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VISVESVARAYA TECHNOLOGICAL UNIVERSITY - BELAGAVI

A
Mini Project Report
on

"AUTOMATIC RAIN SENSING WIPER USING ARDUINO"

Submitted in the partial fulfillment for the award of
Bachelor of Engineering
in
Electronics and Communication Engineering

Submitted by

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2021-22

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Certificate

This is to certify that the Mini Project report entitled **"AUTOMATIC RAIN SENSING WIPER USING ARDUINO"** *carried out* ***BHARATH KUMAR.K 2GO19EC006*** *a bonafide student of Government Engineering College, Haveri in partial fulfillment for the award of* ***Bachelor of Engineering*** *in* ***Electronics and Communication Engineering*** *of the* ***Visvesvaraya Technological University, Belagavi*** *during the year* ***2021-2022.*** *The Mini Project report has been approved as it satisfies the academic requirements in respect of Mini Project prescribed for the said Degree.*

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BHARATH KUMAR K

ABSTRACT

We have proposed an automated wiper system with a rain sensor that detects rain and automatically starts and stops movement of wiper. This project minimizes the manual intervention to control the wipers. The system is not only automatic but also intelligent. When a raindrop hits the sensor, the sensor detects the intensity and the wiper speed is automated accordingly. The higher the rotation speed, the higher the rainfall. This project uses an Arduino with a rain sensor, LCD 16x2, I2C module and servomotor. Humidity is measured via the analog output pin on the rain sensor and the wiper begins to rotate when the humidity threshold is exceeded. The module used here is entirely based on the LM393 op amp. The information captured by the rain sensor is sent to the Arduino. Arduino is a microcontroller board based on Atemga8. Interactive electronic devices can be designed and created using Arduino, a platform for developing the behavior of electronic devices. It consists of an onboard power supply unit and a USB port for communicating with a PC. The information collected by the rain sensor is processed and analyzed by Arduino and controls the servomotor based on the processed information. The driver receives information about precipitation intensity and wiper speed via a 4-bit LCD module near the driver's seat. The rain sensor is on the side of the windshield, outside the car. The rain sensor is connected to the servo motor. The wiper blade is connected to the servo motor. All devices are connected to an Arduino that is connected to the car's power supply.

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CHAPTER-1

INRODUCTION

1.1 GENERAL

A car wiper is a device used to remove raindrops from the windshield. Today, all vehicles are equipped with wipers to prevent accidents and reduce human intervention in controlling wipers for luxury. Wipers usually consist of a metal arm and a long rubber blade. Pneumatic (operated under glass pressure) energy is used in some vehicles. Here, the metal arm is driven by an electric motor. The blade moves clockwise and counter clockwise direction on the glass, pushing water out of the glass surface. Modification of speed automatically done based on the amount of rainfall. Two synchronized radial type arms are used in most of the automobiles are Sync arms, whereas pantograph(parallelogram) arms are used in commercial automobiles.

Wipers are automated in many ways. In this, we propose an unmanned wiper which senses rain and starts automatically and switches off automatically when the rain stops or glass is clear of water. This eliminates the need of human physical intervention to control the speed of the wiper. For this purpose, a rain sensor is used to detect rain and the signal is managed by Arduino to take the necessary actions. Over the last decade, the automotive industry has made progress to find the latest technologies for increasing safety. There are many reasons behind the vehicles which are not equipped with automatic car wipers. windshield wipers are too expensive to fit in an economical car and too unreliable for a new car. Many car companies have tried to cheaply design car wipers that are both economical and efficient. In today's situation, only luxury cars are equipped with automatic rain sensor car wipers. There are many causes of accidents, but the main reason for accidents during the rainy season is poor visibility. The purpose is to design an auto-start wiper system that will start automatically when it rains. The wiper speed is automatically adjusted according to the intensity of rain. The project consists of an Arduino, a rain sensor, a servomotor, and an LCD module that displays speed of rain. The wiper speed is adjusted according to the amount of precipitation, which improves safety.

1.2 PROBLEM STATEMENT

Driver safety issues are of great importance in today's automotive industry. Lack of visibility is often the cause of heavy rain accidents. In many cases, manual errors such as the driver not increasing the wiper speed can lead to accident. Today`s car wipers work on the principle of manual switching. We have proposed an automated wiper system with a rain sensor that detects rain and automatically starts and stops the wipers. It is not only automatic but also intelligent. When a rain drop hits the sensor, the sensor detects the intensity and the wiper speed is automated accordingly. No manual intervention is required to control the wiper

1.3 OBJECTIVES

Observing all the above factors an attempt has been made to design and develop an electronic Automated smart card system

- To controlling the servo motor speed (movement of wiper) according to the output from the sensor module
- To displaying the intensity of rainfall in an LCD module.

CHAPTER-2

LITERATURE REVIEW

A novel and cost-effective resistive rain sensor for automatic wiper manage

AUTHOR: Mukul Joshi, M. A Joshi, Vinayak Sagar, D. N. Sonawane (2013)

In this work, they proposed an automated wiper manage machine that's economical, efficient and has an excellent output. This paper uses a resistive rain sensor. They developed a wiper which is practically demonstrated and a sensor is advanced that's an equivalent mathematical version. The rain sensor normally has a predetermined rotational geometry, when the droplets of the rainfall on the sensor, the droplets form`s a layer at the floor of the sensor inflicting non linearity to its resistance. To lower the non-linearity and to growth the efficiency of the gadget, the reaction from the sensor is to be linearized. The response can be linearized by using the linearized circuit with the equivalent electrical version of the sensor. To reap the changes inside the speed based in the output provided by using the rain sensor, customized PIC micro-controller is used inside the

Automatic rain sensing wipers using Arduino

AUTHOR:P. Devi, U. A. Joginder, S. Karthik, R. Keerthi Vasan (2020)

In this article, we have proposed an automated wiper system with a rain sensor that detects rain and automatically starts and stops. The wiper system automatically detects and activates precipitation. The wiper system is also intelligent. When a raindrop hits the sensor, the sensor detects the intensity and the wiper speed is automated accordingly. The higher the rotation speed, the higher the rainfall. No manual intervention is required to control the wiper. This project uses an Arduino with a rain sensor, LCD 16x2 module and servomotor. The module used here is entirely based on the LM393 op amp. Arduino is a microcontroller board based on Atemga8. Interactive electronic devices can be designed and created using Arduino.

