Automatic Wiper Rain Sensor

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Abstract- *The automated rain wiper system is employed to detect rainfall and activate automobile automatic rain wiper without driver interaction. The system is developed to mitigate driving distraction sand allow drivers to focus on their primary task of driving. The distraction eliminated with the event of this product is that the manual adjustment of windshield wipers when driving in precipitation. The few seconds that a driver takes their attention off the road to regulate a knob while driving in poor weather could potentially cause car accidents. The system uses a mixture of impedance and rain sensor to detect rain and its intensity. switching on and off the wiper. In rainy days we suffer from act of sprinkling of water on front glass of our wheeler. While driving car, driver cannot see on road vehicles. So, he tries operating wiper on glass, for that he should often turn on for operating wiper and since of this it'd cause vehicle accident. If we apply any quite sensor on glass which senses the act of sprinkling water, by automation the wiper is going to be operating automatically. When the water hit the sensor, it'll send signal to the system thus moving the electric motor. Once the sensor didn't detect any water, the wiper will stop. This will reduce the weaknesses which are stated at beginning. Additional decide to this invention is to form the wiper automatically push up from the windscreen when the engine shut off.*

Keywords- Precipitation, Impedance, Sensor, Body Control Module (BCM), Wiper, multivibrator etc.

I. INTRODUCTION

A windscreen wiper or windshield wiper may be a device want to remove rain, snow, ice and debris from a windscreen or windshield. Most automobiles, including cars, trucks, train locomotives, watercraft with a cabin and a few aircraft, are equipped with such wipers, which are usually a legal requirement. A wiper generally consists of a metal arm, pivoting at one end and with a long rubber blade attached to the other. The arm is powered by a motor, often an electrical motor, although pneumatic power is additionally utilized in some vehicles. The blade is swung back and forth over the glass, pushing water or other precipitation from its surface. The speed is normally adjustable, with several continuous speeds and sometimes one or more "intermittent" settings. Most automobiles use two synchronized radial type arms, while many commercial vehicles use one or more pantograph arms.Wipers could also be powered by a spread of means, although most in use today are powered by an electrical motor through a series of mechanical components, typically two 4-bar linkages in series or parallel. So here we propose an automatic wiper system that automatically switches ON detecting rain and stops when rain stops. Our project brings forward this technique to automate the wiper system having no need for manual intervention. For this water for completing its circuit, so when rain falls thereon its circuit gets completed and sends out a sign to 555 timer IC and drive the motor to simulate car wiper action. systems become an even more appealing feature, as they work to minimize the time the driver must take his/her hands off the wheel. These systems detect droplets of rain on the windshield and automatically activate and adjust the wiper system in accordance to the extent of precipitation. Current rain-sensing systems use an optical sensor to detect the presence of water on the windshield, and relay wiper control data to the vehicle's body control module (BCM). Unfortunately, these optical rain sensors suffer from alittle sensing area, are susceptible to false positives, and are too expensive to be included as standard equipment in most vehicles over the past 20 years, the automotive industry has aggressively researched ways to take advantage of modern computing and electronic advances within the development of safety, reliability and entertainment technologies. Despite this, automatic rain-sensing wiper systems are relatively uncommon in modern vehicles for variety of reasons. They are often too expensive, too unsightly, or too unreliable to be desired in new automobiles. Many attempts are made at constructing an efficient, reliable, and cheap rain detection and wiper system for vehicles speed and intermittent interval automatically consistent with the quantity of rain. To measure the quantity of water usually use optical sensor. In this sort of sensors uses the very fact that the refraction angle and therefore the amount of reflection of the sunshine are different when the two windshield is wet. Even though optical sensors are used widely they need some disadvantage. One of disadvantages is that the sensitivity to external light. Another problem is occurring when car drive at

night or gone through tunnel and even in underground parking.For this many systems still activate the wiper when the car comes out of tunnels or underground parking zone. Another shortfall, maybe a serious one is that the sensing area may be a relatively small portion of windshield. Hence the system operates only with limited area. The gear reduction can multiply the torque of the motor by about 50 times, while slowing the output speed of the electrical motor by 50 times also. The output of the gear reduction operate linkage that moves the wipers back and forth.Inside the motor/gear assembly is an electronic circuit that senses when the wipers are in their down, they're parked at rock bottom of the windshield, then cuts the facility to the motor. This circuit also parks the wipers between wipes once they are on their intermittent setting. With drivers exposed to an ever-increasing number of distractions, automatic rain-sensing wiper.

