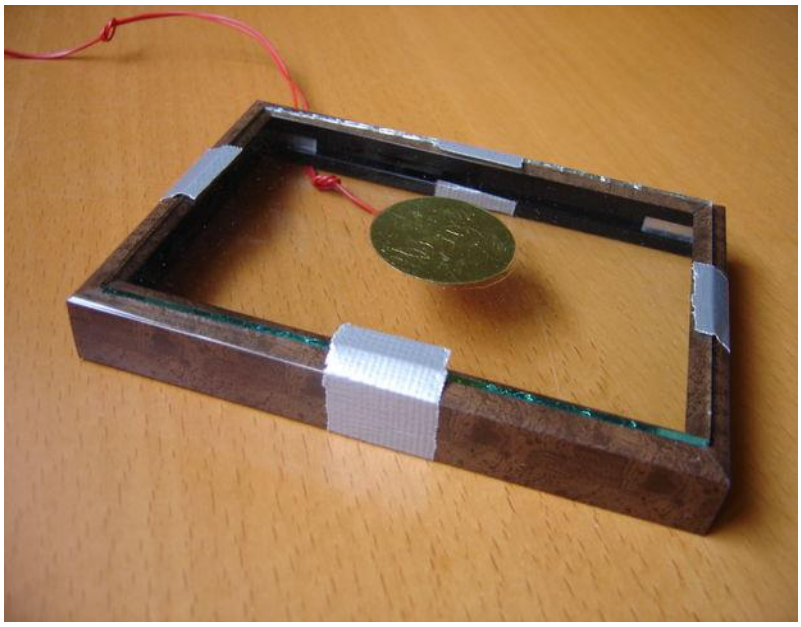


Figure 7. Detecting rain with sound [11].

2.6 Cloud and Rain Detection (Weather Sensor)

This is an advanced weather sensor capable of detecting cloud and sky conditions. Air velocity, temperatures, and other variables can also be detected. This sensor can detect dark clouds and oncoming rain. Close the dome automatically before rain destroys the precision telescope equipment due to weather or close the dome automatically before rain destroys the precision telescope equipment due to weather. Figure 8 shows boltwood cloud sensor.

Figure 8. Boltwood Cloud Sensor [12].

2.7 Optical Rain Sensor

An optical rain sensor is the best rain sensor. It detects the intensity of infrared light reflected from the clear top. As water reaches the surface, any of the lights will be broken. Internally, there is less light reflected. A drop in felt pressure indicates the presence of water.

This optical rain sensor has a quick rain detection reaction. Optical rain sensor is shown in figure 9.

Figure 9. Optical Rain Sensor [13].

3 The Rain Warning System Project

The rain warning project is a straightforward but extremely useful project that detects rain (rainwater) and automatically sounds an alarm or chime. Water is a fundamental requirement in everyone's life. Conserving water and using it properly is very important. The rain alarm will allow us to perform some rainwater harvesting activities and save the rainwater for later use.

3.1 Rain Alarm Project Visualization of Blocks

The block schematic for the rain alarm project is presented below. The Rainwater Sensor, 555 Timer IC, and buzzer are the three essential components of the project. Figure 10 shows block diagram of the rain sensor alarm.

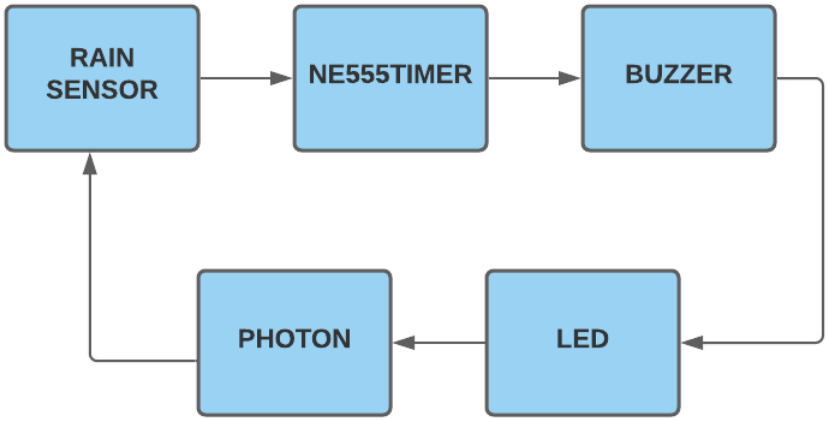


Figure 10. Block Diagram of the Rain Alarm Project.

The rainwater sensor delivers a signal to the 555 Timer when it detects rain. The buzzer will be activated by the 555 Timer IC in A steady Mode.

3.2 Circuit Diagram

An automatic rain detection Alarm circuit, in this circuit we use IC 555 timer, resistors, capacitors, NPN BC548 transistor, 1 buzzer, 12v battery. The rain warning project is schematically represented using Multisim in the diagram described. Instead of using a switch, this circuit uses a rain sensor (key=A). Figures 11 and 12 show the circuit diagrams for the rain sensor alarm project.

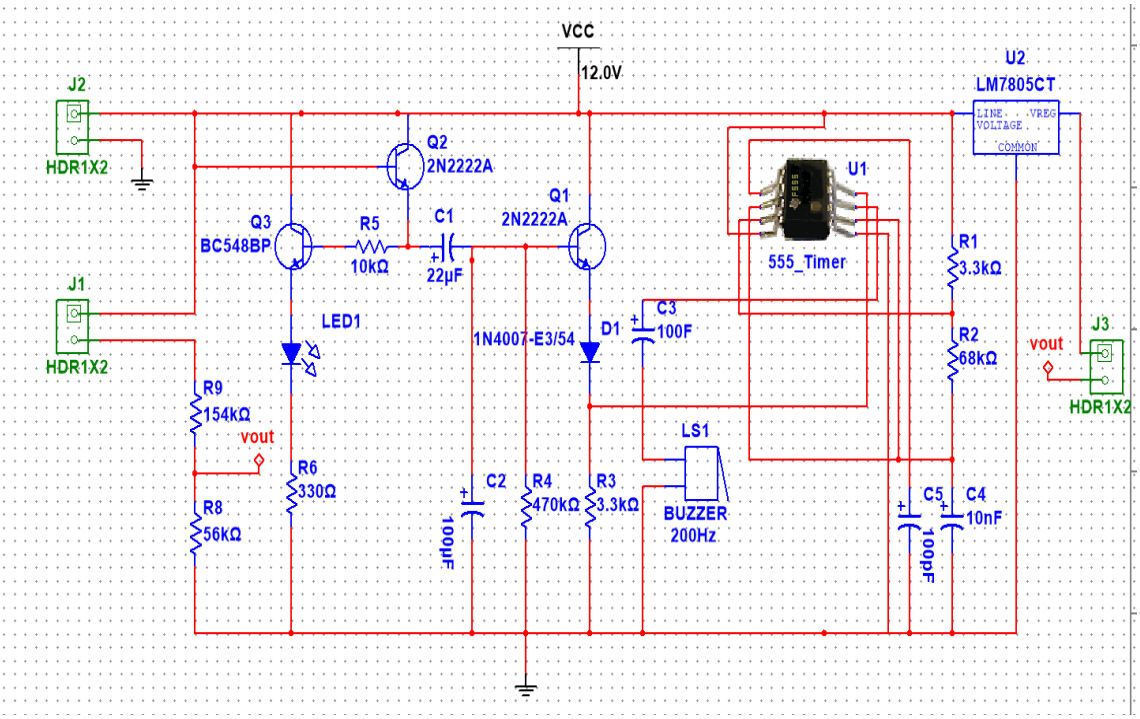


Figure 11. Circuit Diagram for Rain Sensor Alarm (12V).

