



# RAIN ACTIVATED AUTOMATIC WINDOW CONTROL SYSTEM

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**Abstract - Design and execution of an automated window control system during the monsoon season are presented in this study. Our project's goal is to shut the window while it's raining. Our project relies on the rack and pinion system for operation. The rain sensor is mounted outside the window, and the circuit is linked to the window's rack and pinion system and motor. When it rains sensor notices it and a signal is sent to the circuit, causing the motor to operate and the window to begin to close. When the rain ceases, the window automatically opens. Using a switch, we can operate the window (open and close) while it's running. This product's primary benefit is that it doesn't require any labor to operate.**

**KEYWORDS:** Rack and Pinion, Rain Sensor, Motor etc.

## I. INTRODUCTION:

Rainwater detecting windows, which are currently highly useful in safeguarding interiors of houses, operates automatically using sensing the presence of rain drops. It is a very useful tool to have during the rainy season. There has been prior introduction to the idea of sensing precipitation to close the window. It was created with the automotive industry in mind. However, this invention has practical applications in the home. The window will automatically close to safeguard the interior of the house if the system detects that the water droplets that are not contacting the window. The rain sensor is mounted outside the window, and the circuit is linked to the window's rack and pinion system and motor. When it rains, a sensor detects it and sends a signal to the circuit, causing the motor to operate and the window to begin to close. When the rain ceases, the window automatically opens.

We can use a switch to operate the window (open and close) while it is running. This product's primary benefit is that it doesn't require any labor to operate. A system that can automatically close or open windows based on rain sensing is the goal of constructing an automatic rain window system with Arduino. This can be especially helpful for making sure there is enough ventilation and shielding interior areas

from rainwater. If windows are left open during a downpour, rainwater may cause harm to inside rooms.

By automatically regulating windows based on rain detection, an Arduino-powered Automatic Rain Window System seeks to resolve this problem. The use of cars, particularly buses, for transportation is growing daily in the modern day. Both the windows and the door do not instantly close during the rainy season because humans are not present. When it rains outside, most passengers will attempt to close the windows. However, it is not a simple task. It can become stuck when you try to open or close the windows. Additionally, because no one is occupying that seat, several of the windows are left open. To prevent this issue, we created a system known as automated window opening and closing during the rainy season. It facilitates automatic window closing on buses and buildings.

## II. OBJECTIVES:

- To automate windows that can close when it rains and open when rain stops while no one is there to operate them in a building, a home or a car window.
- To effectively control using the switch in each necessary circumstances.
- To create a system that can automatically close windows when it rains to keep water out of interior spaces.
- To create an intuitive user interface for override and manual control.

## III. LITERATURE SURVEY:

1. Jing-Min Wang Ming-Ta Yang and Po-Lin Chen, (2017). "Design and Implementation of an Intelligent Windowsill System Using Smart Handheld Device and Fuzzy Microcontroller

This study presents an inventive application of the Intelligent Window System (IWS) that integrates Bluetooth wireless technology, fuzzy control, and direct control. The goal of integrating these technologies is to improve room comfort and streamline system functioning. Password



authentication has been put in place to guarantee security and stop illegal access to the IWS. The integration of monitoring and remote control features made possible by smart handheld devices (SHD).

2. IOT Based Automatic Control of Electrical Devices Using Smart Switch, (IJRASET), and October 2017.

The International Journal for Research in Applied Science and Engineering Technology (IJRASET) released an article titled "IoT Based Automatic Control of Electrical Devices Using Smart Switch" in October 2017. Most likely, the article discusses a system that uses a smart switch and Internet of Things (IoT) technology to automatically control electrical gadgets. Using a smartphone or other internet-connected device, users may be able to remotely monitor and control their equipment with this method. However, it's challenging to offer a thorough synopsis of the content and conclusions without access to the entire document.

#### IV. METHODOLOGY:

Many essential parts and technologies are used in the design and implementation of the automatic window control system:

##### ARDUINO NANO:

The ATmega328 based Arduino Nano is a small, feature-rich, and easily breadboardable board. It provides almost the same features as the Arduino Duemilanove, but in a different package. It only lacks the DC power jack, and the USB cable is a Mini-B one instead of a standard one.

##### BATTERY:

An instrument called a battery powers electrical devices including electric autos, flashlights, and cell phones. One or more electrochemical cells make up this structure which is connected to the outside world. When a battery is generating energy, its positive and negative terminals are abbreviated to as the cathode and anode, respectively. The negative terminal releases electrons that are directed toward the positive terminal by an outside electric circuit. When a battery is connected to a load, a redox process converts high amount of energy reactants into products with low energy. After that, the electrical energy from the residual energy difference is fed to the external circuit.

