

Automatic Nano Coated Wiper Blade and Sun Visor Using PIC

A.Michael Sundarraj, Dr.V.Natarajan

Abstract— An innovation for a standard intermittent wiper is the concept of a smart wiper that automatically turns itself on or off and adjusts its wiping cycle according to the intensity of rain and automatically sun visor adjustment according to intensity of light. The system contain of PIC microcontroller, rain sensor, dust sensor, light sensor and DC motor to actuate the wiper. This project is focusing on improving human comfort in the system so the driver can drive full attention at all weather condition and increasing wiper rubber life at maximum years. This project focuses on increase durability of wiper rubber and driving comfortness using dual methods. First one is providing Nano coating on wiper rubber. Second one is reducing unnecessary contact with windscreen. Due to glass heat, dust residue and water content spoil wiper rubber durability, so It made to necessary to replace six month or one year once, otherwise it will not clean properly, finally it lead to scratch the windscreen. The complete windshield controlling system has been developed here to increase human comfort, flexibility and durability.

Keywords— PIC-Microcontrollers, light sensor, dust sensor, rain level sensor, Nano composites.

I. INTRODUCTION

An innovation for a standard intermittent of wiper is the concept of smart wipers that automatically turns itself on or off and adjusts its wiping cycle according to the intensity of rain and automatic sun visor adjustment according to intensity of light. This system comprise of PIC (peripherals interface controller) microcontroller , rain sensor, dust sensor, light sensor and DC motor to actuate the wiper, This project focus on increase durability of wiper rubber and driving comfortness using dual methods . First is based on Nano coating on wiper rubber, second on reducing unnecessary contact with windscreen using telescopic method. Due to glass heat, dust residue and water content spoil its durability, so It made to necessary to replace six month or one year once, otherwise it will not clean properly, finally it lead to scratch the windscreen. To avoiding this problem, there is providing Nano composites coating on the wiper blade. Nanocomposites are provided with outstanding properties different from ordinary material-reinforcing and toughing, which have great potential and prospects. It will protect wiper rubber from wear, dust, and water particles. Another concept is rotating wiper arm up to 45 degree at the rest condition, it avoiding contact with windscreen at unwanted time. The wiper acceleration has been

controlled by a water level sensor which regulates the wiper motor through sensing the level of water or rain. Dust sensor has been integrated to spill some water in the windscreen and then wipe it. It sense when a certain level of dust get accumulated in the screen. The automated sun visor has been designed to be controlled through a light sensor. PIC microcontroller is control the overall automaton system it's getting signals from sensors according to the signal. This pivotal concern is to render more attention of the driver on the road.

II. EXISTING SYSTEM

Automotive vehicle is mounted with a windscreen at its front. It serves its purpose as the switch gets on manually by the driver which is situated alongside the steering wheel. Its function is to keep the windscreen clean from raindrops, snow, dust etc. This project aims to develop an automatic control system for the wiper where the driver won't have to turn ON the switch manually. A control system has been developed which contains water sensor, dust sensor, light sensor, relay switches, wiper motor, servo motor and PIC microcontroller. A water sensor is attached with the windscreen which gives signal when even a small amount of raindrop falls. The microcontroller receives the signal through relay and act as it has been programmed. Through this process the wiper responses with the raindrop. Here a dust sensor is also attached which responses after getting a certain amount of dust in the windscreen. By the same process it open up the spray pump to spill water in the windscreen which again gives signal through the water sensor and make the wiper motor ON. It should be noted that the wiper motor speed vary with the level of immersion of the sensor

For sensible turning of sun visor a light sensor could be attached in the windscreen. To rotate the sun visor to a comfortable position of the driver the shaft of the servo motor must be rotated according to the signal. When sunlight fall on the light sensor, it will measure the light intensity using reflection as well as send the signal to control board. The servo motor turns on when light intensity gets higher which may cause a distraction for the driver. Servo motor transfers the rotation to the flap of sun visor which is set at an angle for shading the eye and face. Figure 8 depict the rendered image of designed sun visor. It will rotate by the power given to it according to the program uploaded in the microcontroller.

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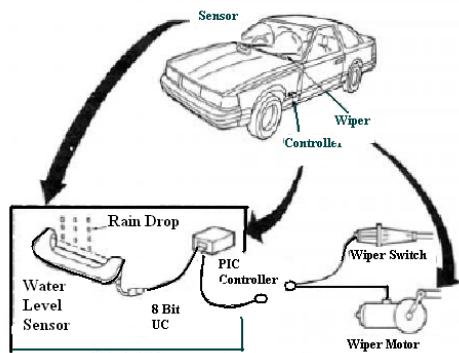


Fig.1. System Implementation on Car

III. WORKING METHODS

Microcontroller is heart of this whole system and controlling wiper oscillation, servo motor motion and sun visor actuation of wiping system. It operates by power supply providing by battery, it is getting signal from sensors such as water, dust, light sensors and controlling the mechanical motion of the wiper. The water sensor is sense the level of water or rain and send signal accordingly to microcontroller. The microcontroller send signal to servomotor to tilt zero position of wiper that means contact position, then wiper motor get signal and then start oscillation.

