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Rain Detection System Using Arduino and Rain Sensor

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ABSTRACT

RAIN SENSOR is a switching device activated by rainfall, there are two main applications for rain sensors ,one is for the automatic irrigation system and another is for the automatic mode of windscreen wipers. This paper, is aimed at designing a rain detection system that uses a rain sensor to detect the rain. The rain sensor is used to detect any rainfall falling on it and then it will sense and perform the required actions. This system is controlled through Arduino. Arduino UNO board is sufficed to control rain sensor and also to interface the sensor. Whereas, the movement of the sensor is controlled by using a rain control module. This module is controlled using the Arduino Uno board as a microcontroller. The signal received from the sensor is processed using "Processing Development Environment Software". Processing IDE gives the output

Keywords—Rain sensor, Arduino Uno, Rain Control Module

I. INTRODUCTION

RAIN SENSOR is one of the 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.

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 analog 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.

II. RELATED WORK

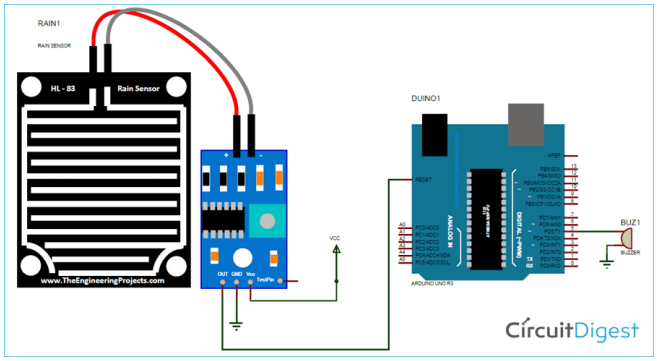
Amado Gutierrez-Gomez made a propagation study of LoRa P2P links for IoT applications , the case of near-surface measurements over semitropical rivers. Valentina Yakovleva has proposed the Rainfall intensity and quantity estimation method based on Gamma-Dose Rate Monitoring. Xi Shen has designed a Retrieval of raindrop size distribution using Dual-polarized microwave signals from LEO Satellites, a feasibility study through simulations. Mattia Stagnaro performed the use of dynamic calibration to correct drop counter rain gauge measurements. Enrico Chinchella proposed the Investigation of the wind-induced airflow pattern near the this LPM precipitation gauge.

III. 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.

Figure 1 Block diagram of the system



IV. COMPONENTS REQUIRED

A. Arduino Board UNO Model

Arduino is an open-source computer hardware, open-source software and microcontroller-based device building kit and interactive objects that can sense and control physical devices. Arduino designs and manufactures software, software and software.

The project is focused on the design of the microcontrollers. The board contains a combination of digital and analog input / output (I / O) pins, which can connect to specific expansion boards (termed shields). The plates

have serial communication interfaces for loading programs from personal computers, including Universal Serial Bus (USB) in the UNO model.

The Arduino project provides the built-in development environment (IDE) for the programming of microcontroller systems to allow code writing and uploading to the board. It runs on Mac OS X, Linux and Windows. The code is written in Java, which is based on open-source software and processing. You can use this program on any board of the Arduino (Figure 3).