The automatic wiper system automates the purpose of the driver's response to control the wiper. The response of the rain sensor to rain to move the windshield wiper has been shown and proven to be less than 400ms. The automatic car wiper was developed using a rain sensor and Arduino, but it can be expanded by replacing the rain sensor with an IR sensor to accurately identify and detect precipitation. When choosing an economical yet efficient wiper, the best way is to use a rain sensor.

Arduino based Bluetooth operated vehicle wiping method using android cellular phone

AUTHOR:P. Devi, U. A. Joginder, S. Karthik, R. Keerthi Vasan (2017)

In this article, we have proposed an automated wiper system with a rain sensor that detects rain and automatically starts and stops. The wiper system automatically detects and activates precipitation. The wiper system is also intelligent. When a raindrop hits the sensor, the sensor detects the intensity and the wiper speed is automated accordingly. The higher the rotation speed, the higher the rainfall. No manual intervention is required to control the wiper. This project uses an Arduino with a rain sensor, LCD 16x2 module and servomotor. The module used here is entirely based on the LM393 op amp. Arduino is a microcontroller board based on Atemga8. Interactive electronic devices can be designed and created using Arduino. The automatic wiper system automates the purpose of the driver's response to control the wiper. The response of the rain sensor to rain to move the windshield wiper has been shown and proven to be less than 400ms. The automatic car wiper was developed using a rain sensor and Arduino, but it can be expanded by replacing the rain sensor with an IR sensor to accurately identify and detect precipitation. When choosing an economical yet efficient wiper, the best way is to use a rain sensor. You can choose from a variety of sensors to serve this purpose.

CHAPTER-3

PRESENT WORK

3.1 HARDWARE DESCRIPTION

3.1.1 ARDUINO UNO R3

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board. Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

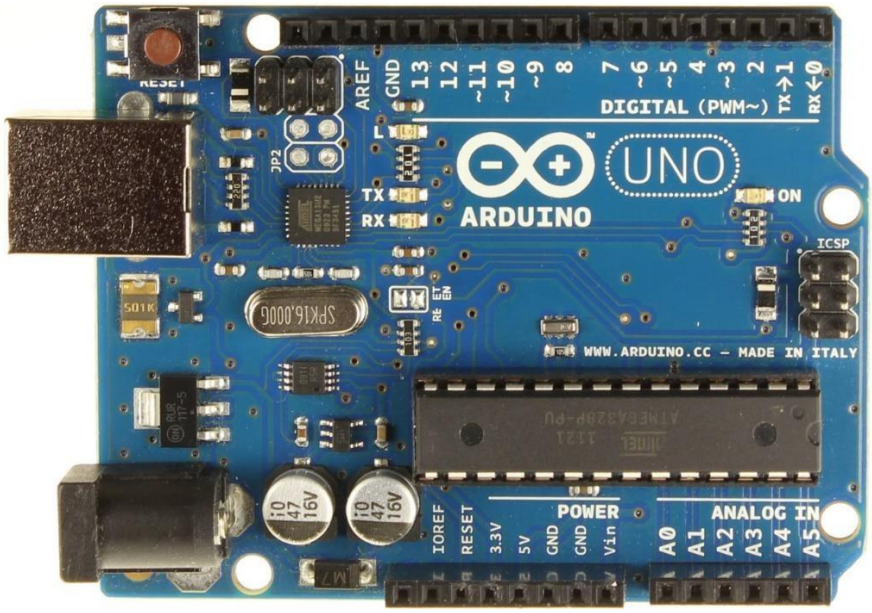

Fig 3.1: Arduino uno R3

Components of Arduino uno R3:

- ATmega328 Microcontroller- It is a single chip Microcontroller of the ATmel family. The processor code inside it is of 8-bit. It combines Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.
- ICSP pin - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board
- Power LED Indicator- The ON status of LED shows the power is activated. When the power is OFF, the LED will not light up.
- Digital I/O pins- The digital pins have the value HIGH or LOW. The pins numbered from D0 to D13 are digital pins.
- TX and RX LED's- The successful flow of data is represented by the lighting of these LED's.
- AREF- The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board from the external power supply.
- Reset button- It is used to add a Reset button to the connection.
- USB- It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.
- Crystal Oscillator- The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.
- Voltage Regulator- The voltage regulator converts the input voltage to 5V.
- GND- Ground pins. The ground pin acts as a pin with zero voltage.
- Vin- It is the input voltage.

Analog Pins- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act as GPIO (General Purpose Input Output) pins.

Specifications of the Arduino UNO are listed below:

- There are 20 Input/Output pins present on the Arduino UNO board. These 20 pis include 6 PWM pins, 6 analog pins, and 8 digital I/O pins.
- The PWM pins are Pulse Width Modulation capable pins.
- The crystal oscillator present in Arduino UNO comes with a frequency of 16MHz.
- It also has a Arduino integrated WiFi module. Such Arduino UNO board is based on the Integrated WiFi ESP8266 Module and ATmega328P microcontroller.
- The input voltage of the UNO board varies from 7V to 20V.
- Arduino UNO automatically draws power from the external power supply. It can also draw power from the USB.

