

Automatic Wiper Control and Pothole Detection System

Renuka¹, Goutami Panchal²

MTech Students; Dept. of Electronics and Communication Engg.,
Dayananda Sagar College of Engg., Bangalore, VTU, Belgaum;
Email: renu.dhulgond@gmail.com, panchalgoutami@gmail.com

Abstract: The automatic wiper control system helps the driver to control the wipers effortlessly also it reduces the manual effort and provides safety to the driver. Nowadays, more accidents happen due to manual wiper which is used to wipe the raindrops, snow on windshield. The aim of this automated wiper control system is to increase efficiency of the vehicle, achieve high safety and to reduce man power and also to avoid vehicle accidents. The pothole detection system helps driver to avoid the potholes on the roads by giving prior warnings to him. A buzzer like warning will be sent to the driver on detection of potholes. The automatic pothole detection is implemented by using accelerometer as vibration sensor, which will help to get the pothole details. Through GPS we will get the location of the particular area and through GSM will send these details to the Government official website, which will help them to get the details of potholes in the roads, so that they can repair it as soon as possible.

Keywords: Arduino Uno, Rain Sensor, Vibration Sensor, Wiper Blade, DC Motor, GSM, GPS.

I. INTRODUCTION:

Rapid advancement in the automotive industry and in transportation systems has resulted in quicker means of travel. Owing to this faster moving traffic, drivers now cannot afford to pay much attention in controlling several additional independent systems manually. Such a system is the windshield wiper system, which clears the windshield during rain or snow to provide better visibility to the drivers. Controlling a wiper system manually can be very problematic in some situations. For instance, heavy-duty vehicle drivers have to control their vehicle's transmission manually. Windshield control is a vital operation of driver during driving. The mountings which are fitted in the windscreen can be automated by using sensors and microcontroller [1]. Improving human comfort in the existing system so that the driver can pay full attention in driving at all weather even in dusty, rainy or summer. The development of vision-based smart windshield wiper system that can automatically adjust its speed and intermittent interval according to the amount of water drops on the windshield. The system employs various image processing algorithms to detect water drops and fuzzy logic to determine the speed and interval of the wiper [2]. Also, to detect raindrops from in-vehicle camera images and recognize rainfall using time series information [3]. There are several advantages of having an effective road surface monitoring system, though they are very expensive. Such a system can identify problem areas early and the relevant authorities can be alerted in time to take preventive measures. Preventive measures always save money. We

stumbled upon a low-cost solution for road surface condition monitoring while designing an environmental pollution monitoring system called BusNet [4].

II. SCOPE AND IMPORTANCE:

To reduce the manual effort of driver, this better the driving experience and improves safety by converting manual windshield wiper system into an automatic system. By devoting attention in controlling the manual system driver safety is under threat, an automatic wiper system helps them to concentrate more on driving safely. Automatic pothole detection system helps the driver and also the government system to repair pothole quickly and easily.

III. COMPONENTS USED

- I. Rain sensor
- II. Vibration sensor
- III. Arduino Uno
- IV. DC motor
- V. GPS module
- VI. GSM module
- VII. Wiper blade

I. Rain sensor:

The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The module features, a rain board and the control board that is

separate for more convenience, power indicator LED and an adjustable sensitivity through a potentiometer.



Figure1: Rain sensor module

II. Vibration sensor:

Accelerometer is used as vibration sensor; accelerometer is a device that measures total specific external force on the sensor. For example, if the device is stationary, it will show some reading corresponding to earth's gravitational force. An accelerometer falling freely in the vacuum will show zero reading. The design of the accelerometer is often very simple.



Figure 2: Accelerometer

III. Arduino Uno

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.



Figure3: Arduino Uno

IV. DC motor:

DC motor is used here to control the speed of the wiper tap blade.

V. GPS:

GPS module is used to track the position of particular area. GPS or Global Positioning System is a network of orbiting satellites that send precise details of their position in space back to earth. The signals are obtained by GPS receivers, such as navigation devices and are used to calculate the exact position, speed and time at the vehicles location.



Figure 4: GPS module

VI. GSM:

GSM is used to send the data to the particular site wirelessly.



Figure 5: GSM module

IV. SYSTEM ARCHITECTURE:

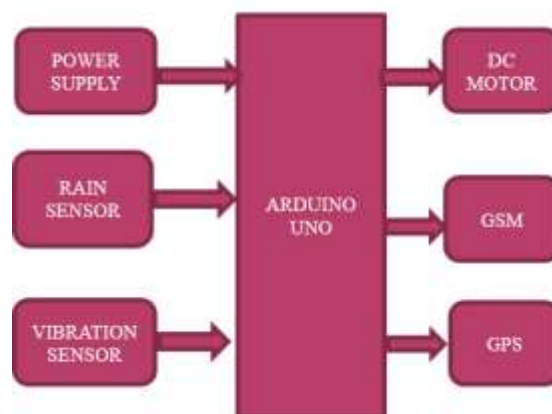


Figure6. System Architecture of Automated Wiper Control System.

