

RAIN SENSING AUTOMATIC CAR WIPER

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Abstract: The purpose of rain sensing wiper is to detect rain and debris by activating the wiper without manual interaction. Through this product the driver is able to avoid the distraction while driving in rainy weather and concentrate more on driving. Any minor distraction while adjusting the wiper could lead to driving hazard. The deployed system uses the combination of fog detector and rain sensor to detect and measure the intensity of precipitation. The input provided by fog detector and rain sensor helps the system to detect rain and in response to that the wiper gets activated. But the main problem regarding this system is availability. This system is currently available in high-end vehicles only because of the cost associated with the product is very high. A lot of labor has been made to increase and research automatic cum manual wipers that are efficient in terms of cost & have better reliability. The idea/concept of this system results in minimization of efforts from drivers' workload and help them to concentrate on road during rain. The most common rain sensing method and one currently in use is the optical sensor (in Chevrolet & Hyundai). These optical sensors measure the angle of reflection on the windscreen through the infrared rays transmitted, which in turn helps in checking presence of water. It is a complicated process in which manufacturing needs to be accurate & precise. But these sensors working on infrared rays might provide inaccurate results whenever there's any presence of dirt particles on the windscreen. Besides that, they are also expensive. While driving a vehicle in rainy weather the visibility of road is minimized. In order to increase the visibility of road the driver needs to manually turn on the wiper which could take his attention away which could result in road accident.

Keywords: Automatic rain sensing wiper, automatic wind screen wiper, sensor, Wiper, Fog detector.

INTRODUCTION

Since last few years, automobiles are been developed by researchers in accordance with the drivers' safety, flexibility, comfort, reliability and entertainment by different technologies. Nowadays, people's expectations before buying a vehicle are usually high. They often go for vehicles with automated features like GPS, voice control, advanced sensors (like rain sensors). Other features include Bluetooth, audio player etc. But sometimes these features might distract the driver from driving. A windshield wiper, usually called a wiper, could be a device that cleans the screen of rain and junk. Virtually each automobile, as well as trains, planes, and boats, is supplied with these wipers, that are generally a legal necessity. A wiper is usually created out of Associate in Nursing arm with a protracted rubber blade connected to at least one finish and pivoting to the opposite. Swinging the blade TO and FRO across the screen, it removes water from the surface of the windscreen. Its speed is typically variable, with varied continual speeds and few additional sporadic choices also. The bulk of vehicles have 2 radial kind arms that are coordinated.

LITERATURE SURVEY

A windscreen wiper or windshield wiper is a device used to remove rain and debris from a windscreen. Almost all motor vehicle, including trains, aircraft and watercraft, are equipped with such wipers, which are usually an essential requirement. A wiper generally consists of an arm, pivoting at one end and with a long rubber blade attached to the other. The blade is swung back and forth over the glass, pushing water from its surface. The speed is normally adjustable, with several continuous speeds and often one or more "intermittent" settings.

Most automobiles use two synchronized radial type arms. The proposed wiper automatically turns on in accordance with the rainfall on the windscreen. Currently the vehicles are equipped with optical sensors. Unfortunately, these optical sensors have many flaws. Firstly, these are too costly, prone to errors and the area in which it is able to detect rain is also small. The reason why optical sensors failed is because they can show false readings when particles other than rain fall on the windscreen. Besides these optical sensors are bulky in nature. Therefore, they are expensive to be included in most vehicles. A number of efforts have been made to make the system cost effective, efficient and more accurate. But still these are not easily available in majority of common vehicles because of the reason mentioned above. Hence the use of rain sensors is encouraged. Our system uses a rain sensor along with fog sensor to detect rain, fog and its intensity. While driving it is required to concentrate/focus on the road since it can prove hazardous being distracted while driving on the road. The problem which the system in low end cars is that the driver needs to switch his focus on the wipers and away from the road which can prove to be fatal.

