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Automatic rain sensing car wiper

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ABSTRACT

The issue of driver's safety is of great importance in today's automotive industry. In many cases, a lack of proper vision is responsible for accidents during heavy rainfall. In many cases, manual errors like not increasing the speed of the wiper by the driver lead to accidents. Today's car wipers work on the principle of manual switching. In this paper, we proposed an automatic rain sensing wiper system that detects rain and starts automatically and stops when the rain stops. The automatic rain sensing car wiper system is not only automatic but also intelligent. The wiper system detects the rainfall automatically and starts itself. The Wiper system is also intelligent. When the droplets of rainfall on the sensor, the sensor detects the intensity and the speed of the wiper are automated accordingly. The higher speed of rotation indicates the higher rainfall. There will be no need for manual intervention for controlling wiper. In this project, we use Arduino along with a rain sensor, an LCD 16x2 module, and a servo motor. The moisture is measured via analog output pins which are present in the rain sensor, the wiper starts rotating when a threshold of moisture is exceeded. The module used here is completely based on LM393 op-amp. The information sensed by the rain sensor is sent to Arduino. The Arduino is an Atmega8 based microcontroller board. Interactive electronic devices can be designed and created by using Arduino, which is a platform to develop the working of electronic devices. It consists of an on-board power supply and a USB port to communicate with the pc. The collected information from the rain sensor is processed and analyzed by Arduino and it further controls the servo motor based on the processed information. The information about the intensity of the rainfall and speed of the wiper is informed to the driver by means of a 4-bit LCD module which is kept near the driver's seat. The rain sensor is kept at the side of the windshield, outside the car. The rain sensor is connected to the servo motor. The blades of the wiper are connected to the servo motor. All the devices are connected to Arduino which is connected to the power source inside the car.

Keywords— Automatic, Sensing, Wiper, Arduino, Rain sensor module

1. INTRODUCTION

A car wiper is a device which is used to remove droplets of rainwater from a windscreen. Nowadays, each and every vehicle is provisioned with the wiper to avoid the accidents and to decrease the human intervention in controlling the wiper to ensure luxury. A wiper generally consists of a metal arm and a long rubber blade. In some vehicles, pneumatic power is used. Here, the metal arm gets powered by an electric motor. The blade moves in clock-wise and counter clock-wise direction on the glass, pushing the water from the surface of the glass. Modification of speed is automatically done based on the intensity of the rainfall. Two synchronized radial type arms are used in most of the automobiles, whereas pantograph arms are used in commercial automobiles. Wipers are automated in many ways. These days' automobiles consist of a series of mechanical parts which are automated by an electric motor. In this, we propose an unmanned wiper which senses rain and starts automatically and switches off automatically when the rain stops. By using this, there will be no need for physical intervention of human to control the speed of the wiper. For this purpose, we use a rain sensor to detect the rain and then the signal is managed by Arduino and takes the required action.

Over the last ten years, the advancement in the automobile industry has been increased to find modern techniques to increase safety. There are many reasons behind the vehicles which are not equipped with automatic car wipers. Many reasons in the sense, the car wipers are too expensive to fit in economical automobiles and they are too unreliable for new automobiles. Many automobile companies made an attempt to construct the automatic car wiper at low cost which is not only economical but also efficient. This paper is all about the attempt they tried to construct.

In the present day situation, only luxury vehicles are equipped with automatic rain sensing car wipers. Our work is created to show the need to use an automatic car wiper system which starts automatically when the rain starts. The speed of the wiper is also adjusted automatically based on the intensity of the rainfall. Such a system ensures the safety of a ride. A lot of reasons are responsible for accidents but the major reason for the occurrence of accidents during the rainy season is due to a lack of proper vision. The objective is to construct a self-starting car wiper system which starts automatically on sensing the rainfall. Automatic adjustments to the wiper speed are made based on the intensity of rainfall. The project is constructed using Arduino, Rain sensor, Servo motor and an LCD Module which displays the intensity of the rainfall. Adjustment to the speed of the wiper is made according to the intensity of rainfall which improves and ensures the safety. This project is a small step towards the comfortability and to save our time.