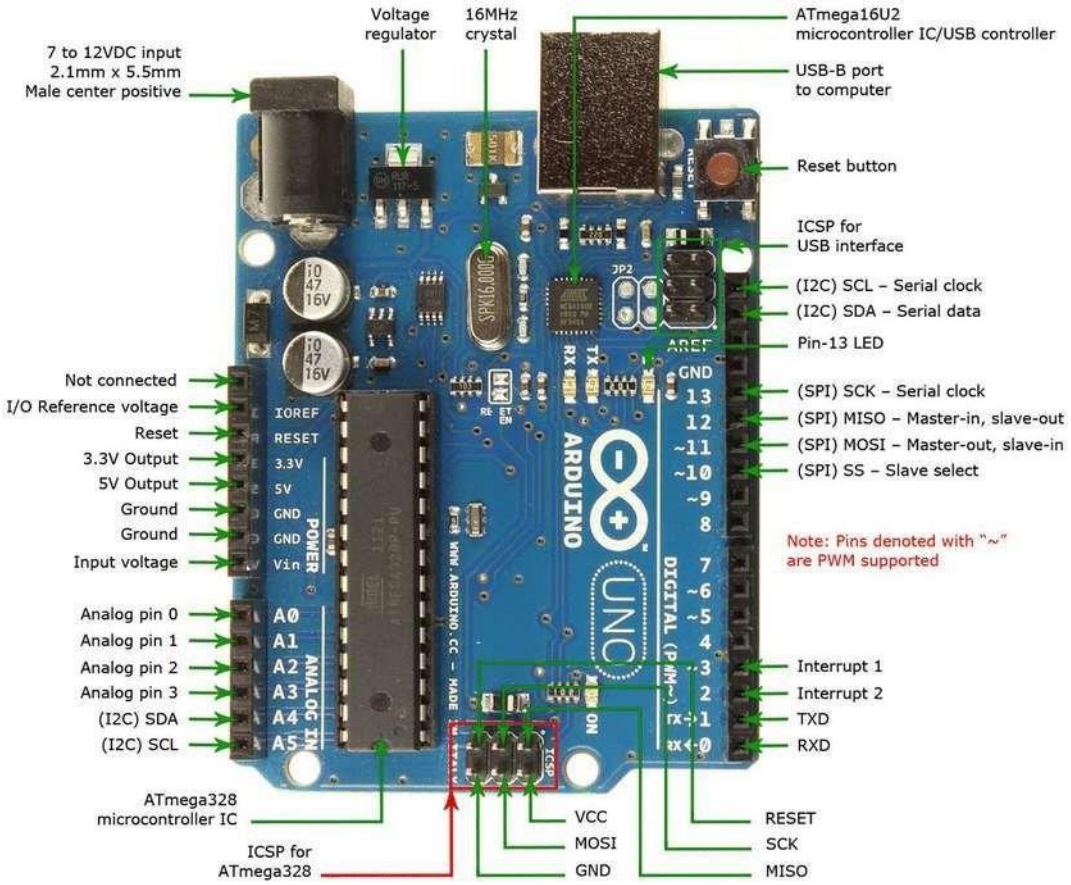

Fig 3.2: Pin description of Arduino uno

3.1.2 RAIN SENSOR

A sensor that is used to notice the water drops or rainfall is known as a rain sensor. This kind of sensor works like a switch. This sensor includes two parts like sensing pad and a sensor module. Whenever rain falls on the surface of a sensing pad then the sensor module reads the data from the sensor pad to process and convert it into an analog or digital output. the output generated by this sensor is analog and digital. The rain sensor working principle is pretty simple. The sensing pad includes a set of uncovered copper traces which mutually work like a variable resistor or a potentiometer. Here, the sensing pad resistance will be changed based on the amount of water falling on its surface. So, here the resistance is inversely related to the amount of water. When the water on the sensing pad is more, the conductivity is better & gives less resistance. Similarly, when the water on the surface pad is less, the conductivity is poor & gives high resistance. the output of this sensor mainly depends on the resistance.