Figure 6 depicts the block diagram of the proposed method; the rain sensor is connected to the analog input of the microcontroller (Arduino Uno) so that a sensor will be sent with the sensed intensity of rain drop values to the microcontroller. The microcontroller will send the control signal to the DC motor, which will start to wipe the rain drops depending upon threshold voltage we have mentioned in the program. So automatically motor will wipe the rain drops falling on the car glass. In automatic pothole detection,

we are making use of Accelerometer as vibration sensor which will sense the pot holes. We will give some threshold depth value in the program, so if a pot hole is above the threshold value; which means we will consider it as a pot hole. Using GPS, we will track the position of the particular area and through GSM will send the location details to the government site so that they can repair the potholes easily.

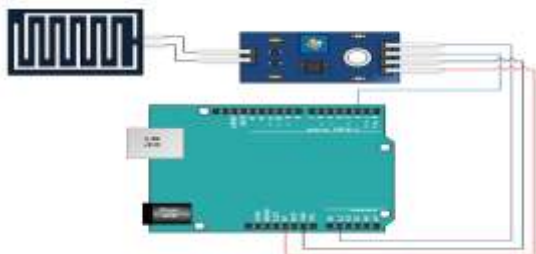


Figure7. Connecting Rain Sensor module to the Arduino Uno Board

V. WORKING PRINCIPLE OF RAIN SENSOR:

At normal condition: the resistance of the sensor is high. The voltages applied to non-inverting, i.e., low when compared to the inverting terminal voltage, in that time OP-AMP output is -12V. The transistor and relay is OFF condition, so the DC motor is in OFF condition.

At Rain Condition: in conducting, the resistance of the sensor is low due to conductance of two leads. The voltage applied to non-inverting terminal is high compared to the inverting terminal voltage in that time, the OP-Amp output is +12V, the transistors and relay are in ON condition. The analog output is used in detection of drops in the amount of rainfall. The signal is given to DC motor, so that it running continuously until the water is in dry condition.

VI. TESTING RESULTS:

The serial monitor shows the results when the raining module was soaked with water. Based on the amount of water, the analog output can read different levels of amount of water drop.



Figure8. showing no Rain

As water is continuously dropped to the module then we will get below status, i.e. Moderate Rain, Heavy Rain.

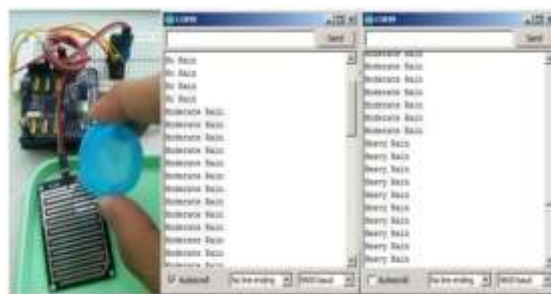


Figure9. Showing Moderate Rain and Heavy Rain

VII. CONCLUSION

The proposed method helped the driver in controlling the wipers automatically during the rainfall. The automatic wiper helped the drivers to concentrate more on driving safely. The automatic pothole detection helped the driver to avoid the potholes while driving, also it helped the government system to get the location of potholes and repair them.

REFERENCES

- [1] A.H.M Fazle Elachi, Mohammad Shafiur Rahman, "Intelligent Windshield for Automotive Vehicles", *International Conference on Computer and Information Technology (ICIT)*. Pp. 392-396, 2014.
- [2] Jee-hun Park, Man-ho Kim, Hong-jun Im, Kyung-chang Lee, Suk Lee, "Development of Vision based Control Smart Windshield Wiper System for Intelligent Vehicle", *SICE-ICASE, International Joint Conference*. pp. 4398-4403, 2006.
- [3] H. Kurihata, T. Takahashi, Y. Mekada, Ichiro Ide, H. Murase, Y. Tamatsu, T. Miyahara, "Raindrop Detection from In-Vehicle Video Camera Images for Rainfall Judgement", *First International Conference on Innovative Computing, Information and Control Volume (ICICIC'06)*. Vol. 2, pp. 544-547, 2006.
- [4] Kasun De Zoysa and Chamath Keppitiyagama. Poster abstract: Busnet - a sensor network built over a public transport system. In Koen Langendoen and Thiemo Voight, editors, *In Parallel and Distributed Systems Report Series — Adjunct Poster/Demo Proceedings of the Fourth European Conference on Wireless and Sensor Networks*, Faculty of Electrical Engineering, Mathematics and Computer Science, *Delft University of Technology*, number PDS-2007- 001. 2007