

# Automatic Control of Rain Sensing Wiper And Headlight in Vehicles

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**Abstract**—This paper describes about the design of automatic control of rain sensing wiper & headlight in the vehicle. It involves two automated parts of vehicles- automatic rain sensing wiper & automatic headlight. Automatic rain sensing wiper consist of rain sensor, microcontroller and motor driver IC whereas headlight portion consists of transistors, LED and LDR sensor. This project is designed keeping in mind the reduction of distractions of driver while driving in humid condition and at night. These systems are very much helpful and it makes driver free to concentrate only on the driving without any distractions and disturbance.

**Keywords**—Rain sensor, Microcontroller Atmega 328, Motor driver IC L293D, LDR, Transistor

## I. INTRODUCTION

In recent years' researchers are trying to develop the automation of the vehicle parts for safety, reliability and flexibility. Generally manual things at the time of driving may cause dangerous distraction for the driver. Distractions are taking drivers off the road may cause unfortunate accidents. Southern part of Asian countries has been placed within top 100 accident happening countries in the world (WHO 2011) [1].

Automatic rain sensing wiper is a system which automatically operates on sensing the water droplets on the rain sensing board. The manual wiper system requires driver constant attention in adjusting wiper speed using manual switch. It is also observed that sometimes windscreen is covered with dust particles during moving vehicle which could be another cause of accident. The manual control of the wiper distracts driver's attention which may be cause of frequent accident. This project is designed to minimize the driver's work by setting automatic control system for windshield wiper and headlight. Automatic rain sensing wiper consists of rain sensing board, sensor module, microcontroller, motor driver IC and a wiper consists of an arm connected to DC motor.

Rain sensor board is connected to the sensor module which generates the proper input signal for the microcontroller. Microcontroller is programmed for its intended functions and it drives the motor driver IC depending on the input and instructions.

Motor driver IC L293D drives the motor in either direction. It works on the concept of H-Bridge which allows the voltage to be flown in either direction.

Automatic headlight consists of LDR sensor. It automatically switches on the headlight, there is no need to switch on the headlight manually. This eliminates the distractions for the driver. The automatic headlight system reacts like the human eye to outside light levels and independently turns the light on and off when needed. Such a system offers both safety and convenience.

The circuit can be helpful when driving on roads with many tunnels, sunset, and even in foggy, icy, stormy and rainy conditions. For example, when the vehicle enters a dark tunnel, the driver will not have to fumble for the headlight switch. The cars headlight will automatically switch on after sensing the poorly lit tunnel, the headlights will switch off.

Previously some projects are designed which describes semi-automatic rain sensing wiper & sun visor, whereas in this project the rain sensing wiper is fully automatic and automatic control of headlight is also designed.

## II. METHODOLOGY

Automatic rain sensing wiper screen is mounted in the vehicle model in front of driver seat which act when there is rain fall on the rain sensing board which is fixed at the screen. Wiper's one end is fixed with motor and other is free to move. Rain sensor board is connected to the sensing module and further the sensing module is connected to microcontroller. The microcontroller gets the input from the sensing module and it drives the motor driver IC, the motor driver IC is responsible for the motion of the wiper in either direction, as shown in figure 1(a).

Automatic headlight is set at the front of the vehicle model. LDR is bent to the front side which senses the amount of light present in front side of the vehicle. In the presence of light LDR has low value of resistance and will increase as the intensity of light decreases due to which a varying voltage drop can be obtained across it with changing ambient light conditions. Transistors are present in the system.

In day time the resistance of the LDR is low and therefore the voltage across it is not much enough to switch on the transistor, whereas in dark the resistance of the LDR becomes high due to which the voltage across it increases enough to turn on the transistors. So, the current flows and the headlights start glowing, as shown in figure 1(b).



Figure 1(a).



Figure 1(b).

### III. IMPLEMENTATION

#### Automatic Rain Sensing Wiper-

The designed system consists of following main components.

1. Rain sensing board
2. Sensor module
3. Microcontroller (ATMEGA 328)
4. Motor driver IC (L239D)
5. D.C. motor
6. Wiper

*1. Rain sensing Board:* Rain sensor board is a printed circuit board designed in following manner as shown in Figure 2. which collects the rain drops. As the rain drops are gathered on the circuit board they create path of parallel resistance that are measured by the op-amp.