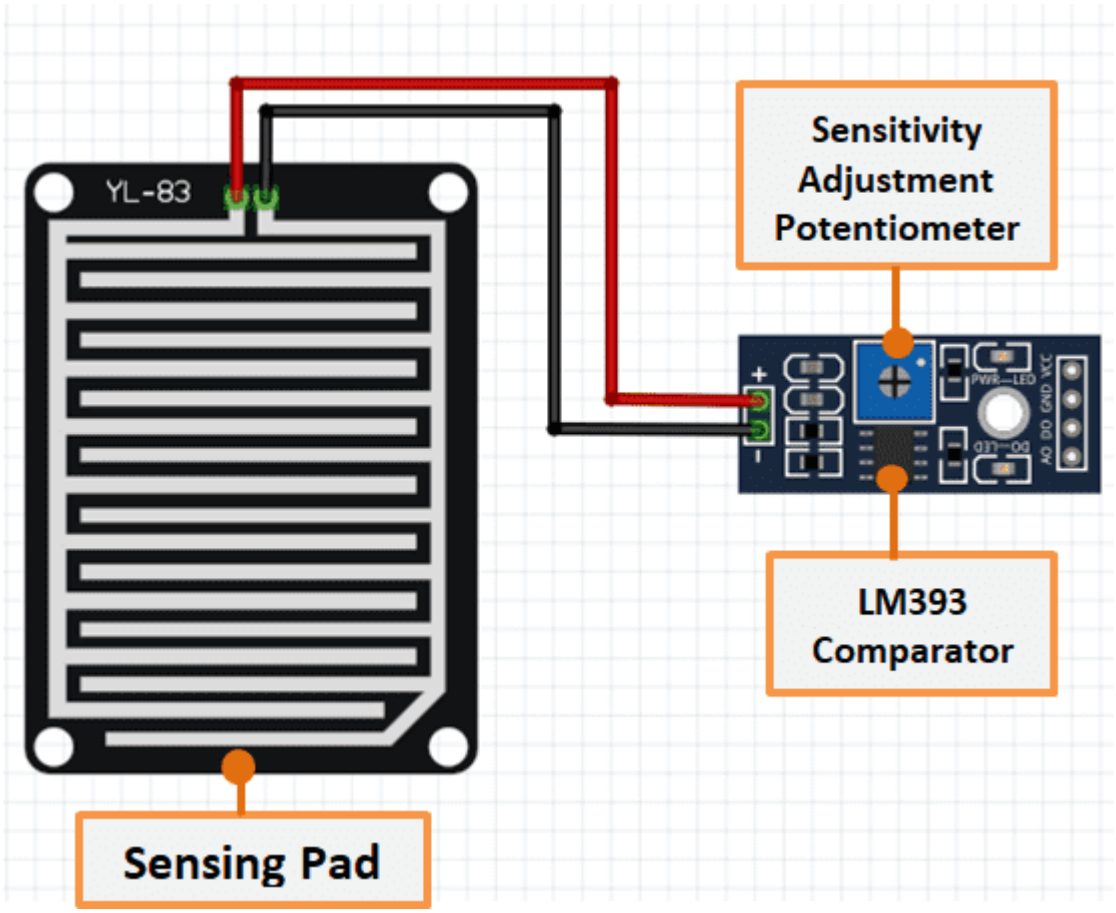

Fig 3.3: Rain Sensor

3.1.2.1 SENSING PAD:

The sensor contains a sensing pad with series of exposed copper traces that is placed out in the open, possibly over the roof or where it can be affected by rainfall. Usually these traces are not connected but are bridged by water.

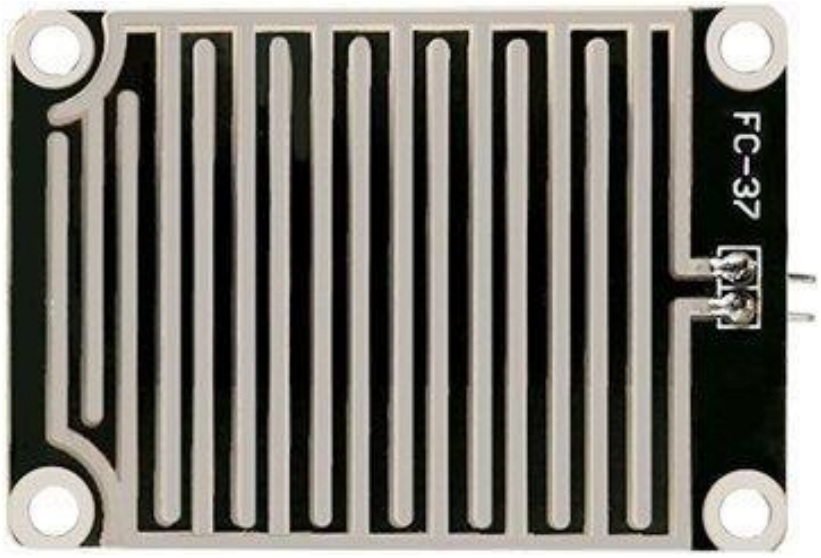

Fig 3.4: Sensing Pad

3.1.2.2 RAIN SENSOR MODULE:

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 shows 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 on sensor 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.

Fig 3.5: Rain Sensor Module

PIN COFIGURATION:

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

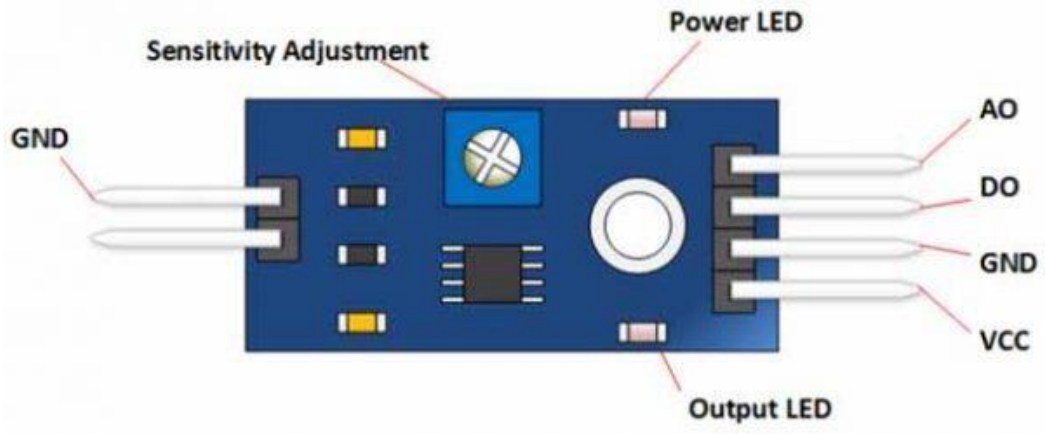

Fig 3.6: Pin Configuration of Rain Sensor

3.1.2.3 WORKING OF RAIN SENSOR:

The working of the rain sensor is pretty straightforward. The sensing pad with series of exposed copper traces, together acts as a variable resistor (just like a potentiometer) whose resistance varies according to the amount of water on its surface.