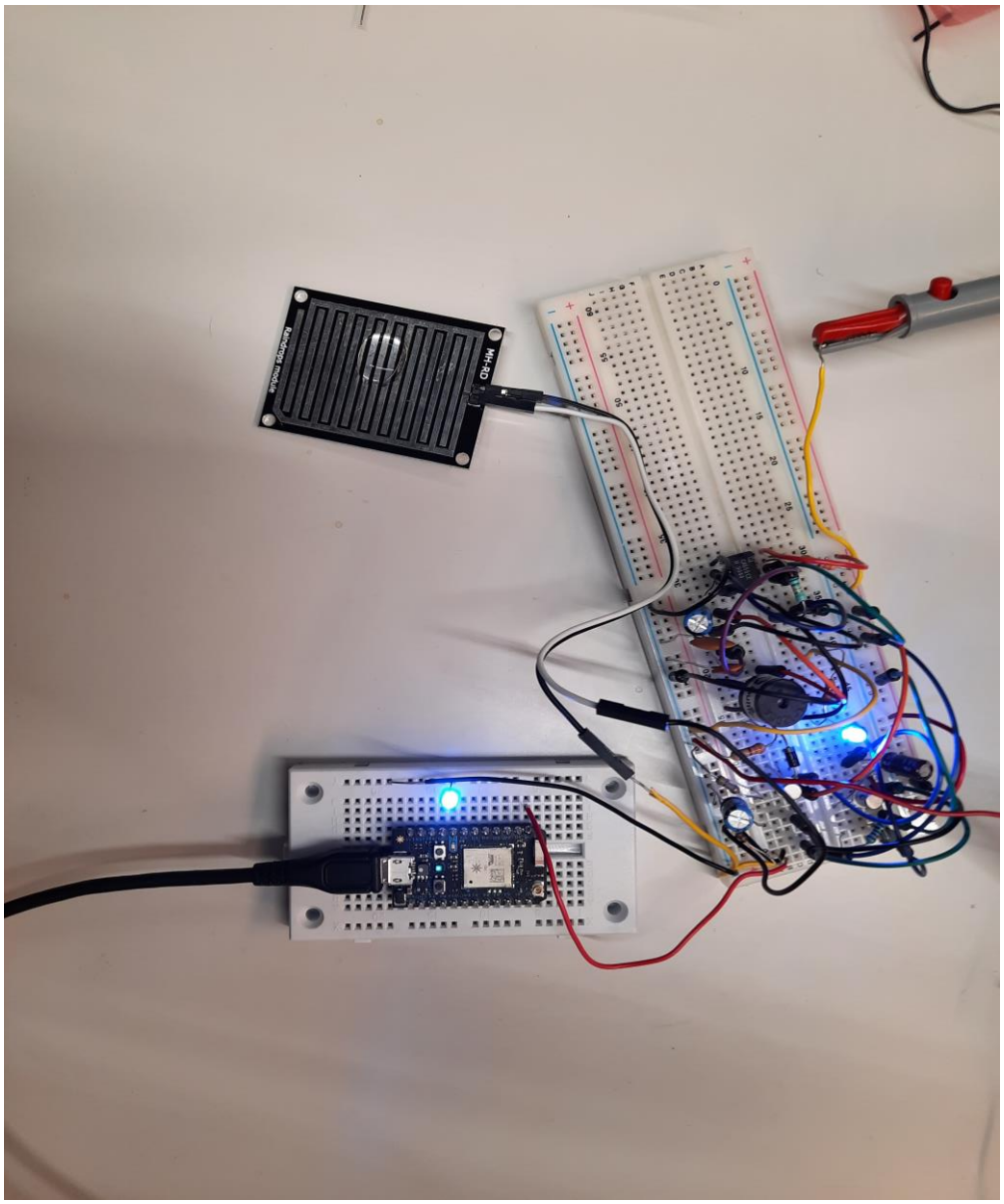


Figure 12. Rain sensor is used as a rain detector.

3.3 Components

The main component of this rain alarm is the rain sensor. The rain sensor alarm's components are listed in table 1 [3].

Table 1. Rain Sensor Alarm Components (12V)

Small Rain Sensor	470 KΩ Resistor (1/4 Watt)

555 Timer IC	3.3 KΩ Resistor (1/4 Watt)
BC548 NPN Transistor	3.3 KΩ Resistor (1/4 Watt)
2N2222 NPN Transistor	22 µF Capacitor (Polarized)
Bright White LED	100 µF Capacitor (Polarized)
1N4007 PN Junction Diode	10nF Ceramic Capacitor (Code – 103)
220 KΩ Resistor (1/4 Watt)	100pF Ceramic Capacitor (Code – 101)
330 Ω Resistor (1/4 Watt)	Buzzer (or Speaker – 8Ω)
10 KΩ Resistor (1/4 Watt)	Connecting Wires
Breadboard	12V Power Supply

4 Power supply

The purpose of a mains power supply is to convert the power delivered to its input by the sinusoidally alternating mains electricity supply into power available at its output in the form of a smooth and constant direct voltage.

4.1 First Power Source: USB

The most obvious and simplest power solution for the Particle Photon is the integrated micro-USB connection. This connection not only enables communication between a PC and the Photon but also as a 5V source for the Photon. Many projects can take advantage of this and use a simple phone charger or computer USB port as a power source for the Photon.

However, this method is practical for portable projects, as most USB sources work on a main. Some wall sockets now include USB outputs, that could be a useful source of

power for future Photon projects that are not portable and hang in various places around the house.

The Photon is powered via the on-board USB Micro B connector or directly via the VIN pin. If the VIN pin is directly powered, the voltage should be kept between 3.6VDC and 5.5VDC. When the Photon is powered via the USB port, VIN will output a voltage of about 4.8VDC due to a reverse polarity protection series Schottky diode connected between V+ of the USB and VIN. The maximum load on VIN when used as an output is 1A. While 3V3 can be used as an output, it has a small overhead of only 100mA.Figure 13 shows the particle photon with USB.