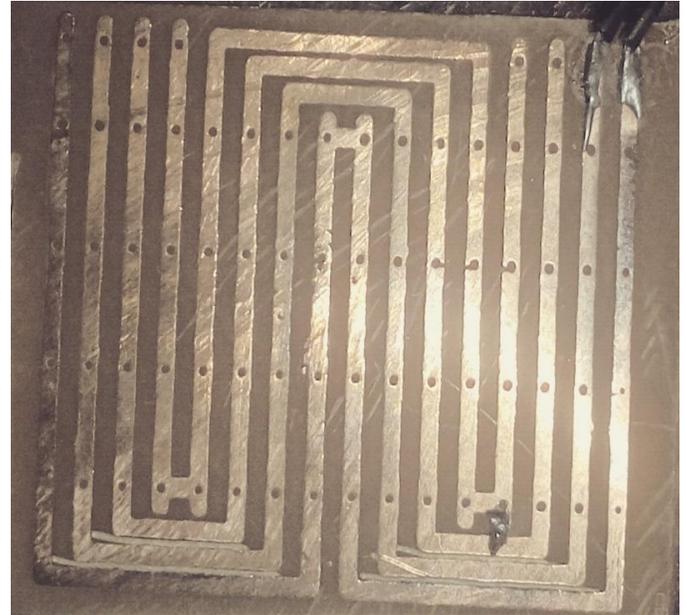


Figure 2- (Rain sensor board)

*2. Sensor module:* The sensor module allows to measure moisture through the output pins and it provides a digital output when a threshold of moisture is exceeded. The module is based on the LM393 op-amp.

Figure 3. shows the description of sensing module.

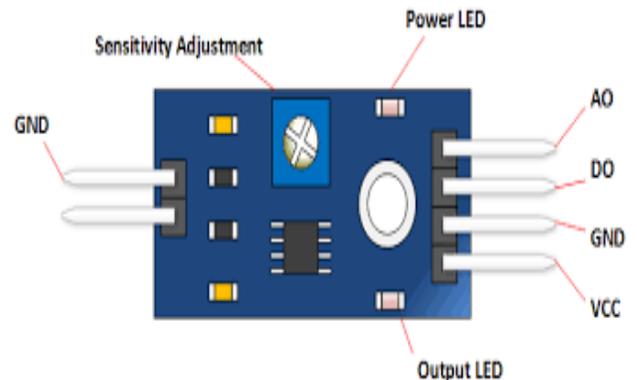


Figure 3- (Rain sensing Module)

Following are the description of the rain sensing module:

- VCC +5v power source.
- GND Negative power source.
- DO Digital output. Goes low when moisture exceeds the set threshold.
- AO Analog output- 0 to 5v.  
Lower is the voltage, greater is the moisture.
- Power LED Indicates that the power is applied.
- Output LED Illuminates when moisture exceeds the threshold set by sensitivity adjustment.

Sensitivity adjustment: Clockwise is more sensitive and Counter clockwise is less sensitive.

3. *Microcontroller:* ATMEGA 328 [2] microcontroller is used in automatic rain sensing wiper system, which is programmed to control the wiper by driving the motor driver IC. Figure 4. shows the picture of microcontroller IC used in the system while Figure 5. Shows programming screenshot part which is burned in the IC.



Figure 4- (Atmega 328)

```
#include <p18cxxx.h>
#include <usart.h>
communication
#include <i2c.h>
#pragma config LVP=OFF
#pragma config WDT=OFF
void rx_handler (void);
void initialize (void);
the C-D Converter
void get_data (void);
for the C-D Converter

long int loop;

unsigned char StatusReg = '0xFF';
status register of the AD7745
unsigned char CapDacValue = '0x00';
to ensure proper operation

unsigned char CapHIGH = '0x00';
unsigned char CapMED = '0x00';
capacitive data
unsigned char CapLOW = '0x00';
capacitive data

unsigned char VtHIGH = '0x00';
data
unsigned char VtMED = '0x00';
capacitive data
unsigned char VtLOW = '0x00';
capacitive data
```

Figure 5- (Programming screenshot)

4. *Motor Driver IC:* Motor driver IC L293D is a typical motor driver IC which permits DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction.

It works on the principle of H-Bridge which allows the voltage to flow in either direction.

Figure 6. shows the pin diagram of motor driver IC L293D.

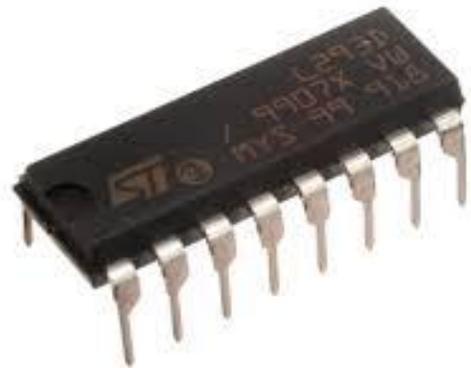
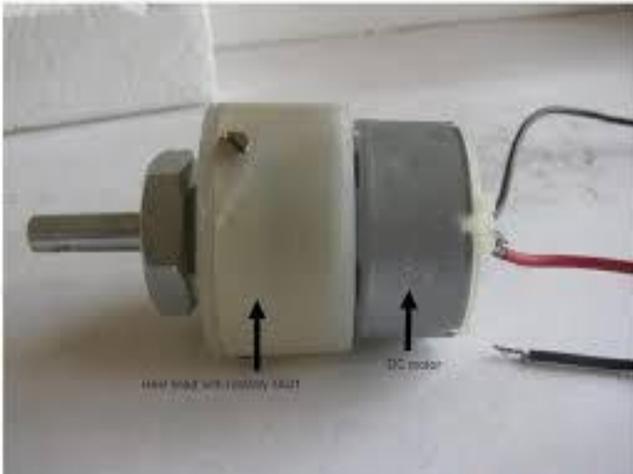