- The more water on the surface means better conductivity and will result in a lower resistance
- The less water on the surface means poor conductivity and will result in a higherresistance

The sensor produces an output voltage according to the resistance, which by measuring we candetermine whether it's raining or not.

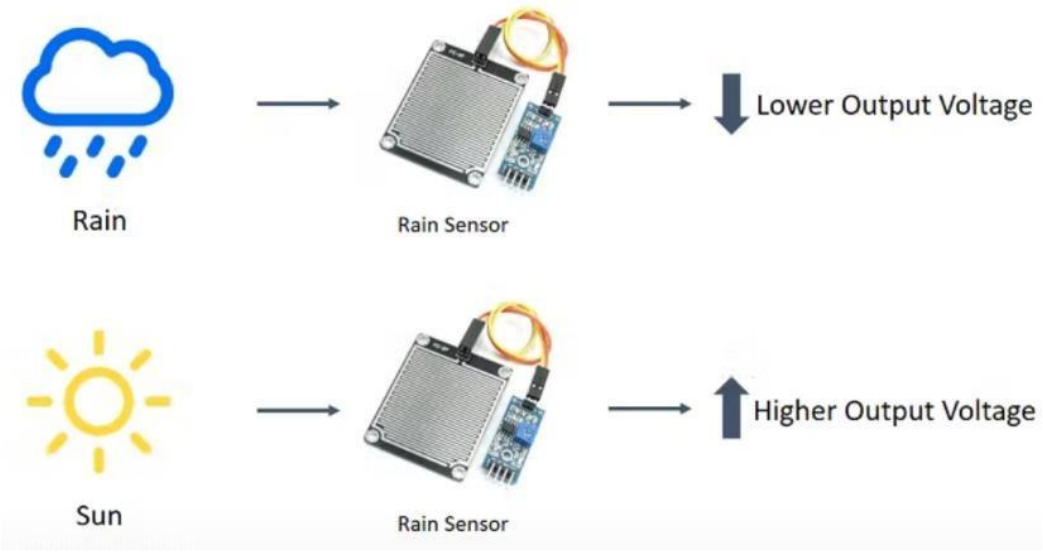

Fig 3.7: Working of Rain Sensor

3.1.2 SERVO-MOTOR

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism. If motor is powered by a DC power supply then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor. For this tutorial, we will be discussing only about the DC servo motor working. Apart from these major classifications, there are many other types of servo motors based on the type of gear arrangement and operating characteristics. A servo motor usually comes with a gear arrangement that allows us to get a very high torque servo motor in small and lightweight packages. Due to these features, they are being used in many applications like toy car, RC helicopters and planes, Robotics, etc.

Fig 3.8: Servo-Motor

3.1.3.1 WORKING PRINCIPLE

A servo consists of a Motor (DC or AC), a potentiometer, gear assembly, and a controlling circuit. First of all, we use gear assembly to reduce RPM and to increase torque of the motor. Say at initial position of servo motor shaft, the position of the potentiometer knob is such that there is no electrical signal generated at the output port of the potentiometer. Now an electrical signal is given to another input terminal of the error detector amplifier. Now the difference between these two signals, one comes from the potentiometer and another comes from other sources, will be processed in a feedback mechanism and output will be provided in terms of error signal. This error signal acts as the input for motor and motor starts rotating. Now motor shaft is connected with the potentiometer and as the motor rotates so the potentiometer and it will generate a signal. So as the potentiometer's angular position changes, its output feedback signal changes. After sometime the position of potentiometer reaches at a position that the output of potentiometer is same as external signal provided. At this condition, there will be no output signal from the amplifier to the motor input as there is no difference between external applied signal and the signal generated at potentiometer, and in this situation motor stops rotating.

3.1.3.2 CONTROLLING SERVO MOTOR

Servo motor is controlled by PWM (Pulse with Modulation) which is provided by the control wires. There is a minimum pulse, a maximum pulse and a repetition rate. Servo motor can turn 90 degree from either direction form its neutral position. The servo motor expects to see a pulse every 20 milliseconds and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90° position, such as if pulse is shorter than 1.5ms shaft moves to 0° and if it is longer than 1.5ms than it will turn the servo to 180°.

Servo motor works on PWM (Pulse width modulation) principle, means its angle of rotation is controlled by the duration of applied pulse to its Control PIN. Basically servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears. High speed force of DC motor is converted into torque by Gears. We know that WORK= FORCE X DISTANCE, in DC motor Force is less and distance (speed) is high and in Servo, force is High and distance is less. The potentiometer is connected to the output shaft of the Servo, to calculate the angle and stop the DC motor on the required angle.

Servo motor can be rotated from 0 to 180 degrees, but it can go up to 210 degrees, depending on the manufacturing. This degree of rotation can be controlled by applying the Electrical Pulse of proper width, to its Control pin. Servo checks the pulse in every 20 milliseconds. The pulse of 1 ms (1 millisecond) width can rotate the servo to 0 degrees, 1.5ms can rotate to 90 degrees (neutral position) and 2 ms pulse can rotate it to 180 degree. All servo motors work directly with your +5V supply rails but we have to be careful about the amount of current the motor would consume if you are planning to use more than two servo motors a proper servo shield should be designed.