Figure13. The particle photon with USB [5].

One of the most common power supplies in use today is the 5V (or 5VDC) power supply. It is simple to get 5V in Multisim by adjusting the values of the resistors and capacitors.

A 555-rain detector/sensor alarm circuit will be demonstrated as an interesting project. This circuit will play a melody until it senses any water drops on the surface. There are two integrated circuits in the circuit.

The first is a 555 timer IC, which provides the circuit with oscillations and time delay. A UM66 melody generator IC is also used to set up the melody circuit. The audio output is amplified by a transistor amplifier at the IC's output to drive the 8 ohms, Buzzer. The presence of rain is visually shown using LED. Figures 14 and 15 illustrate the circuit designs for the rain sensor alarm with a 5V power supply and PCB design.

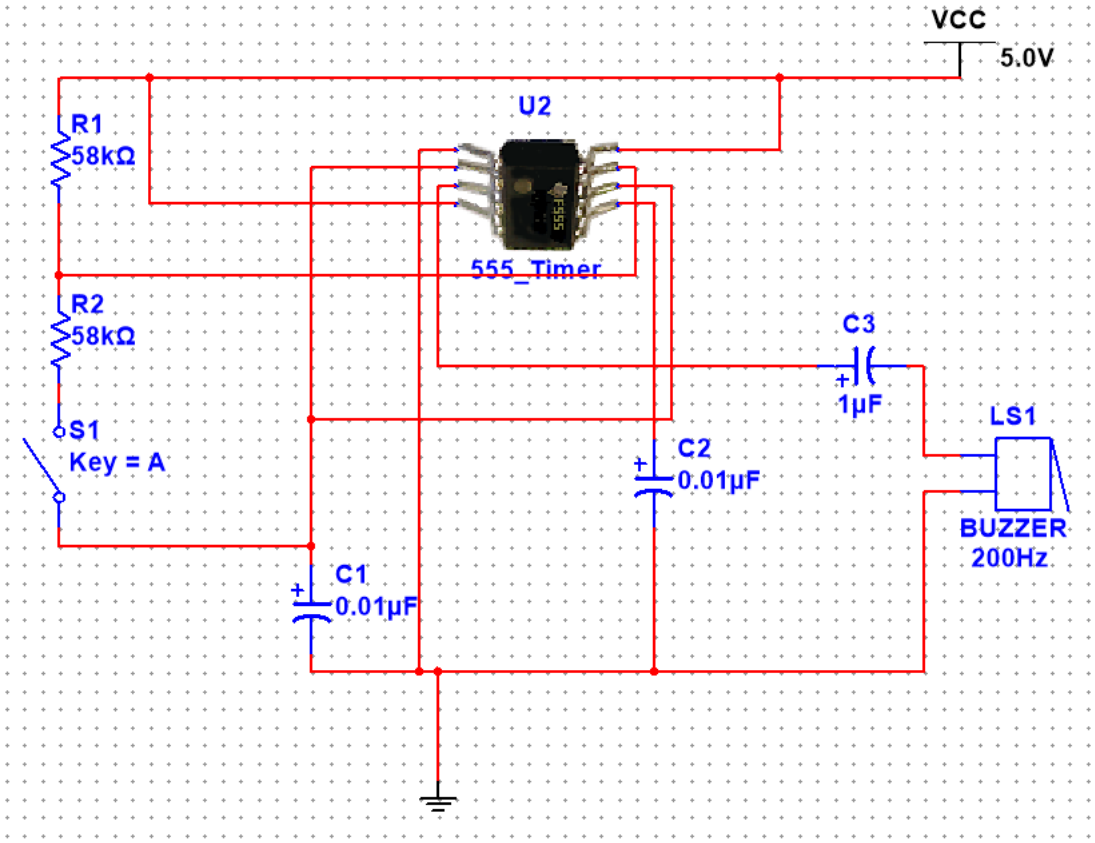


Figure 14. Diagram of the Rain Circuit (5V).

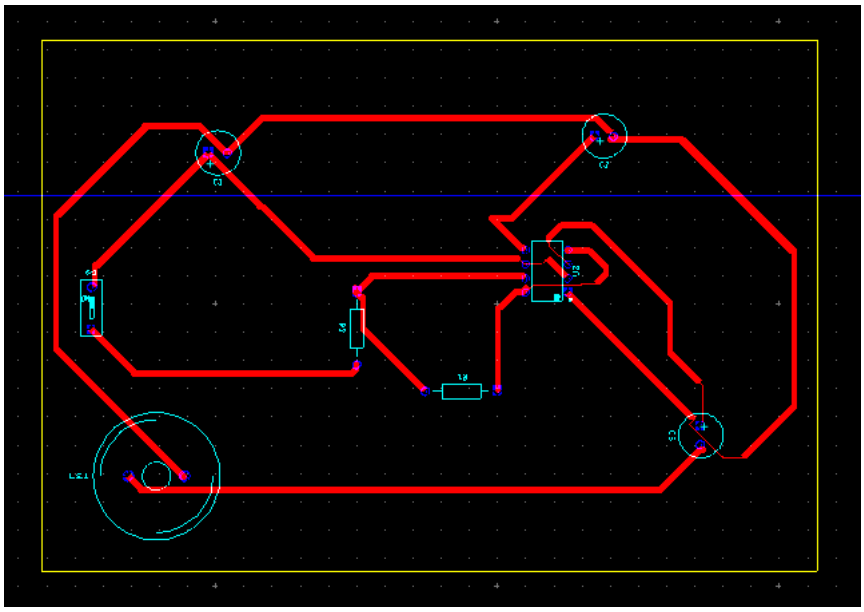


Figure 15. PCB design for Rain Senor alarm (5V).

Hardware Components

Table 2 below lists all the components required for the rain sensor alarm project with power supply (5V)

Table2: Rain Sensor Alarm Components (5V)

Component	Value
Power Supply	5V
Rain Sensor	
IC	NE555
Resistor	58K
Electrolytic Capacitor	0.01uF ,1uF. 0.01uF
Buzzer	8 ohms

The voltage used in this circuit is 5 volts DC. The sensor in this circuit was handcrafted. It can be made using a variety of methods, including simply joining thin wires into a 3-to-6-inch square piece of plastic.

A 1-to-3-millimetre piece should be used. All wires are separated by this distance. When the rain sensor detects rain, an input signal is sent to the 555 timer IC, which triggers the LED melody generator IC and the UM66.

The transistor amplifies the output melody and powers the loudspeaker. To secure the components in this circuit, current limiting resistors are used. If you want to operate this circuit at a higher voltage, such as 6, 9, or 12 volts, place a 3.3 V Zener diode in front of the UM66 IC, along with a resistor.