2. BLOCK DIAGRAM

2.1 Architecture diagram

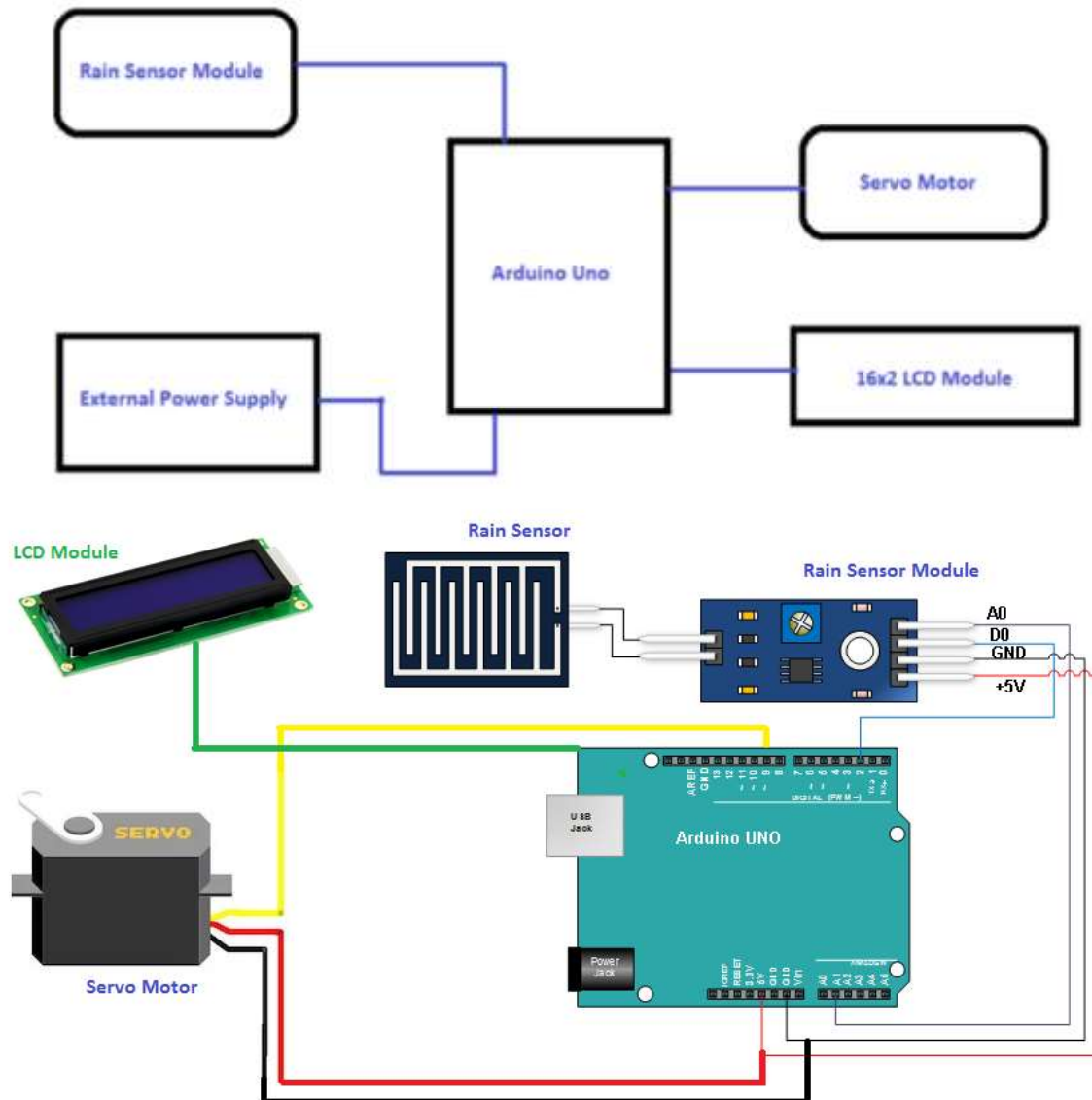


Fig. 1: Block diagram of automatic rain sensing wiper

Stages Involved: There are four stages involved in the car wiper system. The first stage is the reading stage where reading data from rain sensor module takes place. The second stage is the processing stage where processing of the information from sensor takes place. The third stage is the analysis stage where comparison/analysis of the processed information takes place. The fourth stage is the controlling stage where controlling output for servo motor and LCD display takes place. Arduino Uno is used and the language used is Arduino programming language.