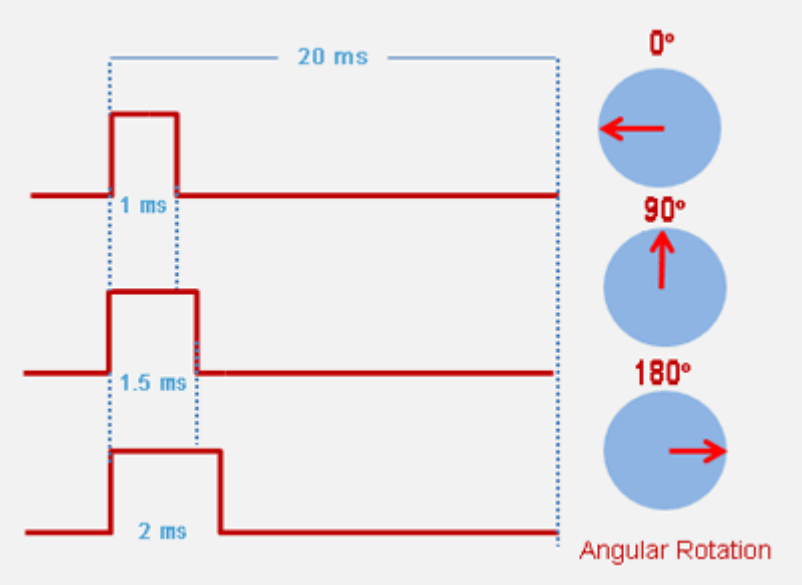

Fig 3.9: Controlling Servo Motor

3.1.4 LCD DISPLAY

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. A 16x2 LCD is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

Fig 3.10: 16*2 LCD Display

3.1.4.1 I2C MODULE

Since LCD has many numbers of pin, it might get very complicated with the wire soldering and connection. An I2C module is interfaced with 16x2 LCD Screen. It uses an I2C communication interface. It means it only needs 4 pins for the LCD display: VCC, GND, SDA, SCL. I2C Module has an inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD. It has a default I2C address of either 0x27 or 0x3F. The module has a contrast adjustment pot on the underside of the display. This pot is used for adjusting the screen contrast to display text correctly

Fig 3.11: I2C Module

3.2 SOFTWARE REQUIRED

The components in the Automatic Rain Sensing Wiper are programmed using Arduino IDE using C programming language.

3.2.1 ARDUINO IDE

The Arduino Integrated Development Environment is a cross-platform application that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards. It contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. The Arduino UNO R3 Development Board can be easily programmed with Arduino IDE

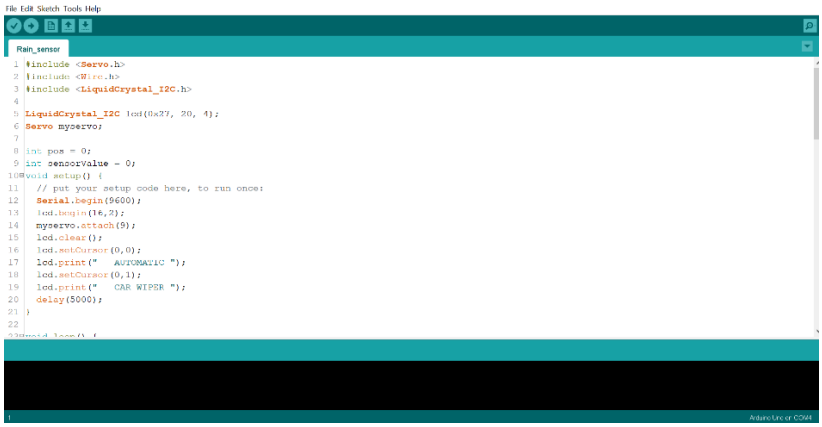

Fig 3.12: Arduino IDE

3.2.2 C LANGUAGE

C is a general-purpose high-level language that was originally developed by Dennis Ritchie for the Unix operating system. It was mainly developed as a system programming language to write an operating system. A system programming language is used to create system software. It is a system programming language because it can be used to do low-level programming (for example driver and kernel). It is generally used to create hardware devices, OS, drivers, kernels, etc. The main features of the C language include low-level memory access, a simple set of keywords, and a clean style. Arduino is the hardware platform used to teach the C programming language as Arduino boards are available worldwide and contain the popular AVR microcontrollers from Atmel.