4.2 Option 2: 12V DC Power Supply

4.2.1 Using 12V battery pack

Making a 12V power supply at home is simple: The 12V Home Battery Pack is a straightforward design that uses a series of lithium-ion batteries to produce a 12V battery pack. Figure 16 shows 12 V battery pack with leads.

Figure 16. 12V AA Battery Pack with Leads, 8 x 1.5v AA Battery Case Holder [14].

4.2.2 Issues with Using 12 V

Different batteries are used.

Consuming a large number of batteries and debating whether to purchase disposable or rechargeable batteries.

Feed the current through the regulator.

A regulator is an integrated circuit with a straight-line output voltage that is continuously controlled. The importance of voltage control is that it removes the need to adjust the output voltage as the load shifts. Regulator circuit diagram is shown in figure 17.

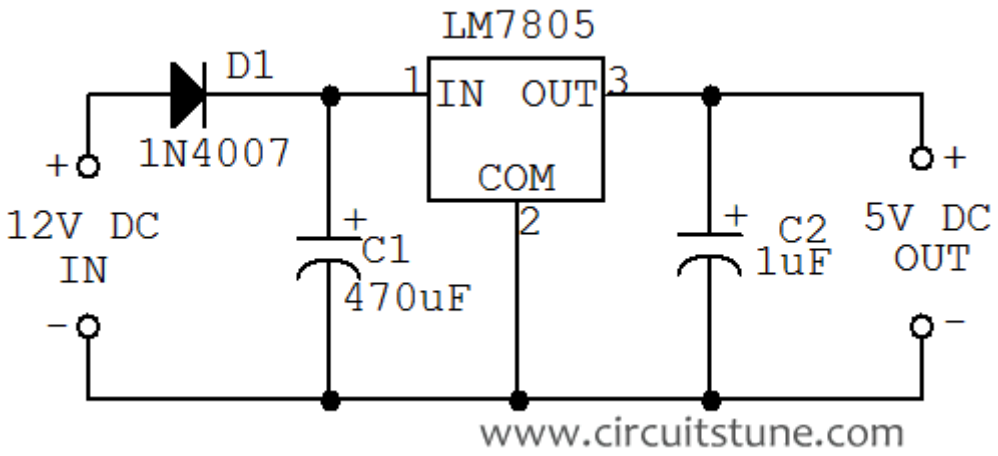


Figure 17. 12v to 5v dc-dc converter circuit diagram [15].

The output voltage of a regulator IC influences its selection. Since we are developing for a 5V output voltage, we will use the linear regulator IC LM7805. In the design phase below, the voltage, current, and power values of the selected regulator IC are needed. This is accomplished by referring to the IC controller's data sheet. Figure 18 shows the regulator.

Figure 18. The Regulator IC (LM7805) [16].

4.2.3 Heating and cooling

During operation, the circuit board's design generates heat, and the amount of heat generated depends on how much electricity is consumed and at what frequencies the circuit board is operated.

The higher those variables rise, the higher the board's operating temperature rises. The PCB would find it more difficult to reach its target output levels at these higher temperatures.

The aim is to build the circuit board in such a way that heat is transferred away from the circuitry without producing hot spots.

To solve the major thermal problems of high-speed and high-performance panels, here are some design techniques that can help:

- Large metal pads to serve as heating pads under hot sections.

- Heat conduction from heating pads to ground planes is aided by fixed filling routes.
- Heat sinks attached to hot element heating pads.
- Using sheet materials with stronger thermal properties, such as polyimides or metal-cored sheets.
- Cooling fans, as well as component positioning that puts hot components in the fan's circulation direction.

5 Sensor of Rainwater

The figure below depicts the Rainwater Sensor used in this project. A simple sensor that can be used to detect rain. It can function similarly to a simple switch, with the switch typically opening and closing once it rains. As illustrated in figure 19.

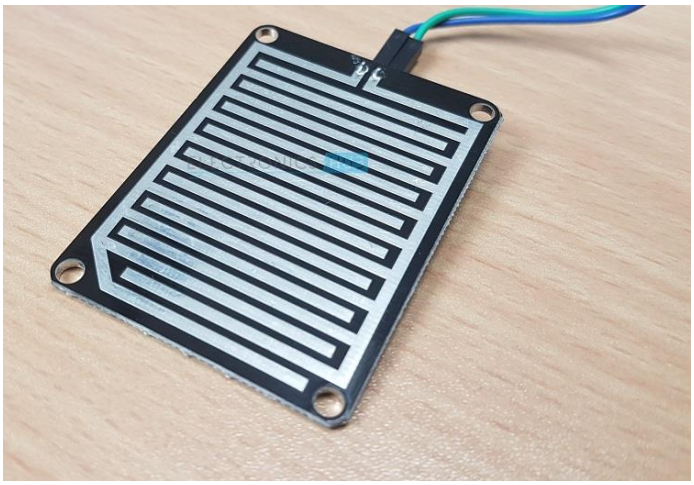


Figure 19. Rain Sensor [2].

The Bakelite or Mica board must be totally flat, and the aluminium wire must be glued to the flat board as seen in the illustration. It is important to make sure there are not any gaps between the wire and the circuit board.

The voltage must flow through the wires until the rainwater sensor is finished and attached to the circuit.

Since there is no conduction between the sensor wires when it is not raining, the resistance between the contacts is extremely high.

Water droplets fall on the rain sensor as it rains, forming a conductive path between the wires and lowering the resistance between the contacts.

As a result, the sensor board's wires drive and activate the NE555 timer via transistor circuits. The output pin will go high as soon as the NE555 is switched on, and the manufacturer will trigger the alarm [4].

6 Circuit Application for Rain Alarm Projects

The following are some examples of rain sensor applications:

When it rains, this sensor is connected to the irrigation system and serves as a water control unit, shutting down the system.

This sensor protects the interior of a vehicle from rain and allows the wipers to operate normally.

This sensor is used to trigger a rain blower over the air inlet, clear water droplets from the mylar wrap, and keep the air in the waveguides pressurized and dry in special satellite communication antennas.

With the aid of a rainwater detector, we can automatically save rainwater in a normal home. (This can only be achieved if the home automation is turned off and the appropriate rainwater storage equipment is available.) The rainwater detector in this case can detect rain and assist in turning on the equipment that will automatically collect and store rainwater for various purposes.)

It is even possible to do this when it is raining chemicals. This is a frequent occurrence in manufacturing areas [1].

7 Implementation in Practice

The hardware and software elements of the rain sensor alarm design are divided into two parts. This section will go over the parts of software and hardware.

7.1 The Framework

If water is detected, a notice will be sent to us right away. This means you will get a notification on any (or all) of your devices, including your phone and computer. The mechanism for receiving rain notification is represented in Figure 20.