3. LITERATURE SURVEY

In this work, they proposed an automatic wiper control system which is economical, efficient and has a good output. This paper uses a resistive rain sensor. They developed a wiper which is practically verified and a sensor is developed which is an equivalent mathematical model. The rain sensor generally has a predetermined rotational geometry. When the droplets of the rainfall on the sensor, the droplets form a layer on the surface of the sensor causing non-linearity to its resistance. To decrease the non-linearity and to increase the efficiency of the system, the response from the sensor is to be linearized. The response can be linearized by using the linearization circuit with the equivalent electrical model of the sensor. To achieve the changes in the speed based on the output provided by the rain sensor, customized PIC micro-controller is used in the paper named "A novel and cost-effective resistive rain sensor for automatic wiper control: circuit modeling and implementation" by Mukul Joshi, M. A Joshi, Vinayak Sagare, D. N. Sonawane.

In this paper, fuzzy logic was used to operate the collected analog data from the rain sensor. The program was programmed to use fuzzy logic in collecting data. The wiper motor is controlled by the microcontroller which uses pulse width modulation. The reason for using the fuzzy logic in this project is only because it can be easily rearrangeable. They are used to redesign things. It can be used to construct different wipers for different vehicles without changing any hardware configuration. After a successful configuration, it can be placed in a vehicle and used. This is based on the paper named “Design and implementation of a reconfigurable automatic rain sensitive windshield wiper” by Lubna Alazzawi, Avik Chakravarty

In this paper, the Bluetooth car wiper system is proposed. The wiper starts to wipe when it captures any wireless Bluetooth signal from any mobile. They introduced an innovative way to wipe the windshield. Although it is a Bluetooth based car wiper, there is a need for human intervention. For the wiper to start, it needs to detect Bluetooth signals and those should be sent by the driver in order to start the wiper. The Bluetooth car wiper is constructed using HC05 Bluetooth, Arduino and servo motor. We can control the movement of the car wiper by sending low range Bluetooth signals. This work is done in the paper named “Arduino based Bluetooth operated car wiping technique using android mobile phone” by Sourish Mitra, Soham Biswas, Mrinmoy Aus.

4. EXISTING SYSTEM

Every year during the rainy season, more than 2 million people die worldwide because of accidents in the rainy season according to world health organization. People end up dying because of small mistakes. Today’s car wipers need human intervention to start the wiper and to control its speed. In this type of manual switching, the driver needs to switch on the wiper when needed and need to adjust the speed of the wiper as required. This causes inconvenience to the driver during rainfall. He can neither concentrate on driving nor focus on the adjustment of the speed of the wiper. This type of scenario leads to accidents. In the current scenario, only luxury vehicles employ intelligent rain-sensing windshield wiper systems.

5. METHODOLOGY

In this paper, we propose an automatic car wiper system which turns on automatically when the rain starts and stops when the rain stops. In this paper, there will be no need for physical intervention of man for controlling car wiper. In this paper, we use a servo motor, rain sensor Arduino and an LCD module for control in the wiper system. Whenever the rain falls, the rain sensor detects the intensity of the rainfall and sends the information to Arduino. The information collected by the rain sensor is processed by the Arduino and send the processed information to the servo motor to take the desired action. The rain sensor consists of digital analog output pins from where the intensity of the rain is calculated. The information which is sent to the microcontroller is responsible for controlling the speed of the wiper and based on the intensity of the rainfall. The LCD will show the intensity of the rainfall.