##### EASYEDA:

With Easy EDA, a web-based EDA tool set, hardware engineers may create, model, share, and discuss schematics, simulations, and printed circuit boards. Additional functions include generating a bill of materials, generating pick-and-place files and Gerber files, and producing documentation outputs in SVG, PDF, and PNG formats. With Easy EDA, you may use SPICE to simulate mixed analog and digital circuits, develop and edit schematic diagrams, design and

alter printed circuit board layouts, and potentially even produce printed circuit boards.

Based on Ng Spice, Easy EDA is a feature-rich browser-based program for creating PCBs, capturing schematics, and simulating SPICE circuits. It can import files from Altium Designer, Circuit Maker, Eagle, Ki-Cad, and LT Spice file formats in addition to supporting general SPICE netlists. In addition to exporting SPICE netlists to external simulation tools, PCB netlists can be exported in Altium, PADS, and Free PCB formats. One helpful technique to seamlessly move schematics to PCB layout without requiring a fresh start is to import LT Spice schematics and symbols.

The user has two options for sending the Gerber files for a finished PCB design: either send the Gerbers directly to Easy EDA for manufacturing, or choose a PCB manufacturer after downloading and examining the files with a third-party Gerber reader. As an alternative, home PCB etching supports printable PCB layer image output in SVG, PDF, and PNG formats. The application also features an expanding SPICE model library, a rich components library, and sharing and collaboration facilities.

##### L298 MOTOR DRIVER:

To manually control two DC motors, a simple twin motor driver module with a full bridge rectifier module we used is the L298 H-bridge that may be used with Arduino kits or basic switches. When the 5V enable jumper is enabled and the input voltage is 7 V or higher, this module can produce a 5 V output that can be utilized for Arduino operations. The voltage ranges of 7 V to 12 V are advised

##### RAIN SENSOR:

Rain is a type of precipitation that arises when individual raindrops from clouds descend to the Earth's surface. However, not all rain falls through dry air and evaporation occurs before it reaches the surface. It is referred to as virga when none of it touches the ground; this phenomena is frequently observed in hot, dry desert settings. The Bergeron process is the name of the scientific theory that explains how rain originates and falls. Water from the sea evaporates, condenses into clouds, precipitates return to earth, and finally returns to the sea through streams and rivers repeating the hydrologic cycle. Rain is a part of this cycle.

A rain sensor is one kind of switching device that can identify precipitation. This sensor works similarly to a switch; the theory behind it is that the switch will typically be closed during a downpour. This board features nickel-coated lines and operates mostly on the resistance concept. This sensor provides analog output pins for measuring moisture and generates a digital output when the moisture threshold is exceeded. This module and the LM393 IC are comparable in that it is equipped with an electrical module and a PCB. In this module, raindrops are gathered through

the use of a PCB. Rain on the board creates a parallel resistance path, which is calculated by the operational amplifier. Being a resistive dipole, this sensor solely responds to moisture by displaying resistance. When it's wet, for example, its resistance increases, and when it's dry, it decreases.

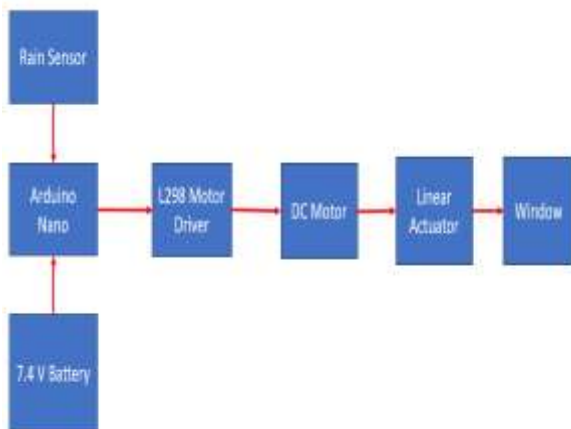
**DC MOTOR:**

It is a kind of electrical motor that creates mechanical energy using direct current (DC) supply. The most often used types depend on the magnetic field produced by coil currents. Nearly all categories of DC motors, whether electromechanical or electronic, include an inbuilt mechanism that permits the periodic reversal of the motor's share of the current. These motors were the first to be largely used because they could be powered by the lighting power DC networks of distribution that were already in place. By adjusting the motor's supply voltage or the field windings current strength, the speed of a DC motor can be adjusted over a large range. Toys, appliances, and tools all employ small DC motors.

**LINEAR ACTUATOR:**

An actuator that produces linear motion as opposed to the rotatory motion of a traditionally operated electric motor is known as a linear actuator. Machine tools, industrial equipment, computer peripherals like printers and disk drives, dampers and valves, and numerous more applications requiring linear motion all use linear actuators. Pneumatic or hydraulic cylinders generate linear motion by nature. A revolving motor can provide linear motion through a variety of different methods. The interior is protected from rainwater by the automatic window control system's implementation of these parts and technology. It is especially helpful in places like restaurants, companies, and colleges where having people around all the time is not feasible.

