
RAIN DETECTION SYSTEM USING IOT

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ABSTRACT

Nowadays, conserving water as well as its proper usage is essential in everyone's life. Here is a sensor namely rain sensor which is used to detect the rain and generate an alarm. So, we can conserve water to use it later for different purposes. There are several methods available for conserving water like harvesting, etc Using this method we can increase the level of underground water. These sensors are mainly used in the field like automation, irrigation, automobiles, communication, etc. This article discusses a simple as well as reliable sensor module which can be available at low cost in the market.

I. INTRODUCTION

RAIN SENSOR is one of the kinds of switching device which is used to detect the rainfall. It works like a switch and the working principle of this sensor is, whenever there is rain, the switch will be normally closed.

In 1958, the Cadillac Motor Car Division of General Motors experimented with a water sensitive switch that triggered various electric motors to close the convertible top and raise the open windows of a specially-built Eldorado Biarritz model, in case of rain.

Raindrop sensor is basically a board on which nickel is coated in the form of lines. It works on the principal of resistance.

Rain sensor module allows to measure moisture via analogy output pins and it provides a digital output when a threshold of moisture exceeds. The module is based on the LM393 op amp. It includes the electronics module and a printed circuit board that collects the rain drops. As rain drops are collected on the circuit board, they create paths of parallel resistance that are measured via the op amp.

The sensor is a resistive dipole that show less resistance when wet and more resistance when dry. When there is no rain drop on board it increases the resistance so we get high voltage according to $V=IR$. When rain drop present, it reduces the resistance because water is a conductor of electricity and presence of water connects nickel lines in parallel so reduces resistance and reduces voltage drop across it.

What is a Rain Sensor?

A rain sensor is one kind of switching device which is used to detect the rainfall. It works like a switch and the working principle of this sensor is, whenever there is rain, the switch will be normally closed.

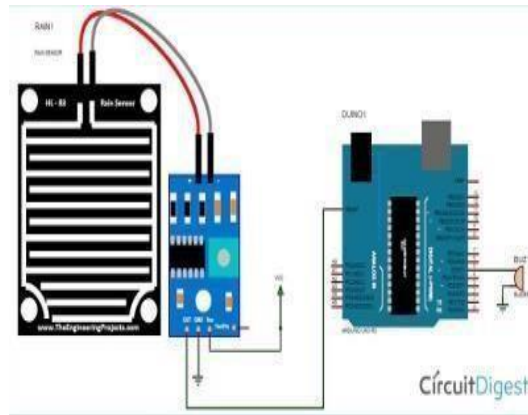
II. SYSTEM OVERVIEW

The Block diagram of Rain Detection System Using Arduino is as shown in (Figure 1). In this work, the falling of the rainfall is measured through a Rain sensor, and the sensor output is connected to the signal conditioning unit.

After that, it is processed through the Arduino microcontroller. The measured results are displayed on the personal computer.

The sensor is attached to the rain control module to control the sensitivity and compare and convert the analog values to digital values.

III. BLOCK DIAGRAM OF THE SYSTEM



IV. RAIN SENSOR MODULE

The rain sensor module/board is shown below. Basically, this board includes nickel coated lines and it works on the resistance principle. This sensor module permits to gauge moisture through analog output pins & it gives a digital output while moisture threshold surpasses.



Rain-sensor-module

This module is similar to the LM393 IC because it includes the electronic module as well as a PCB. Here PCB is used to collect the raindrops. When the rain falls on the board, then it creates a parallel resistance path to calculate through the operational amplifier.

This sensor is a resistive dipole, and based on the moisture only it shows the resistance. For example, it shows more resistance when it is dry and shows less resistance when it is wet.