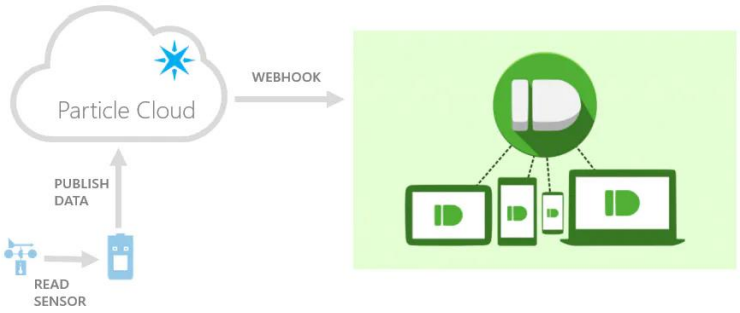


Figure 20. Pushbullet webhooks and particle cloud provide instant updates to all your computers [17].

7.2 Principle of Operation

These measures will show you how it works: As soon as water is detected, the firmware on the Particle sends an event to the cloud. A webhook that lives in the Particle cloud intercepts this published cloud incident. This webhook sends a notification to Pushbullet, which then pushes it to our devices via Pushbullet.

8 The Hardware

8.1 The Particle Photon

A Particle Photon is a fantastic Arduino-compatible Wi-Fi development kit that lets us attach a variety of sensors to the internet. The Particle Photon enables us to attach a variety of devices to the internet, including sensors, other devices, garage doors, and even water sensors.

The particle photon comes standard with a particle cloud platform and wireless flashing through a browser as can be seen in figure 21.

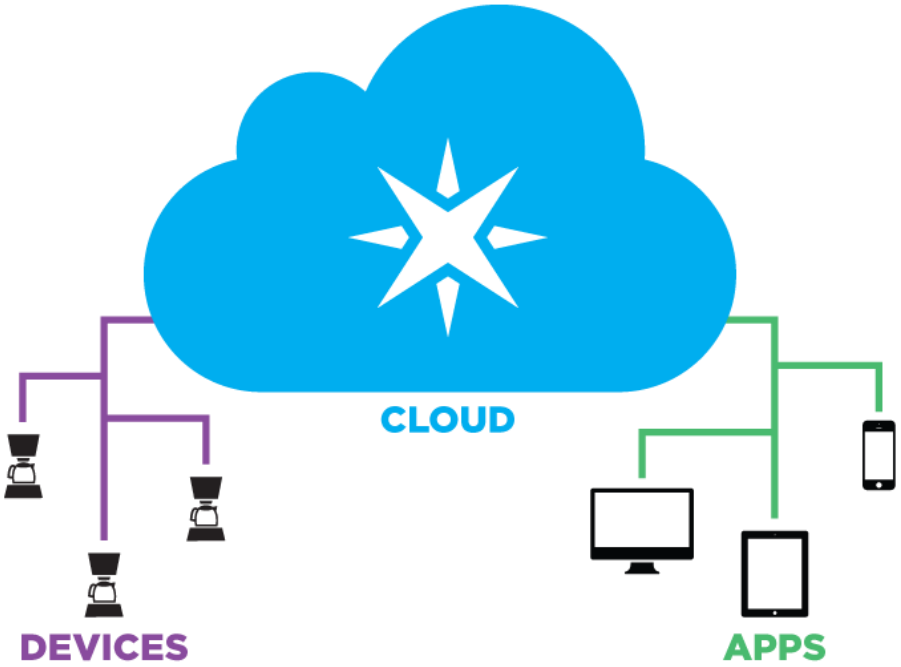


Figure 21. The Cloud [20].

8.2 The Rain Sensor

For water detection, we could use two exposed wires as water is a great conductor. They are turned off as soon as water contacts them, which can be seen with a digital input on our particle P. We will utilize the particles' internal pull-up resistors to link the rain sensor to the ground and digital input D0.

9 Software

Pushbullet is an uncomplicated app that allows you to link your smartphone, tablet, and computer. Pushbullet is available for iOS, Android, web browsers, and desktop computers even after you have begun using it. By sending notifications from any device to your Desktop computer as shown in figure 22 and 23.

Figure 22. Pushbullet app [18].

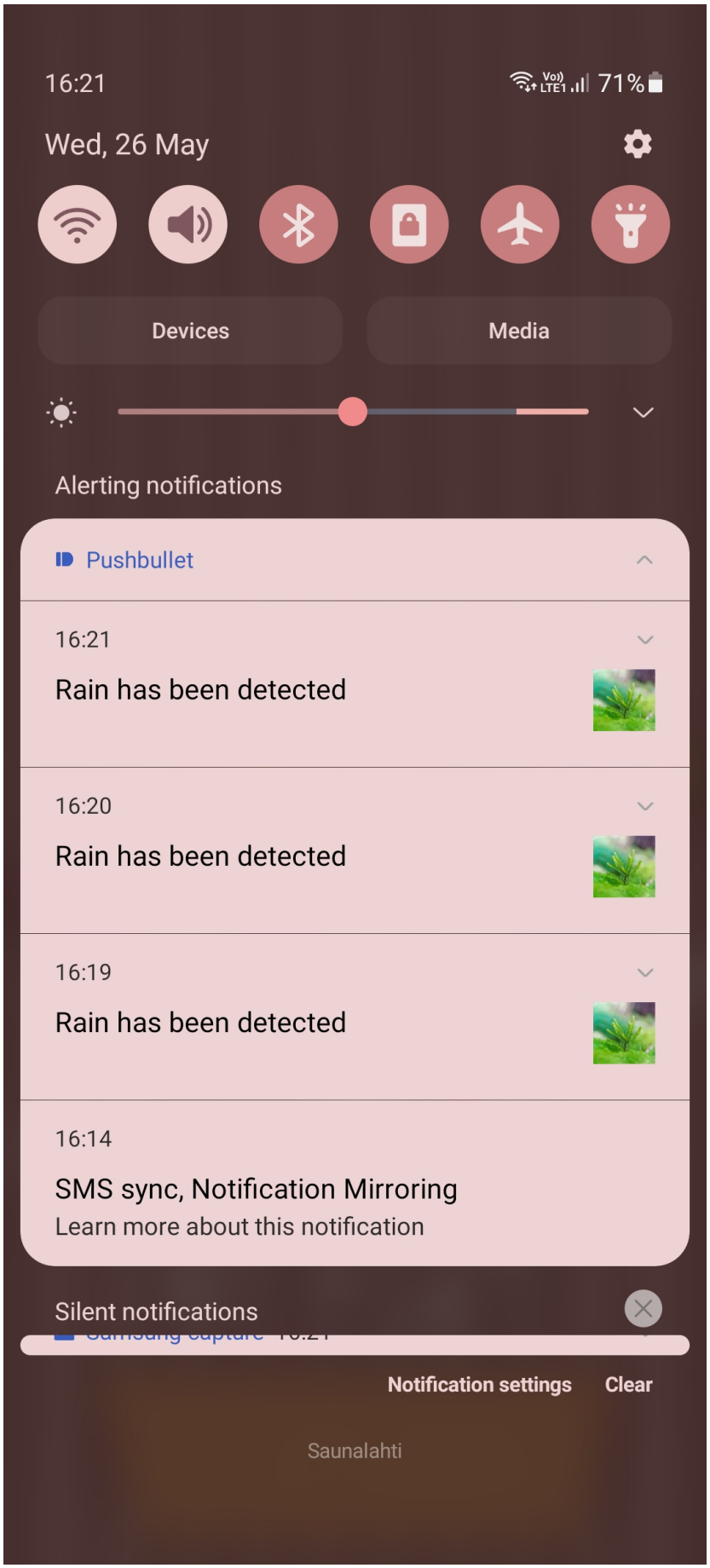
Figure 23. SMS on phone or PC [19].