Fig- View of Automatic Wiper

Implementation on Car

And according adjusts that temperature and take away moister inside car windshield. The problem definition is to style a prototype for a PIC microcontroller (PIC18F2580) based vision system aid in windshield assembly which controls the windscreen wiper speed supported the quantity of water. For this a comprehensive study of sensors, actuators and mechanical design was done. Development of hardware module and therefore the software has progress. The basic method used for designing the circuit is that a rain level sensor will detect the quantity of rain and provides the signal to the controller.

Automatic Wiper System

Vehicles are now available with driver-programmable intelligent (automatic) windscreen wipers that detect the presence and amount of rain using a rain sensor. The sensor automatically adjusts the speed of the blades consistent with the quantity of rain detected. Rain-sensing windscreen wipers appeared on various models within the late 20th century, one among the primary being Nissan's 200SX/Silvia. As of early 2006,rain-sensing wipers are optional or standard on all Cadillac and most Volkswagen, and are available on many other main-stream manufacturers.

Why Automatic Wiper

In the present automobiles the number of facilities is far higher. The driver has got to consider road while driving, and with increased traffic, things get frustrating. The features within the car like GPRS to trace the route, music system, air condition system etc. may chase away the eye of the driving force. Thus, an attempt has been made to scale back the trouble put by driver in controlling the speed of the wiper and put more concentration on his driving. Since this technique is put into use in many higher end cars and has been successfully working, an attempt was made to scale back the value of the system so that this technique is often implemented in common economic cars where a standard man also can enjoy the advantages. In section II, the detail explanation about designing aspects of the system is given. In section III the working procedure of the system is given. The section IV covers the calculations involved, algorithm and therefore the supporting graphs. The Conclusion is drawn in Section V.

II. DESIGN

It was found that the rain sensor is that the expensive unit within the present system and an attempt is completed in making a sensor which is cheap by price, the Cup Sensor. The sensing device used here is essentially a conical shaped cup with a tray on the highest of the cup to gather maximum possible amount of water. The different views of the device are shown below.

When the rain begins and therefore the visibility to the driving force is reducing, the system has got to trigger the wiper to wipe the water on the screen. It can so happen that the driving force feels the necessity of wiper but because the floater has not reached the extent of the probe the system might not begin its function.

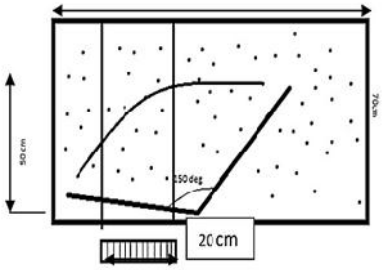


FIG 2. The water collected at the bottom in a cup type rain sensor

Degree of Automation Degrees of automation are of two types

1. Full Automation-In case of full automation, no manual work is required and even power supply are often operated automatically.
2. Semi Automation-In case of semi automation, not all the operations are operated automatically. Some operations are handled manually. Automation is often achieved through computers, hydraulics, pneumatics, robotics, etc., of those sources, pneumatics forms a beautiful medium for low-cost automation. Automation plays a crucial role in automobile.