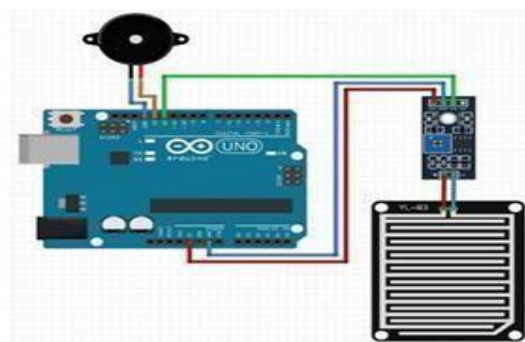
V. HARWARE SYSTEM DESIGN

The interfacing between the PC and the Arduino is done by Type B USB 2.0. The Arduino receives the data from the Rain Sensor Module and process it.

In the Arduino software, it is used to calculate the resistance obtained when the rain board is wet. Also, the wetness of the board is calculated from the Arduino program.

The Arduino sends these data, which are the resistance provided by the board for processing software to show them on the output screen.

The figure 6 shows the design of hardware that is designed. The connection of different electronic components is displayed.



Hardware System Design

VI. PIN CONFIGURATION

The pin configuration of this sensor is shown below. This sensor includes four pins which include the following.

- Pin1 (VCC): It is a 5V DC pin
- Pin2 (GND): it is a GND (ground) pin
- Pin3 (DO): It is a low/ high output pin
- Pin4 (AO): It is an analog output pin

VII. SPECIFICATIONS

The specifications of the rain sensor include the following.



Rain-sensor

- This sensor module uses good quality of double-sided material.
- Anti-conductivity & oxidation with long time use
- The area of this sensor includes 5cm x 4cm and can be built with a nickel plate on the side
- The sensitivity can be adjusted by potentiometer
- The required voltage is 5V
- The size of the small PCB is 3.2cm x 1.4cm
- For easy installation, it uses bolt holes
- It uses an LM393 comparator with wide voltage
- The output of the comparator is a clean waveform and driving capacity is above 15mA

VIII. APPLICATIONS

The applications of rain sensor include the following.

- This sensor is used as a water preservation device and this is connected to the irrigation system to shut down the system in the event of rainfall.
- This sensor is used to guard the internal parts of an automobile against the rainfall as well as to support the regular windscreen wiper's mode.
- This sensor is used in specialized satellite communications aerials for activating a rain blower over the opening of the aerial feed, to get rid of water droplets from the mylar wrap to keep pressurized as well as dry air within the waveguides.

Thus, this is all about the rain sensor. From the above information finally, we can conclude that this sensor is used to detect the rain and generate buzzer sound to take necessary action in further. Here is a question for you, what is the function of LM393 comparator?

IX. FUTURE SCOPE

- **Integration with Smart Irrigation Systems:** Enhancing the rain detection system by integrating it with smart irrigation systems can automate watering schedules, reducing water wastage and ensuring optimal soil moisture levels.
- **Urban Infrastructure:** Implementation in urban areas to manage and optimize rainwater harvesting systems, reducing reliance on municipal water supplies and mitigating urban flooding.

- **Agricultural Applications:** Wider adoption in agriculture to provide real-time data on rainfall, enabling farmers to make informed decisions about irrigation and crop management, ultimately improving yield and water usage efficiency.
- **Environmental Monitoring:** Expanding the system to include environmental monitoring capabilities, such as detecting air quality and humidity levels, to provide comprehensive weather data for research and public use.
- **Automobile Industry:** Integration with automotive systems for automatic control of windshield wipers and other weather-related functionalities, enhancing driver safety and comfort.
- **Smart Cities:** Incorporating rain detection systems in smart city initiatives to manage water resources more efficiently, promote sustainable practices, and enhance the quality of urban living.

X. CONCLUSION

The rain detection system using IoT technology presents a promising solution for water conservation and efficient resource management. By utilizing a reliable and low-cost rain sensor module, this system can significantly contribute to increasing underground water levels and optimizing water usage in various fields. Its potential applications in automation, irrigation, automotive, and communication sectors underscore its versatility and importance. As we move towards more sustainable living practices, such innovative technologies will play a crucial role in ensuring the responsible use and management of our natural resources.

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