3.3 METHODOLOGY OF WORK

3.3.1 BLOCK DIAGRAM:

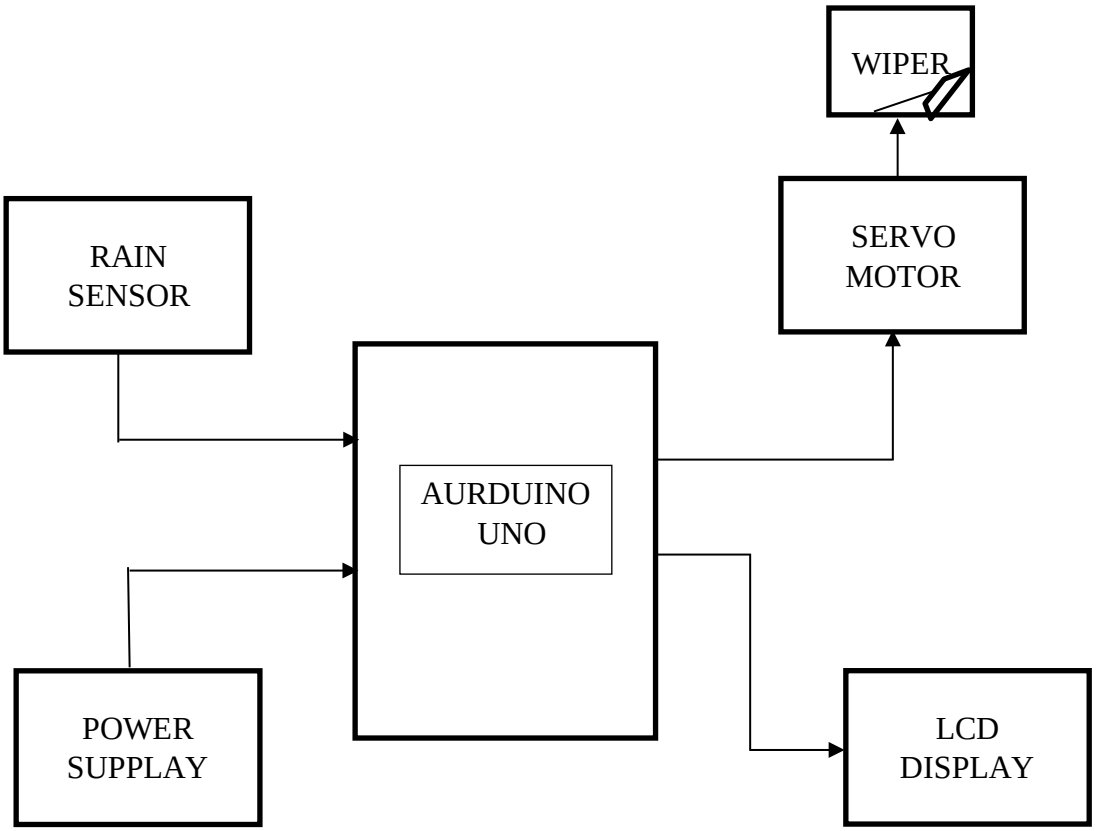

Fig 3.13: Block Diagram of Automatic rain sensing wipers using Arduino

In this project we have use a servomotor, rain sensor Arduino, and LCD module to control the wiper system. Whenever it rains, the rain sensor detects the intensity of the rain and sends that information to the Arduino. The information collected by the rain sensor is processed by Arduino and the processed information is sent to the servo motor to perform the desired action. The rain sensor consists of digital-to-analog output pins that calculate the intensity of the rain. The information sent to the microcontroller controls the speed of the wiper and is based on the intensity of the rain. The LCD shows the intensity of precipitation. When it rains, the rain sensor has a water column or a water column, and the resistance changes. Therefore, the sensor acts as a variable resistance board. The relationship between rain intensity and resistance has been found to be inversely proportional to each other. As the number of raindrops increases, the resistance of the sensor decreases. The sensor then sends a signal and the signal is received by the microcontroller.

The microcontroller determines the intensity and transfers the signal to the servomotor in the form of pulse width modulation. After that, the wiper operation mode is turned on according to the rain Strength. The sensor is designed so that its size does not obstruct the driver's view. The sensor is completely resistant to particles and elements from the environment that may come into contact with the sensor. Therefore, when such an event occurs, the sensor does not send a false alarm. Resistance decreases with increasing rainfall. The drop in resistance is recorded as a signal that the Arduino Uno microcontroller uses to determine the intensity of the rain. The signal is sent to the servo motor, which operates and moves the wiper blades. The speed of the wiper increases as the strength increases.

3.3.2 CIRCUIT CONNECTIONS

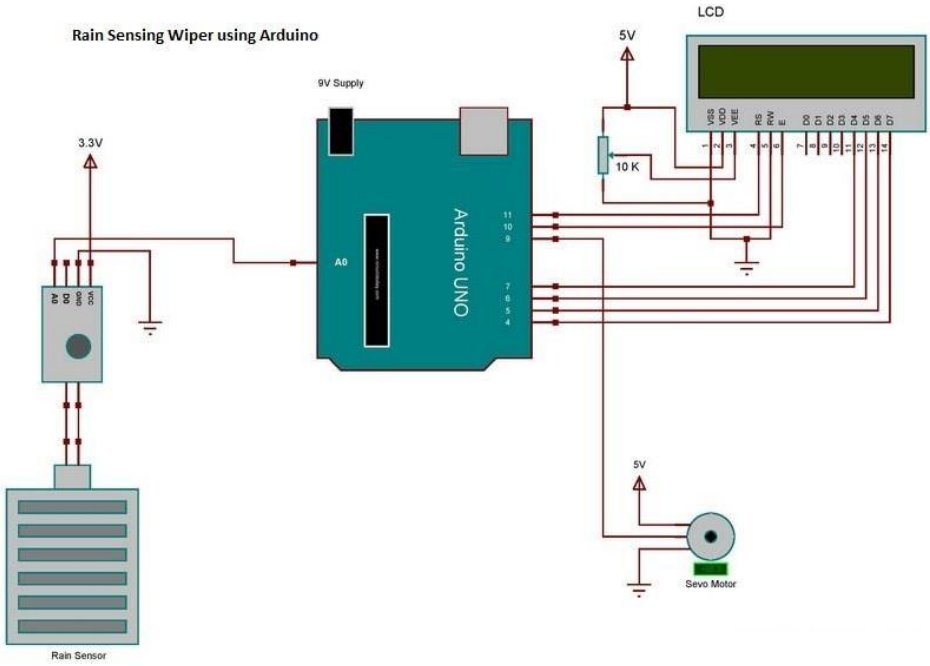

Fig 3.14: Circuit Connections

MH-RD rain detector is the sensor module that we are using here. The module have 4 pins: Vcc, A0, D0 and Gnd. Vcc and Gnd are connected to the supply pins of the Arduino. A0 and D0 are the analog and digital output pins of the module respectively. Since we need continuous change in rainfall, we will make use of the A0 pin instead of D0. The analog out from senor is then connected to one analog input pin of Arduino.