III. CONSTRUCTION AND WORKING

3.1 Construction

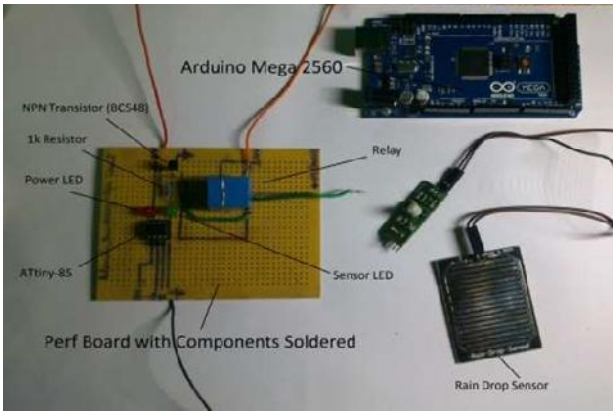


Figure 3.1 Circuit Connections of Automatic Wiper Rain Sensor

Many attempts are made at constructing an efficient, reliable, and cheap rain detection and wiper system for vehicles. A perfect system could subtract another task from the driver's workload, and permit them to raised keep their eyes on the road and hands on the wheel during foul weather. Despite this, automatic rain-sensing wiper systems are relatively uncommon in modern vehicles for variety of reasons. They are often too expensive, too unsightly, or too unreliable to be desired in new automobiles. While variety of various design approaches are made to enhance upon these issues, none are successful enough for the technology to become widely adapted in new vehicles. By far the foremost common rain detection method, and therefore the one currently employed by Hyundai vehicles, is that the use of an optical sensor.

These optical sensors function by transmitting an infrared beam at an angle through the windshield and measuring the reflection to work out the presence of water. This is a comparatively difficult task, requiring complex circuitry and precision manufacturing. Optical sensors are thus somewhat expensive and may produce false readings when dirt or other particles on the windshield cause a mirrored image mimicking that of rain. Because it relies on an infrared beam for detection, the optical sensor also suffers from a really small sensing area on the windshield, limiting its effectiveness in rapidly responding to light rain. In addition, the sensor housing is physically bulky, reducing its appeal in luxury vehicles.

These issues can largely be mitigated by employing a capacitive sensor instead of an optical one. Instead of sending an infrared beam through the windshield glass, a capacitive sensor works by emitting an electrical field which may undergo the glass to interact with objects resting on it. Because water and other objects like dirt or rocks interfere with the electrical field in very alternative way , the sensor are going to be less likely to be fooled if designed correctly. Unlike a typical capacitor, which confines the electrical field lines between two conductors during a tight package, a capacitive sensor allows the sector lines 8 to open up, and is designed to maximize the fringing of the electric field lines away from the conductors.

WorkingThe battery supplies the facility to the sensor also as rain operated motor. Wiper motor is automatically ON during the time of rainfall. The senor is fixed within the vehicle glass. The conductive (Touch) sensor is employed during this project. It senses the rainfall and giving control signal to the control unit. The control unit activates the electric motor automatically. This operation is named “Automatic rain operated.

FAST Diagram

Design and capacitive-Sensing circuit

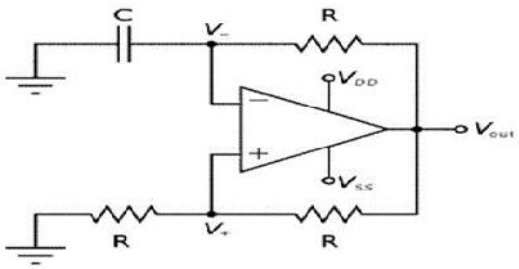


Fig 4. A stable multi vibrator capacitive-sensing circuit (C1 = C sensor)

The first proposed design was to create a capacitive sensing circuit from basic components like op-amps, comparators, and passive components. Due to experience in

analog circuitry, the team realized that the capacitive sensor traces form a variable capacitor that changes as objects interfere with the 13 fringe fields. Many circuits exist that utilize the time-constant principle of an RC circuit to supply an output waveform. A stable RC-multi vibrator circuit, as seen in Figure 3, produces a square wave output with a frequency varying with reference to the capacitance of the sensor traces when they are used as the capacitor.

This varying square wave could then be interpreted by a microcontroller, and compared to known responses from rain to work out appropriate wiper action.

3.2 WORKING OPERATION

The battery supplies the facility to the sensor also as rain operated motor. Wiper motor is automatically ON during the time of rainfall. The senor is fixed within the vehicle glass. The conductive (Touch) sensor is employed during this project. It senses the rainfall and giving control signal to the control unit. The control unit activates the electric motor automatically. This operation is called "Automatic rain operated.