Figure 6- (Motor Driver IC L293D)

5. *DC motor:* DC motor is used in the system to rotate the wiper, it converts the electrical energy into mechanical energy. In Figure 7 picture of DC Motor is shown.



**Figure 7- (DC Motor)**

6. *Wiper*: This is a mechanical part of the system which is responsible for removing the rain drops from the screen of the vehicle [3]. Figure 8. shows the wiper portion of the system.



**Figure 8- (Wiper Portion)**

#### *Automatic Headlight-*

Automatic headlight is the latest technology used in today's cars. The technology remove the need for the driver to manually switch on or off the headlights in most driving situation.

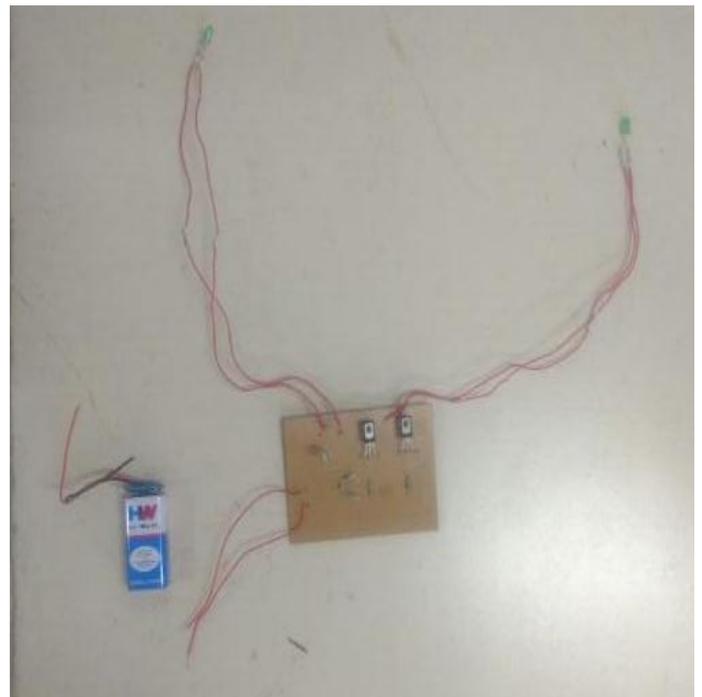
The circuit is made up of using LDR sensor. The automatic headlight systems react like the human eye to outside light levels and independently turns the lights on and off when needed.

Basically, an LDR is a resistor (light dependent resistor) whose resistance decreases with increase in the intensity of incident light. Usually, an LDR exhibits very high resistance in darkness and low resistance in the presence of ambient light [4]. Hence varying voltage drop is obtained across it with changing light conditions.

In the presence of light the LDR has low value of resistance [5], due to which the available voltage is not much sufficient to conduct the transistors. But in the situation of darkness LDR has high value of resistance resulting in much more availability of voltage that conduct the transistors and turns on the headlights.

Figure 9. shows the diagram of the headlight circuitry of the project, and Figure 10. representing the LDR sensor.

Head light portion is a simple circuitry of LDR sensor, transistors, resistors, battery and LED.



**Figure 9- (Headlight Circuit Portion)**



**Figure 10- (LDR Sensor)**

Figure 11 shows the finally implemented picture of the automatically controlled parts in the car model.



**Figure 11- (Complete Model)**

#### IV. CONCLUSION

The developed project is an improved version of intermittent wiper system. The system reduces cleaning of windscreen and improved driver's level of comfort to an extent. It provides a new dimension of comfort and aid to the drivers who work at night and traffic prone areas in all seasons where they already have to concentrate on break and clutch.

The automation of wiping of windshield during rain will provide them much ease and help them to concentrate on the basic ABC (Accelerator, break and clutch) of driving.

This work further includes automatic control of headlights. The system is designed using LDR (light dependent resistors) sensor which will automatically actuate headlight on finding concern level of darkness. The system is fully automatized as there is no need to turn on or turn off the headlight manually due to which it enhances the comfort level and maintain concentration of the driver.

#### V. FUTURE SCOPE

In future, more work can be done for the designing of automatic control of air conditioner, sun visor etc. parts of the vehicles for providing more comfort to the drivers while driving.

Also, a combined integrated panel can be created which can automatically control headlight, wiper, Air conditioner and sun visor.

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