As mentioned earlier a servo motor is used here for wiper movements. Servo motor is a special kind of high torque dc motor whose shaft can be adjusted to desirable position by generating an appropriate PWM signal at its signal line. Here we connect the signal line of servo to one of the PWM pin of Arduino (i.e. digital pin 9). Next comes is the LCD module, which is for displaying the rainfall intensity. Interfacing of Arduino to 16×2 LCD is quite simple. I2C is the LCD module used here. The I2C has 4 pins. I2C Module has an inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD. To facilitate communication between Arduino and LCD module, we make use of a builtin library in Arduino <LiquidCrystal_I2C.h> – which is written for LCD modules making use of the PCF8574 I2C chipset (or a compatible chipset). The pins Vcc and GND is connected to supply pins of Arduino and SDA pin is connected to A4 of Arduino and SCL pin is connected to A5 of Arduino.

CHAPTER 4

RESULTS

Automatic rain sensing wiper using Arduino is as shown below

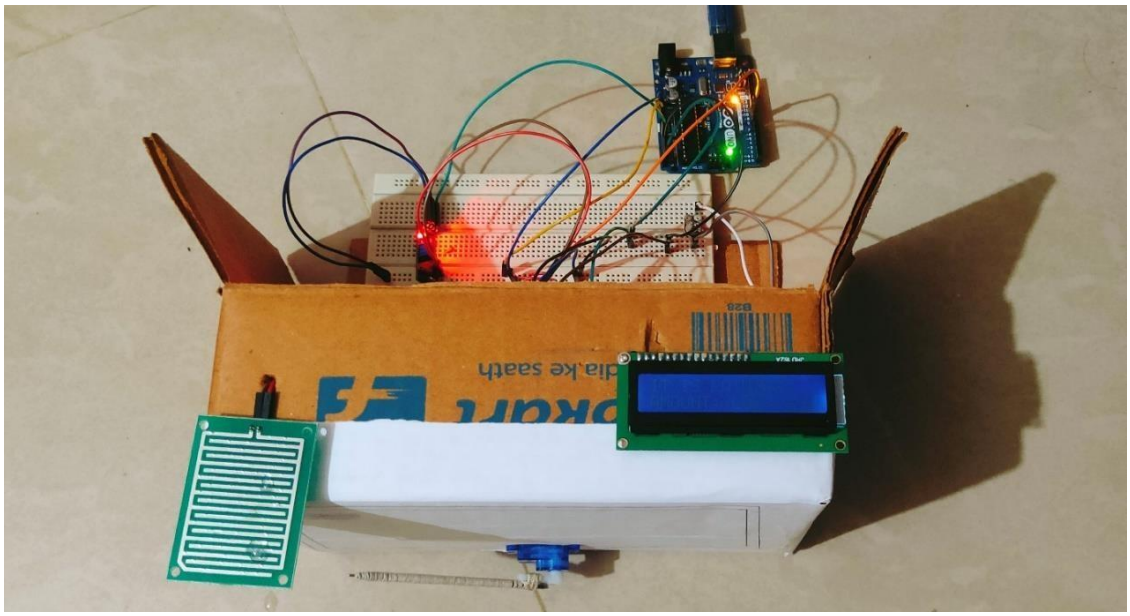

Fig 4.1: Rain Sensing Wiper Model

The LCD module displays precipitation intensity from NIL to low, medium and high. If there is no precipitation, the LCD display will show the precipitation intensity as NIL. When it starts to rain, the rain sensor will automatically detect the rain and send a signal to the LCD to show the intensity of the rain from low to high. When the precipitation intensity changes, the rain sensor detect the intensity and send a signal to the servo motor, this increases the rotation speed.

- Formula to calculate ADC value of rain sensor is ADC = (analog voltage value*1023)/5

Table of Results yielded on LCD

Stages	Output on the LCD	Description
1	 **Fig 4.2: Displays NO RAIN**  **Fig 4.3: No Rain on Sensor**	When we start the model initially their will be no rain drop on the sensor and the total ADC of this sensor is 1023. if the ADC is greater than 800 it displays No Rain in LCD Display
2	 **Fig 4.4: Displays Amount LOW**  **Fig 4.5: Small amount of rain drops on Sensor**	When there are some rain drops on the sensor the ADC decreases to less than or equal to 800 and greater than 600 it displays rain amount as LOW

3	 **Fig 4.6: Displays Amount MEDIUM**  **Fig 4.7: more rain drops than first one on Sensor**	When there are more rain drops than low on the sensor the ADC further decreases to less than or equal to 600 and greater than 460 it displays rain amount as MEDIUM
4	 **Fig 4.8: Displays Amount HIGH**  **Fig 4.9: Large amount of rain drops on Sensor**	When there are more rain drops than low on the sensor the ADC further decreases to less than 460 it displays rain amount as HIGH

CHAPTER 5

CONCLUSION AND FEATURE SCOPE

5.1 CONCLUSION

The automatic wiper system is designed to detect rain and wipe the windows by moving the wiper. The automatic wiper system automates the purpose of the driver's response to control the wiper. The automatic car wiper was developed using a rain sensor and Arduino, but it can be expanded by replacing the rain sensor with an IR sensor to accurately identify and detect precipitation. When choosing an economical yet efficient wiper, the best way is to use a rain sensor. You can choose from a variety of sensors to serve this purpose as you move forward and change your system.

5.2 FEATURE SCOPE

- To automate the wiper mechanism and working in automobiles
- We can use various sensors to detect various particles on wind shield
- To minimize rate of accident caused by distraction in driving
- To develop a cheaper automated system that can be integrated easily

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