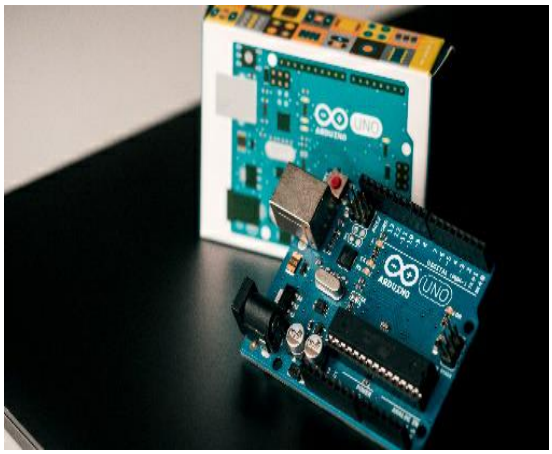


Figure 2 Arduino UNO

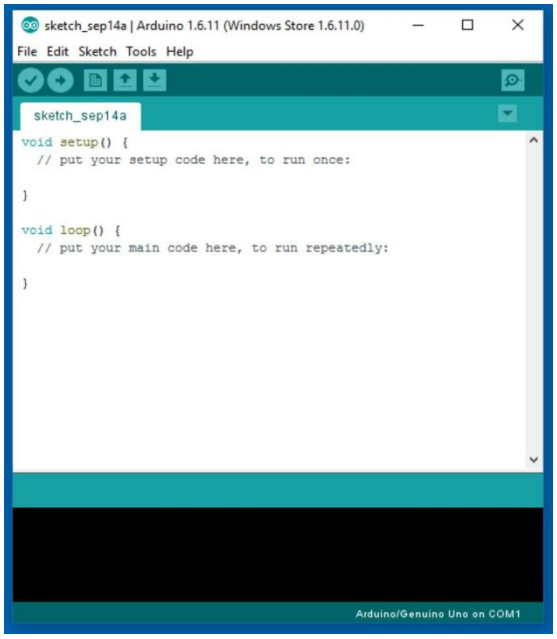


Figure 3 Arduino IDE

B. Rain Control Module – LM393 Comparator

The rain control module which is shown below consists of 4 pins to connect to the arduino namely VCC,GND,D0,A0 and two more pins to connect the rain board module. In summary, the rain board module detects the rainwater, and the control board module is used to control the sensitivity and compare and convert the analog values to digital values.

Figure 4 Rain Control Sensor

C. Buzzer

The buzzer active 5v module is an active piezo buzzer module useful for creating sound and alerting the falling of rain water on the sensor module

Figure 5 Piezo Buzzer (5V)

V. HARDWARE 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.

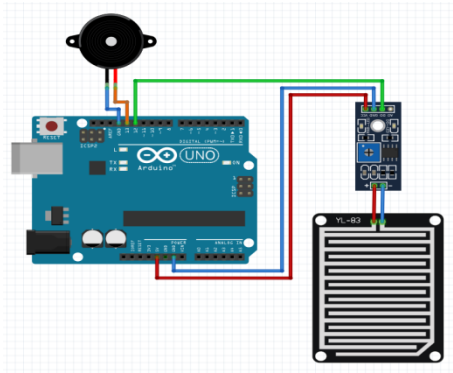
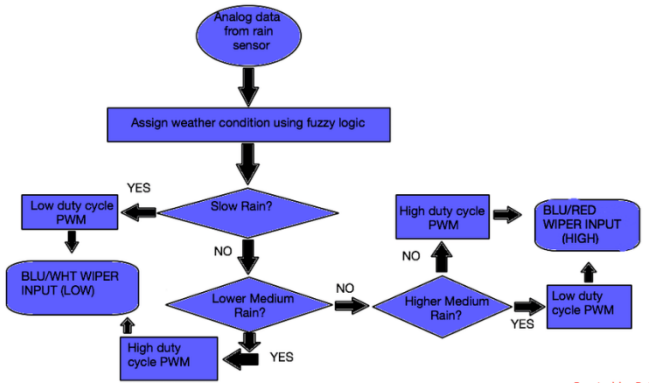


Figure 6 Hardware System Design

VI. FLOW CHART

The flowchart shows the overall operation of the rain detection algorithm.



VII. RESULTS

The hardware model of the project is shown in Figure 7.

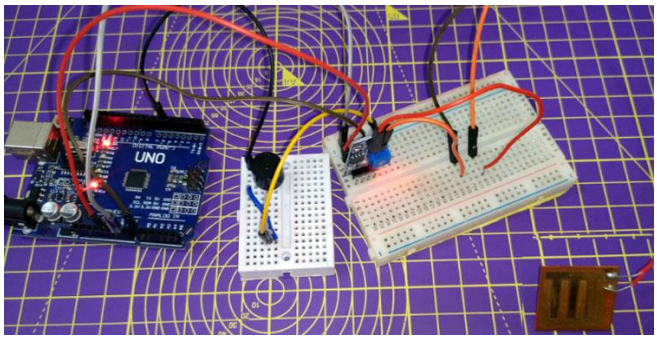


Figure 7 Hardware Model of the Project

VIII. APPLICATIONS

The rain sensor is mostly used in the agriculture and automobile fields.

A. Application in Agriculture Fields

This is used for automatically regulating the irrigation process. Also, the continuous rainfall data can help farmers use this smart system to automatically water the crop only when absolutely required.

B. Application in Automobiles

It is also used in cars for the windshield wipers, which can be made fully automatic by using the rain detection system.

C. Application In Home Automation Systems

In home, it can be used for detecting the rain and automatically closing the windows and also for adjusting the room temperature.

IX. CONCLUSION AND FUTURE SCOPE

This paper presents the design and implementation of a simple rain sensor system using Arduino as microcontroller for short range applications. The implemented system detects the rain and measure the resistance. This Short-range rain sensor system is a low cost, a simple device for detection of rainfall. Hence, the device calculates the resistance with suitable accuracy and. The data is converted from analog values to digital values. This rain sensor system can be extended and implemented into anything we wish.

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BIOGRAPHY

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