EXISTING SYSTEM

According to the World Health Organization, more than 2 million people die in accidents each year during the rainy season. People die because of small mistakes. Today's car wipers require human intervention to start the wiper and control its speed. This type of manual switching requires the driver to turn on the wiper as needed and adjust the wiper speed as needed. This causes inconvenience to the driver when it rains. He can't concentrate on driving or setting the wiper speed. This type of scenario leads to an accident. In the current scenario, only luxury cars use an automatic wiper. The Arduino board can recognize inputs such as finger detection on sensors, light control in patterns, and finger placement on buttons. The light goes out. The Arduino Uno microcontroller board can be controlled by sending instructions in code format. The code used here is based on Arduino programming. Use Arduino software for processing.

PROPOSED SYSTEM

There are several automatic wiping systems put in in vehicle however the driver has got to concentrate in driving and with traffic obtaining increased, things get troublesome. It's not safe, driver get distracted when the wiper requires to turn on and off. Manual shift consumes additional energy than automatic shift. This shift has less accuracy than the projected system. Rain sensing automatic wiper has become an important feature in vehicles nowadays because they allow the driver to focus on the road while driving, by reducing the time the driver uses to activate the wiper system manually while taking their hands off the steering. Instead, in this proposed system, the wiper works automatically when rain drops are detected. The use of fog detector along with the rain sensor makes it more efficient than usual since visibility issues due to fog, smoke & mist are tackled by it. The main aim of this proposed system is to provide an effective solution to one of the major causes for road accidents at lost cost. Additionally, it can be modified to work according to the intensity of the rainfall.

RELATED WORK

Right now, only expensive cars have sophisticated automated wiper systems that can detect rain. Numerous accidents have happened when there is heavy rain because of a lack of adequate eyesight. A number of the collisions were brought on by mistakes made by the drivers. Only high-end automobiles utilize the system of a deep rain sensing automatic wipers, which our system adjusts the speed of wipers, supporting the amount of rain falling, and boosting safety in the current circumstances. Our system is designed to demonstrate and illustrate the value of an automated wiper system that regulates its speed based on the amount of rain falling. Currently, only high-end automobiles have clever rain-sensing automatic wiper systems, which reduces the safety of driving.

SUMMARY OF PAPERS

Year	Reference	Summary
2021	Rain sensing automatic car wiper using AT89CS51 microcontroller (ResearchGate)	The technology being developed by this research automates the wiper mechanism and does away with the requirement for manual intervention. To do this, we use a microcontroller and a rain sensor to control the wiper motor.
2020	Automatic rain sensing wiper (IJCRT)	This study's objective was to provide a new model to the market that would be more affordable while still being effective.
2019	An automated wiper system for vehicles (IJRASET)	The device described here employs two different types of sensors, an IR sensor and a water drop detecting plate, to detect liquid drops on the windscreen.
2015	Automatic rain operated wiper system in automobile (IJSRD)	The safety of the driver and passengers in cars will increase with the usage of automatic wipers. It will make the road more visible and require less effort from the motorist.

PROBLEM DEFINITION

1. Manual handling:

In instances such as heavy rain or hazy conditions, the manual handling of currently employed wiper systems causes problems for the driver. In these conditions it proves to be difficult for the driver to constantly change the wiper settings, repeatedly.

2. Controlling Speed:

During heavy downpour, it is required that the speed of the wipers should be set according to the rain condition. Controlling the speed manually is required by existing systems, which might be inconvenient when driving.

3. Foggy weather/Low visibility:

During foggy weather usually the visibility on the road is compromised, which can cause inconvenience. Manually switching on the wipers continuously may result in distractions.

4. Unnecessary usage of wipers:

It is possible for automatic car wipers to activate while the vehicle is parked somewhere during precipitation, which might cause unnecessary usage of automated components.