The dust sensor is sense the level of dust accumulated on the windscreen, send signal accordingly to the microcontroller, it first send signal to spray motor and spray some water on wind screen then servomotor, then wiper motor got signal and oscillate. Light sensor is sense light intensity of sun and send signal accordingly to controller,

The controller actuates the sun visor. The drawing is representation of working block of auto – wiping system shown below.

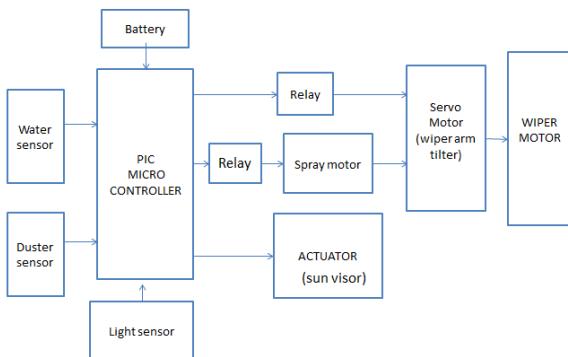


Fig.2. Block diagram for wiping system

IV. PHYSICAL COMPONENTS

A. wiper mechanism

Each automotive vehicle is incorporated with wiper mechanism to clean the windscreen when needed. It has multiple components linked along to serve its purpose. Such as wiper motor, cam assembly, wiper blades, joins nuts etc. For automatic control of the wiper some components are used

to create the control system. Such as water sensor, dust sensor, microcontroller board, relays etc.

B. Microcontroller

In this project PIC18f2580 is use with CAN facilities. The controller area network (CAN) is a serial communication network protocol. It is define a standard for efficient and reliable communication between sensors, actuators, controller, and other nodes in real time application.

C. Sensors

Three sensors have been used for this project.

- (a) Water sensor (b) dust sensor (c) light sensor

Water sensor: Rain level sensors are useful device for automatic wiping of vehicle windscreens when it is wet due to moisture, rain drop or even mud. It measures the amount of water inside tube with respect to time within the windscreens. When water level is increase with respect to raindrop fall onto the windscreens, then system then activates the wiper to operate in full automatic mode. The main features are automatic wiper activation and deactivation and intelligent wiper speed control. The dust sensor designed to sense dust particles. This dust sensor gives a good indication accumulated on the windscreens. The light sensor is a passive device that converts this "light energy of sun light into an

electrical signal output. Light sensors are more commonly known as "Photoelectric Devices" or "Photo sensor" because they convert light energy (photons) into electricity (electrons)

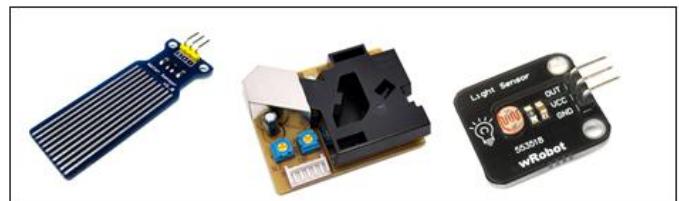


Fig.3. Different type of sensors (water, dust, light sensors)

D. Motors

The mechanism behind the moving wiper is the windshield wiper motor, which provides the capacity to run. A linkage converts the rotational output of the windshield wiper motor into the back-and-forth motion of the wipers. A worm gear controls the force that the windshield wiper motor delivers to the drive arm by slowing down the speed of the electric motor by 50 times while multiplying the torque by 50 times.

Wiper motor with wiper



Fig.4. (a) Wiper motor (b) wiper arm assembly.

E. Sun visor:

The sun visor is a component of an car and goods vehicle, which is located on the interior just above the windscreen. They are designed with a hinged flap that is adjustable to help shade the eyes of drivers and passengers from the glare of sunlight.



Fig.5. Sun visor

V. PROPOSING SYSTEM

Here proposing two methods to increase life, durability and reinforcing of wiper rubber, that's mentioned below

A. Wiper arm tilting system

B. Nano coating on wiper rubber

The both system is fully focusing on wiper rubber. The first system helps to reduce unnecessary contact with windscreens, due to this can protect from glass heat as well as sun light, dust particles and water contaminant. The second system Nano coating on wiper rubber it is resist wear and also it not allow to adhesive at any particles on the wiper rubber.