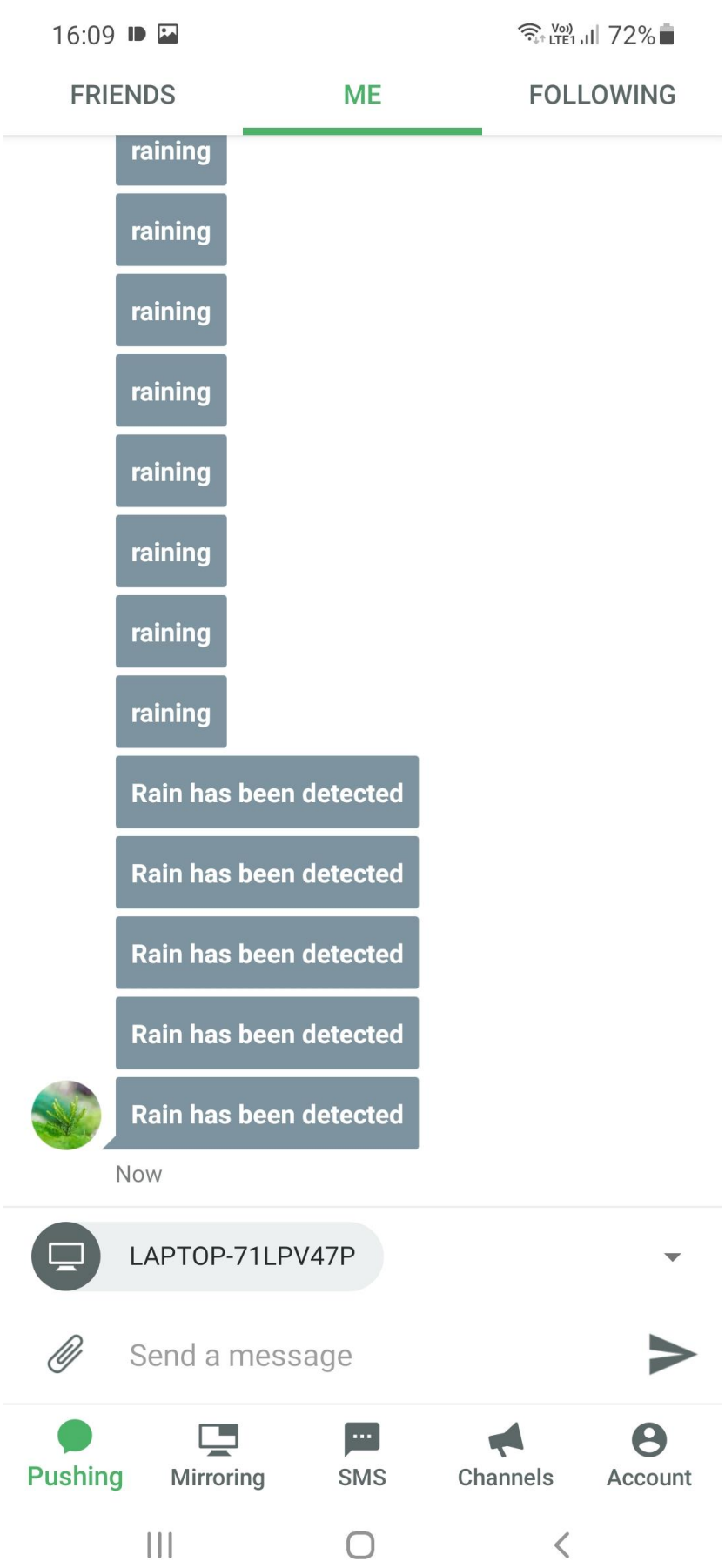
This equation is made up of two parts:

- Download the firmware and install it on your Particle.
- Configuration is required for the webhook.

Configuration of the Particle Cloud Webhook The Particle CLI is used to set up webhooks. Drop the water leak sensor into a glass of water and watch for the LED built into the particle development kit to light up to ensure everything is working properly.

Ten seconds later, you should receive a notification on one of your devices, either your phone or your computer (this requires installing a Pushbullet app) The following is how notifications are setup to be sent: 10 seconds, one minute, five minutes, fifteen minutes, one hour, and then every four hours until the problem is fixed as illustrated in figure 24.


16:21
71%
Wed, 26 May
Devices
Media
Alerting notifications
Pushbullet
16:21
Rain has been detected
16:20
Rain has been detected
16:19
Rain has been detected
16:14
SMS sync, Notification Mirroring
Learn more about this notification
Silent notifications
Notification settings
Clear
Saunalahti


16:09
72%
FRIENDS
ME
FOLLOWING
raining
raining
raining
raining
raining
raining
raining
raining
Rain has been detected
Rain has been detected
Rain has been detected
Rain has been detected
Rain has been detected
Now
LAPTOP-71LPV47P
Send a message
Pushing
Mirroring
SMS
Channels
Account

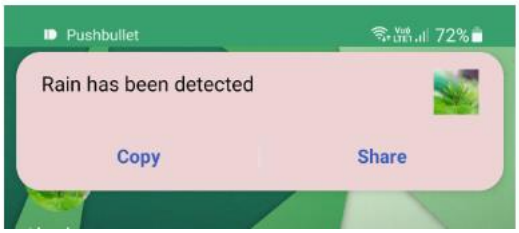


Figure 24. Your Phone Will Alert You When It is Raining.

10 Circuit Board (PCB)

NI Ultiboard is an electronic circuit board design program that is part of the NI Multisim range of circuit design applications.

This software provides efficient and easy-to-use schematic capture, PCB layout, and auto router tools.

PCB layout: The PCB layout editor allows for schematic annotation and automatic routing, which connects traces depending on the schematic's connections.