OBSERVATION ON SURVEY

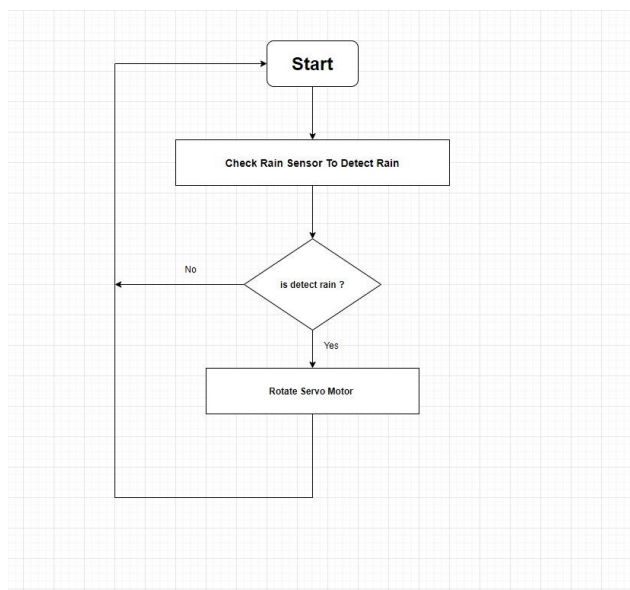
The number of amenities on the market in today's automobile is significantly higher. whereas driving, the driver ought to admit the road, and with traffic issues, it may get frustrating. Choices inside an auto, like GPRS for route steering, standardization system, air conditioning system, and so on, may divert the driver's attention. As a result, a shot has been created to reduce the trouble required by the driver to manage the speed of the wiper and to increase his awareness of his driving. Since this method has been effectively implemented in many higher-end cars, a shot has been created to reduce the value of the system therefore it's getting to be placed in extra affordable cars, allowing the soul to create the foremost of it.

METHODOLOGY

1. At first, we have a tendency to analyze the detector.
2. We've to use required sensors i.e., rain sensor, Smoke/Fog Detector.
3. We have a tendency to create a circuit consisting of
 - **Rain sensor:** A rain sensor is a device used to detect raindrops. These are electrically separated and can be used as printed circuit boards. The function of the rain sensor can be properly compared with the function of the switch. When it rains, the switch switches to off mode. When it rains the circuit closes and the resistance changes. They usually have zigzag track patterns to guide rain and waterfalls. This rain sensor unit consists of a rain board and a control board. It rains on a rainbow with two LED lights. One shows the power supply and the other shows the rain. The second LED light on the control board only flashes when a raindrop hits the rainbow. The rainbow is set to rain. Rain sensors are commonly used to detect precipitation droplets. Thresholds are defined for each rain sensor. When the droplet or moisture reaches the threshold limit, the rain sensor sends information to the person performing the desired action. The rain sensor is equipped with a digital-to-analog pin that can be used to record humidity. When the detected humidity exceeds the threshold, the desired action is taken. When the rain sensor is wet, it changes from 100000 to 2 M ohms and acts as a variable resistor. Therefore, if the board is wet, there will be more power lines. A0, D0, GND, and VCC are analog, digital, ground, and positive voltages, respectively. The rain sensor is equipped with two loop pins, + and sensor board connectors A and B.
 - **Servo Motor:** This motor typically consists of output shafts that can be used to position the shaft at a particular angle using the coded signal transmitted by the servo. Servo motors are very useful in everyday life and are used in many devices. Servo motors are very efficient and economical. Servo motors are small and can be placed on the device to perform the desired action more effectively. Servo motors are very efficient and energy saving motors. These servo motors are controlled by pulse width modulation. Pulse width modulation uses a control wire to send an electrical pulse. The minimum, maximum pulse and repetition rate are three types of pulse width modulation. The total amount of movement of the servomotor is 180 °, and it rotates 90 ° in each direction. Servo motors rotate both clockwise and counterclockwise.
 - **Arduino:** It is an easy-to-use type of software that you can use to write code to control hardware and electronic devices. The Arduino board can recognize inputs such as finger detection on sensors, light control in patterns, and finger placement on buttons. The light goes out. The Arduino Uno microcontroller board can be controlled by sending instructions in code format. The code used here is based on Arduino programming. Use Arduino software for processing.