**V. BLOCK DIAGRAM**



**VI. DESIGN AND IMPLEMENTATION:  
PCB DESIGN:**

The steps for PCB designing are as follows:

- Real Material Design
- Acquiring Material
- PCB Layout
- PCB preparation
- Assembly of the parts
- Experimenting

**PCB FABRICATION TECHNIQUE:**

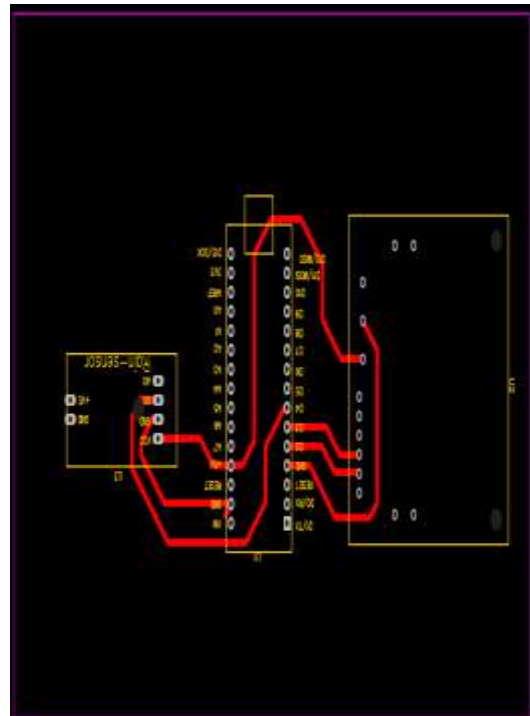


Fig. 1 – Project PCB Layout Diagram

The creation of a printed circuit board is the initial stage of assembly. In the realm of electronics, the creation of the program counter is vital. The PCB has an impact on the circuit's success as well. Regarding expenses, the design and production of the PCB account for over 25% of the total cost.

**ETCHING OF PCB:**

It is the process of chemically assaulting and removing the exposed copper matter from the copper plate in order to form the appropriate conductor pattern. The very common enchantment utilized for the industrial purpose is ferric chloride

The erotically anyone of the below solution can be utilized to prepare PCB:

- Chromic Acid
- Ammonium per sulphate
- Ferric Chloride
- Cupric Acid

Spray etching and tray rocking tank etching are two etching techniques. The easiest one is May rocking, out there. The Pyrex glass tray is coupled to a powered rocking table, although it is also possible to rock the tray manually while using an etching solution.

#### DRILLING:

A drilling machine is used to carry out the drilling process. When drilling, the number of drill bits used varied based on the hole's needed diameter.

#### MOUNTING:

After drilling and mounting the component gets completed. The appropriate component was soldered after flawed holes were positioned on the PCB. The PCB was prepared for connection to the appropriate relays and supplies after soldering. The wiring diagram sections that determine the external wire connection to the PCB are drawn prior to that.

#### TESTING:

The primary event, testing, is significant in the field of electronics. Testing is the process of determining the circuit's problem in its many forms as well as its output performance. Testing's primary goal is to confirm that the output performs in accordance with our assumptions. In the case of an electronics circuit, even the slightest negligence could result in a significant malfunction; this is dependent on the PCB's architecture and design. Electrical current and signals are routed across printed circuit boards via copper lines that are mainly contained by an insulating core. Every electrical circuit must go through a few standard procedures in order to be tested.

#### VII. WORKING:

- Raindrop presence is determined by the rain sensor module.  
The rain sensor's output is continuously monitored by the Arduino.
- The Arduino detects rain, and when it does, it activates the relay, which then moves the linear actuator to close the window.

- The user can manually operate the window with pushbuttons, or the device can be set to open automatically when the rain ceases.

#### VIII. RESULT:

Following completion and several tests, the window appears to function properly. There are still certain problems with the sensor's sensitivity. The 10 rpm motors allow the window pane to move consistently, and the circuit breakers work effectively. Since the circuit gets heat up, adding an appropriate heat sink might be necessarily important. An internal refracting rain sensor, similar to those found in cars, can be substituted for the PCB rain sensor. These sensors have a greater sensitivity than a PCB sensor.



Fig. 2 – Project Hardware

#### IX. CONCLUSION:

The research work is achieved and it makes sense to use such a basic technique to a home window as not attended open windows can be shut in the event of rain to shield inside spaces from the elements. The circuit can be further modified to incorporate a wind operated speed sensor, which will cause the windows to close when winds reach a predetermined speed, in order to keep dust and other unwanted contaminants out of the house. To improve efficiency and lower energy consumption, more changes to the construction, window mechanism, and circuit may be made. If there is no current, a battery should be placed as a power source for backup. This is an additional modification.

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