After Multisim has completed the schematic design, it is possible to transfer all components to Ultiboard and position them within the board outline, then start autoroute and examine in three dimensions as seen in figure 25 and 26. Figure 27 shows rain sensor alarm project PCB prototyping.

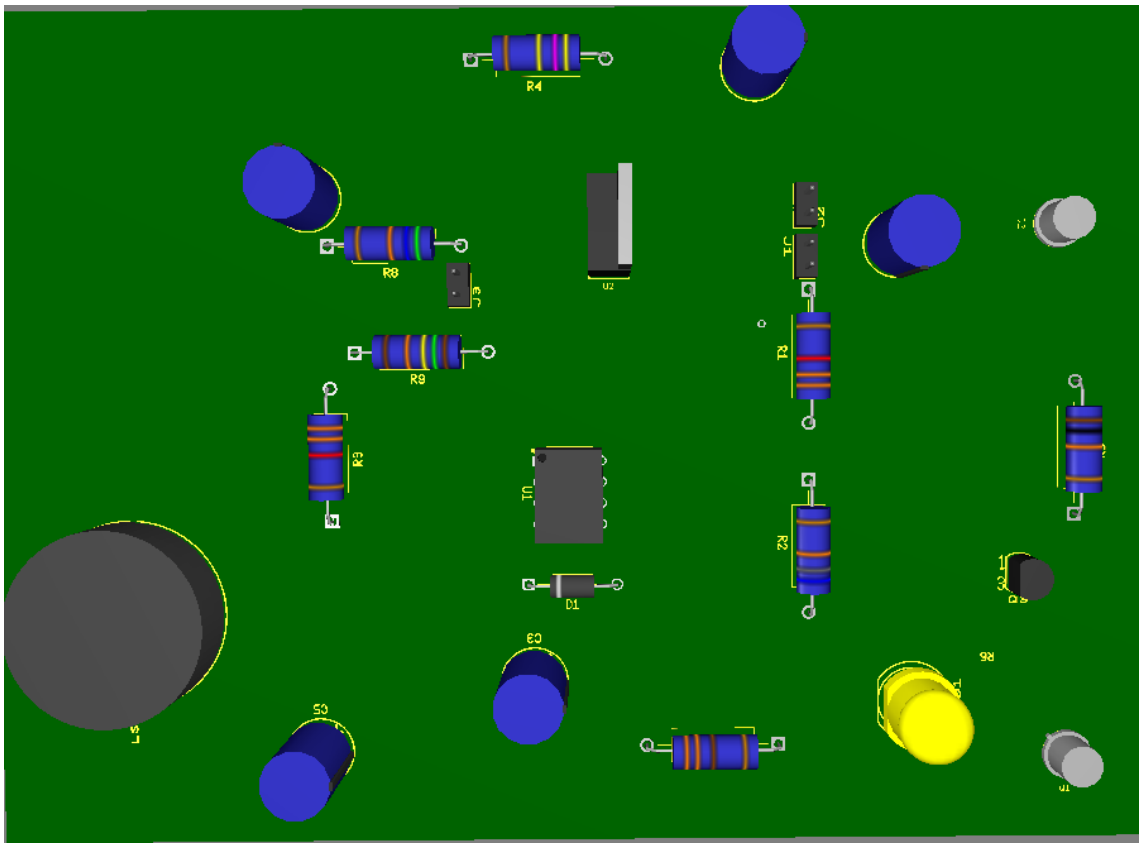


Figure 25. The rain sensor alarm design in 3D. (12V).

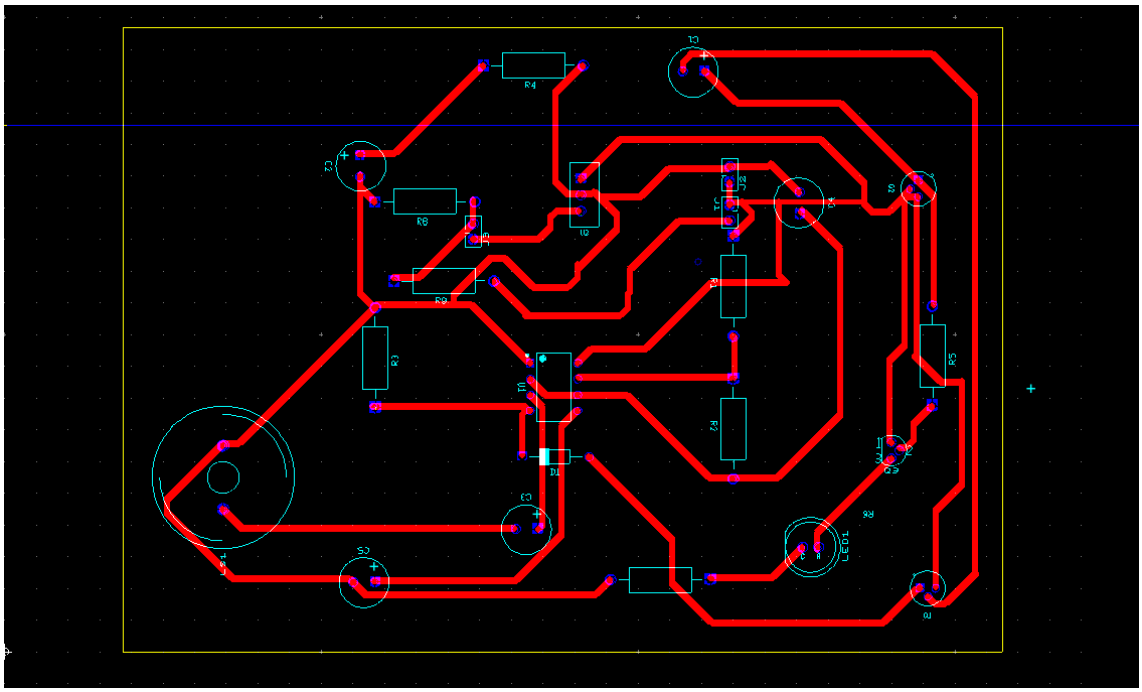


Figure 26: PCB design for a rain sensor alarm (12V).

Figure 27. PCB prototyping for the Rain Sensor Alarm Project.

Ultiboard is popular because of its benefits:

Customizable and accessible features for circuit board design programs, efficient and easy-to-use routing tools for circuit board design programs.

Ultiboard features an advanced spreadsheet view, toolbox, design wizards, and other tools that improve functions like copper placement and overall board layout.

Simple schematic to PCB transfer- Ultiboard integration with Multisim TM delivers features and tools that allow for precise part placement as well as automated capability for quick layout design work.

Standardization of Files-You can export your design file from one format, such as DXF or Gerber, to another format that is necessary for centralization.