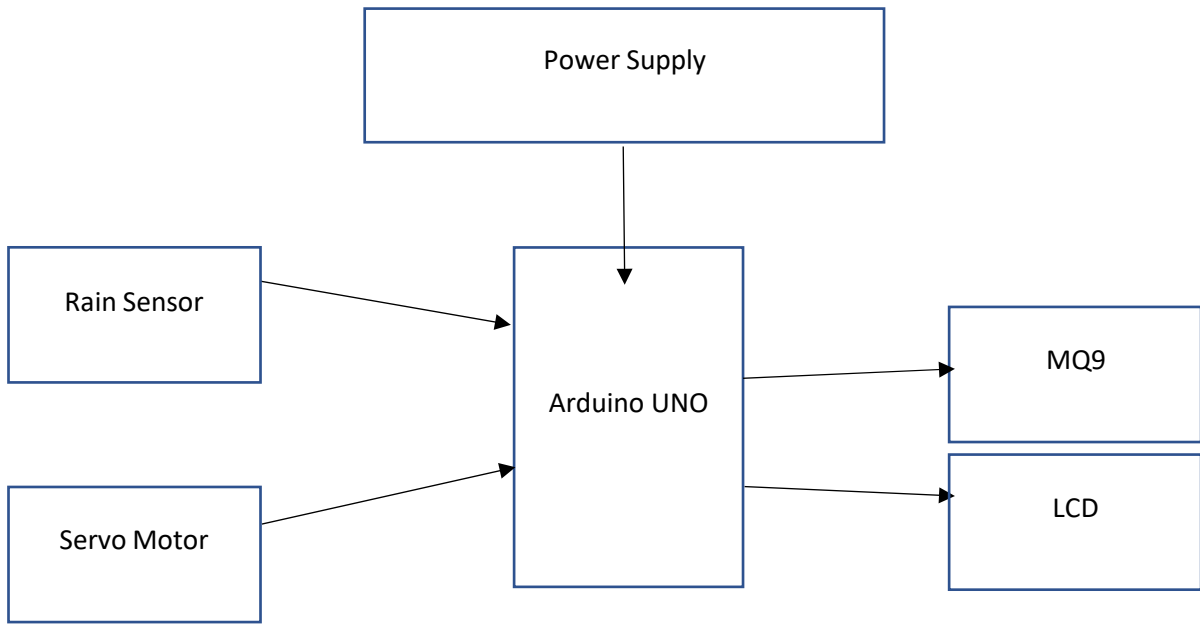
- **Rectifier:** An electrical device that helps in converting the alternating current into direct current.
- **Fog/Smoke detector:** The Fog/Smoke detector uses MQ9 sensor which is sensitive to carbon monoxide and flammable gases. It can detect the detect carbon monoxide density from 10ppm to 1000ppm and flammable gases density from 100ppm to 10000ppm. MQ9 has an internal heater which starts warmingup if a 5V voltage is applied.
- **HC05 Bluetooth module:** This is a Bluetooth module which is used for wireless communication. It is commonly used in wireless devices like mouse, keyboard, gaming controllers etc. It is used to notify the user weather the connected device is working or not. It consists of 6 pins, namely key/EN, VCC, GND, TXD, RXE, State. It has a frequency of 2.4GHz ISM band and has a range of approximately 10 meters/33Feet. And it operates on a current and voltage less than 50 mA and 3.3v-5v Direct Current respectively.
- **Relay:** A closed circuit for an electrical device through which the signal flows from one component to other.
- **Power Supply.**