VI. PHYSICAL COMPONENT OF PROPOSED SYSTEM

The physical components of the system shown below. Its chemical and hardware materials such as requirement of nano coating epoxy resin, organic rubber powder, inorganic alumina. The components for wiping arm tilting servomotor, wiper arm, joints, packages.



Fig.6: proposed physical components epoxy resin, organic rubber powder, inorganic alumina-powder, servo motor, wiper rubber.

VII. PROBLEM IDENTIFYING

How to find out the worn out wiper, it we can found easily if

worn out wiper will not clean the

water properly as well as dust. First stage Line coting will form on the wiper improper cleaning second stage it get juddering on screen struggle to smooth movement third stage leaving unwashed margins, next stage it making noise like screech, finally it make scratch on wind screen.

This problem occur due to continues contact with wind screen, glass heat, sun heat, dust contaminant on the wiper rubber,

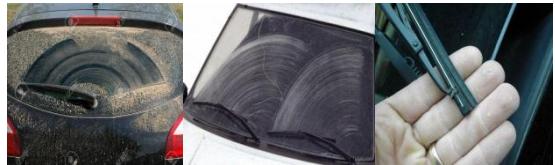


Fig.8. Worn out wiper



Fig10. New wiper cleaning



Fig11. Stages of wear

VIII. METHODOLOGY

A. wiper arm tilting:

In this method the wiper arm getting rotate at 45 Deg by using stepper motor, the motor split arm into two piece (as shown in fig). Namely it is head and tail arms. In head arm one end connected with wiper motor another end connected to stepper motor. In tail arm one end connected with stepper motor another end connected to wiper blade, the blade contain wiper rubber. The rubber connected with wind screen at default it may be summer nor rain season, it's take most important role of cleaning the windscreens hence it has to face direct sunlight heat, reflection of glass heat, more dirty dust, water contaminant, friction with glass, those are causes to damage the wiper.

This method helps to protect wiper from above mentioned sunlight heat, glass heat, dust, and water contaminants problems. Once stopped wiping oscillation, it wait for another oscillation until 15 Min, if there isn't any movement the stepper motor start to tilt the tail wiper arm it contain wiper blade and rubber. There is placed a cover assembly permanently at the seating area.

B. Nano composite coating on wiper rubber:

Nano coating on a wiper rubber is a process. In this process the Nano composites will apply on wiper rubber by using spray gun or brush type at 333k(60 deg Celsius) of room temperature for 30 Min. The hole process is called curing process. This coating used to protect as well as reinforcing the rubber. Nano composite consist of inorganic alumina, organic nitric rubber Nano - powder. The two Nano particles are adding with epoxy resin for improving surface strength.

C. Testing method:

The testing method can carry out wear measurement manually by continues oscillation based on hours we can find level of wear before and after applying Nano composites on wiper rubber. Otherwise we can measure hardness of rubber by using Durometer tester. For abrasion test can use Rotary abrasion tester. The wiper arm tilting system and auto wiping system can check it out visibly.

IX. DESIGN FOR LOCATION OF SENSORS AND WIPER ASSEMBLY

Its represents sensors and wiping area, where it has to locate, it should not disturb the driving visibility same time suitable for sense intensity of light as well as rain, dust levels.

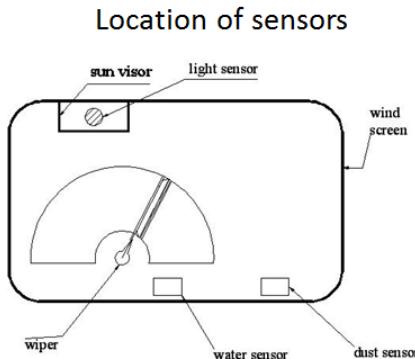


Fig.7. Location of wiping area and sensor.

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X.CONCLUSION

The automatic wiping control system is improving driver level comfort. It gives a new dimension of comfort. It gives dimension of comfort and aid to drivers who work at night and traffic prone area where they already have to concentrate on break and clutch. The removal of controlling the wipers during rain will provide them much ease and help then concentrate on the basic ABC(acceleration, break, clutch)of driving and all so the mixture of two improved surface strength and elastic modulus of the epoxy composites, also increase wear resist, and resistance to plastic deformation. Alumina nanoparticles can increase the thermal diffusivity at high content. The mixed filler can be helpful to obtain the epoxy Nano composites with optimal surface strength properties and thermal conductivity and also keep away wiper blade from windscreens hence increasing rubber durability. The whole process has to implement.