11 Test and Result

The developed rain detector-alarm system was tested for ten rainy minutes to guarantee its dependability and operation, and the results of the testing are shown in this part, with Figure 28 providing a summary of the testing findings.

Search for events ADVANCED

NAME	DATA	DEVICE	PUBLISHED AT
hook-sent/pushbullet		particle-internal	5/26/21 at 4:13:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:13:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:12:45 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:12:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:12:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:11:46 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:11:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:11:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:10:47 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:10:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:10:45 pm

NAME	DATA	DEVICE	PUBLISHED AT
hook-sent/pushbullet		particle-internal	5/26/21 at 4:17:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:17:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:16:46 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:16:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:16:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:15:46 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:15:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:15:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:14:46 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:14:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:14:45 pm

NAME	DATA	DEVICE	PUBLISHED AT
hook-sent/pushbullet		particle-internal	5/26/21 at 4:12:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:12:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:11:46 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:11:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:11:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:10:47 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:10:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:10:45 pm
hook-response/pushbu...	{"active":true,"iden":"ujA...	particle-internal	5/26/21 at 4:09:46 pm
hook-sent/pushbullet		particle-internal	5/26/21 at 4:09:45 pm
pushbullet	Rain has been detected	Aimo	5/26/21 at 4:09:45 pm

Figure 28: Rain detection test results

12 Advantages and disadvantages

12.1 Advantages

Water Conservation A rain sensor can help you conserve a lot of water. When it rains, the lawn sprinkler system is automatically turned off, saving water that can be used for other critical purposes like firefighting.

Prevent illness and nutrition depletion. Overwatering stops your plants' roots from penetrating deep into the soil, making them disease prone. Because overwatering eliminates nutrients from the soil, it is also a primary cause of nutrient loss in plants. Your plants are frail and sickly.

Spend less on fertilizers. You may avoid overwatering your plants and lawns by using a rain sensor. Nutrients from the grass enter the sewer system when a plant is overwatered. You will need to compensate by fertilizing your grass and plants more. This implies that you will have to spend more money on fertilizers. Your garden lawn will remain an optimum setting for your plants thanks to a rain sensor that efficiently stops your lawn's irrigation system from over-watering your lawn and plants. Depending on the type of fertilizer that was utilized.

Make Your Irrigation System Last Longer By reducing the working life of your lawn sprinkler system, using a rain sensor minimizes unnecessary wear and tear. This is especially handy during the rainy season when rain falls in and out without warning.

Groundwater and streams should not be contaminated. The runoff of residual water such as pesticides, motor oil, fertilizers, pet droppings, and sediments into your waterways is reduced by using a lawn irrigation system with a rain sensor. It also reduces the number of pollutants that do not get up in your groundwater system, such as herbicides and fertilizers.

12.2 Disadvantages

This Project does not indicate the rate at which rain falls on the roof. Until the detector is wet, a signal is issued or the LED lights up. The detector will not work until it is wet if something happens.

13 Conclusion

To conclude, this sensor will detect rain and sound a buzzer, indicating that action will be taken in the future. The rainwater detection alarm system can be used in both residential and commercial settings. It alerts users to the presence of rainfall and rain when it is forecasted to fall. It is activated by even the tiniest drop of water, allowing the user plenty of time to reclaim their belongings, cover windows, and, in some situations, prepare to collect rainwater. When appropriately positioned to catch the first set of

raindrops, the device can protect objects drying in the sun / rain from invading homes, businesses, and silos, among other places.

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Appendices

Particle Code

pushbullet.ino

```
// This #include statement was automatically added by the Particle IDE.
#include <elapsedMillis.h>

String _version = "0.04";

//this reads the rain sensor every 2 seconds
#define rain_READ_INTERVAL 2000

//this defines the frequency of the notifications sent to the user
#define rain_FIRST_ALARM 10000 //10 seconds
#define rain_SECOND_ALARM 60000 //1 minute
#define rain_THIRD_ALARM 300000 //5 minutes
#define rain_FOURTH_ALARM 900000 //15 minutes
#define rain_FIFTH_ALARM 3600000 //1 hour
#define rain_SIXTH_ALARM 14400000 //4 hours - and every 4 hours ever after, until the situation is rectified (ie no more water is detected)

#define rain_NOTIF "rain"

elapsedMillis rain_timer;
elapsedMillis rain_alarm_timer;

int rain_alarms_array[6]={rain_FIRST_ALARM, rain_SECOND_ALARM, rain_THIRD_ALARM, rain_FOURTH_ALARM, rain_FIFTH_ALARM, rain_SIXTH_ALARM};
int rain_alarm_index = 0;
bool rain_detected = false;
unsigned long rain_next_alarm = 0;

int rain_SENSOR = D0;
int LED = D7;

void setup() {
 pinMode(rain_SENSOR, INPUT_PULLUP);
 pinMode(LED, OUTPUT);
 pinMode(LED, OUTPUT);
 Spark.publish("device starting", "Firmware version: " + _version, 60, PRIVATE);
}

void loop() {

    rain_check();

    if ( rain_detected ) {
        rain_notify_user();
    }
}

/*******************************************************************************
 * Function Name  : rain_check
 * Description    : check water leak sensor at rain_READ_INTERVAL, turns on led on D7 and raises alarm if water is detected
 * Return         : 0
 *******************************************************************************/
int rain_check()
{
    if (rain_timer < rain_READ_INTERVAL) {
        return 0;
    }


    rain_timer = 0;

    if (not digitalRead(rain_SENSOR)) {

        
        if (rain_detected){
            return 0;
```

```
            return 0;
        }

        rain_detected = true;

        //reset alarm timer
        rain_alarm_timer = 0;

        //set next alarm
        rain_alarm_index = 0;
        rain_next_alarm = rain_alarms_array[0];

        digitalWrite(LED,HIGH);
    } else {

        digitalWrite(LED,LOW);
        rain_detected = false;
    }
    return 0;
}

/*******************************************************************************
 * Function Name  : rain_notify_user
 * Description    : will fire notifications to user at scheduled intervals
 * Return         : 0
 *******************************************************************************/
int rain_notify_user()
{

    if (rain_alarm_timer < rain_next_alarm) {
        return 0;
    }
```

```
    }


    //time is up, so reset timer
    rain_alarm_timer = 0;

    //set next alarm or just keep current one if there are no more alarms to set
    if (rain_alarm_index < arraySize(rain_alarms_array)-1) {
        rain_alarm_index = rain_alarm_index + 1;
        rain_next_alarm = rain_alarms_array[rain_alarm_index];
    }

    //send an alarm to user (this one goes to the dashboard)
    Spark.publish(rain_NOTIF, "rain detected!", 60, PRIVATE);

    //send an alarm to user (this one goes to pushbullet servers)
    Spark.publish("pushbullet", "rain detected!", 60, PRIVATE);

   return 0;
}
```