FLOWCHART

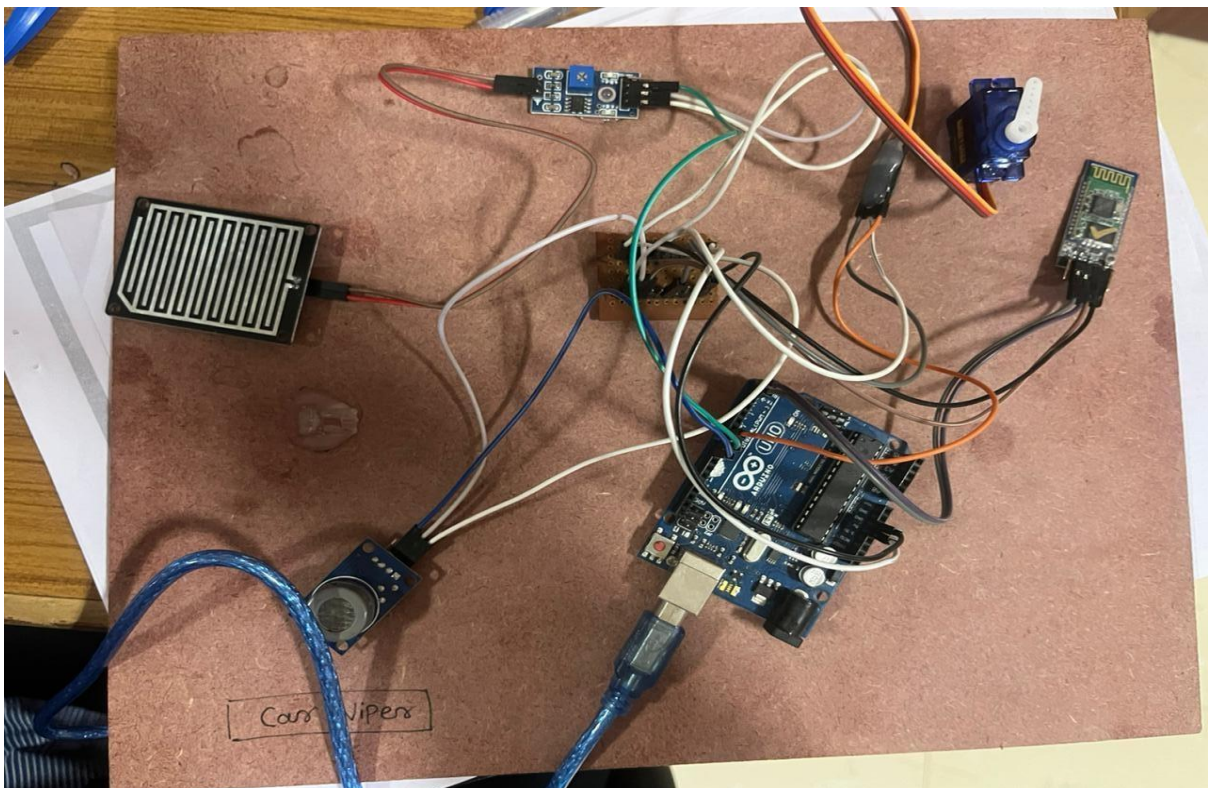


SYSTEM ARCHITECTURE

The system consists of an Arduino Uno board, a rain sensor, a servomotor and an LCD module. Block diagram of the proposed system. The proposed system aims to remedy the shortcomings of existing systems. The wiper system consists of four stages. The first stage is a reading stage in which data is read from the rain sensor module. The second stage is the processing stage where the information from the sensor is processed. The third stage is the analysis stage, where the processed information is compared / analyzed. The fourth stage is the control stage, which controls the servo motor and LCD display. It uses Arduino Uno and the language used is the Arduino programming language.



MODEL



COMPLETE OVERVIEW

The rain sensor is placed over the windshield and the motor influences the wiper blades, which are straight connected to the motor. When the signal is received, the Arduino is attached to all of the five components, namely, the rain sensor, the servo motor, smoke detector, HC05 Bluetooth module and the LCD. The microcontroller unit is placed inside the car and is attached to a dc source; The LCD is also in the car near the driver's seat. It displays the speed of the wiper blades along with the intensity of the falling rain. Also, in case of presence of fog or mist on the windscreen, the smoke/fog detector will activate the wiper. Additionally, the HC05 Bluetooth module will also notify the driver in advance if they need to clean the car.

RESULT

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 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 as you move forward and change your system.

CONCLUSION

As a result, we have this tendency to developed a model that detects rain and mechanically activates the wipers, adjusting their speed according to the rain intensity. The wiper speed will increase/decrease to a collection level according to the intensity of the rain. The rain sensor's digital and analogue pin inputs are checked by the microcontroller. This automated wiper will work in almost every weather condition and will also be cost effective since its applicable on every vehicle model.

FUTURE WORK

One of the primary objectives in this task was to make a design which is compact and easy to integrate with a complex system such as a vehicle. Also, we wanted to demonstrate how these relatively novel sensors can be integrated with a microcontroller to develop an application. Modifications in the circuit can be made with the objective of creating a system on-chip, which can be easily plugged into existing vehicles. The sensor proposed in this model is low cost and efficient to a great extent, however with the development of more high quality and accurate sensors, much more desirable and reliable outputs can be obtained. Another interesting area to explore into is controlling the speed of the wiper to a more accurate sense. Currently, the wiper moves at two different speeds. By modifying the code, we can have different speeds for a different amount of rain. Also, we can use this automated car wiper along with other automated features to make a Smart Car.

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