6. DETAILS OF COMPONENTS

6.1 Arduino

Arduino is easy to use a type of software which allows us to write the code for controlling hardware and electronics. Arduino boards can sense the inputs like sensing a finger on the sensor, controlling a light in a pattern, placing a finger on a button etc. for example, whenever a finger is placed on a button, light switches ON and whenever it is removed, the light switches OFF. The Arduino Uno microcontroller board can be controlled by sending instructions to it in the form of a code. The code used here is based on Arduino programming. Arduino Software is used for processing.



Fig. 2: Arduino Uno board

6.2 Rain Sensor

Rain sensors are generally used for sensing the droplets of rainfall. A threshold limit is set to every rain sensor. When the droplets or humidity reaches the threshold limit, the rain sensor sends the information to the one which takes the desired action. The rain sensor is equipped with digital analog pins through which the humidity can be sensed. When the sensed humidity is more than the threshold limit, then the desired action is performed. When the rain sensor is wet, it changes from 100000 to 2M ohms acting as a

variable resistor. So, when the board is wet the more conduction of current is more. A0, D0, GND, and VCC are the analog output, digital output, Ground and positive voltage respectively. Rain sensors are provided with two loop pins that are + and-, which are sensor board hook up A and B respectively.



Fig. 3: Rain Sensor

6.3 Servo Motor

A servo motor generally consist of an output shaft through which the positioning of the shaft to a certain angle can be done using a coded signal which is sent by the servo. Servo motors are very useful in day-to-day life and are used in many appliances. Servo motors are very efficient and economical. Servo motors are small in size and can be placed in appliances for performing the desired action more effectively. Servo motors are very efficient and low energy consuming motors. These servo motors are controlled by using pulse width modulation, where a control wire is used to send electrical pulses. Minimum, Maximum pulse and repetition rate are the three types of pulse width modulations. A servo motor has a total movement of 180° of which it turns 90° in either direction. The servo motor rotates in clockwise as well as counter clock-wise direction.



Fig. 4: Servo Motor

6.4 Implementation

The rain sensing wiper system is constructed using Rain Sensor, Servo motor, LCD module, and Arduino. Whenever the droplets of the rain on the rain sensor, it senses the rainfall and sends Arduino the necessary information for the process to carry on. Arduino is a microcontroller board which is generally an Atemga8. The information sent by the rain sensor is processed by the Arduino and controls the servo motor based on the information processed. The LCD module is to display the information about the speed of the wiper and intensity of the rain. The rain sensor, which senses the rainfall is placed at the side corner of the windshield outside the car. The wiper blades are connected with the servo motor and are powered by it. LCD module is kept inside the car nearby the driver's vision. The rain sensor, LCD module, and the servo motor are connected with Arduino, which is present in the car connected to a dc source. The speed of the servo motor is increased whenever the intensity rises from low to high. There are three different speeds for the Low, Medium and High intensity of the rainfall. When the intensity of the rainfall increases, the rotation speed of the wiper will decrease automatically. Accordingly, the LCD module displays the information.

7. RESULT

The LCD module displays the intensity of rainfall ranging from NIL to low, medium, high. When there is no rainfall, the LCD display will show the intensity of rainfall as NIL. When the rain begins, the rain sensor senses the rain automatically and sends a signal to the LCD and displays the intensity of the rainfall ranging from low to high. When the intensity of the rainfall changes, the rain sensor senses the intensity and sends a signal to the servo motor and the servo motor will increase the speed of rotation accordingly.

8. CONCLUSION

The automatic car wiper system was developed to sense the rain and wipe the glass by moving the windshield wipers. By using automatic car wiper system, the purpose of driver's response to control the wiper is automated. It is demonstrated and proved that the rain sensors response to the rain for moving the windshield wipers is less than 400 milliseconds. Though the automatic car wiper is designed using rain sensor and Arduino, it can be advanced by replacing the rain sensors with IR sensors for accurately

determining and detecting the rainfall. If you opt for using a wiper which is not only economical but also efficient, using a rain sensor is the best. To advance the movement and to change the system different sensors which are useful for this purpose can be selected.

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