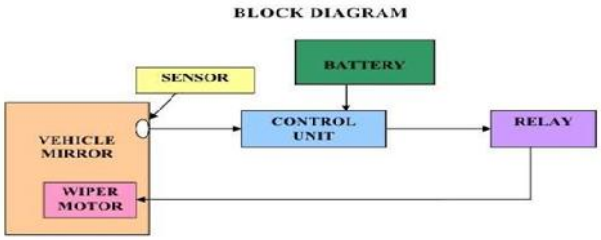
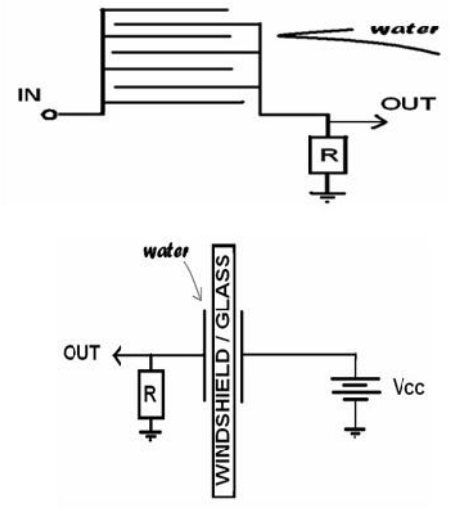


Fig 3.2. Block diagram of wiper arranging circuit system

IV. SENSOR

4.1 Impedance sensor

The impedance sensor to be implemented is that the grid sensor shown in Figure. The sensor works by outputting a voltage, which may be a function of what proportion water is in between the teeth. The closer the teeth, the more sensitive the sensor becomes. For the prototype, the separation distance are going to be adjusted between 0.10 mm and 1.0 mm to the specified sensitivity. At least two sensors will be made and placed at different locations on the glass to increase reliability.



Grid Sensor with varying electrical conduction due to water

A problem with this particular approach is that sometimes rain water isn't very conductive; therefore, the output voltage is going to be very small and undetectable. One way around this problem is to use another impedance sensor that monitors capacitance rather than conductance.The sensor represented in Figure 4 is formed of two thin copper plates placed around a glass, thus forming a capacitor. The presence of water changes the permittivity of the capacitor. The sudden change leads to a detectable current/voltage that's fed into a special MARE windscreen wiper System ECE4007L02: Group 48 input module for amplification and standardization. Obviously, the reliability and accuracy of the 2 impedance sensors discussed above are often improved by combining a mess of them. However, they're susceptible to corrosion, dirt, and other forms of deposits.

4.2 Optical Sensors

The optical sensors are going to be wont to bounce beams of sunshine through the windshield, and appearance for disturbances within the beams caused by raindrops. Typically, a rain sensor will have an emitter that emits pulses of sunshine, coupled into the windshield with a lens. These beams travel through the windshield at about 45 degrees. The beams are totally internally reflected by the surface of the windshield, in order that they recover into the sensor. The sensor then detects the reflected beams and measures them. If rain drops are present on the surface of the windshield, a number of the beams escape and this reduces the intensity of the beams. The detector will measure this reduction in intensity and communicate that to the remainder of the system that actuates the windshield wipers

V. APPLICATION

1. This small circuit finds numerous applications.
2. Useful to vehicles.
3. It can be implemented at house window for cleaning.
4. A slight modification in it leads to a better cleaning system.
5. Prevents glass shield or bars from getting corroded.

VI. ADVANTAGES

1. It can be easily and quickly installed in automobiles.
2. Low Power consumption
3. Simple and Portable
4. Easy to implement
5. Cost Effective

VII. CONCLUSION

As almost everything described already for this design, we might wish to say there are still numerous sorts of enhancements one can implement on this project to form it even more convenient. The project we have made and presented is quite efficient and it is cost effective also. It has great advantage of over the optical sensor covering all the planning specifications alongside the wants of commoner. The speed controlling mechanism are often added during this project which can make it work consistent with the intensity and speed of water approaching the sensor. The basic maneuvering is done only to make it cost effective and reliable.

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