Intelligent Rain sensing Smart Windshield wiper system

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Abstract: This is an era of automation where it is broadly defined as replacement of manual efforts by mechanical power in all degree of automation. While using traditional wiper system it requires driver’s constant attention in adjusting the wiper speed and intermittent wiper interval, because the amount of on the windshield constantly varies according to time and vehicle speed. Despite this, automatic rain-sensing wiper systems are relatively uncommon in modern vehicles for a number of reasons. They are often too expensive, too unsightly, or too unreliable to be desired in new automobiles. For this we present the Vision-based Smart Windshield wiper system which is automatically sense the amount of rain on windshield and according to the speed of rain adjust the speed of wiper system. The system is based on CAN technology. For achieving this system various method, sensor and mechanical design were tested and finally we came up with model with use of CAN technology. The cyst of this project is that the speed of wiper is directly proportional to rain level.

Keywords: PIC 18F4580, comparator IC 4049, motor windshield wiper

I. INTRODUCTION

Windshield wiper system is important because they permit during rainy & snowy condition. When intelligent added it offer the potential to enhance safety and convenience significantly for both driver and passenger. Many attempts have been made at constructing an effective, reliable, and cheap rain detection and wiper control. To measure the amount of water usually use optical sensor. In this type of sensors uses the fact that the refraction angle and the amount of reflection of the light are different when the 2 windshield is wet. Even though optical sensor are used widely they have some disadvantage One of disadvantages is the sensitivity to external light. Another problem is occurs 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 lot. Another shortfall, maybe a major one is that the sensing area is a relatively small portion of windshield. Hence the system operate only with limited area.[2] The wiper system may fail to activate when there are some raindrops on the driver’s line of sight, but not on the sensing area. They are often too expensive, too unsightly, or too unreliable to be desired in new automobiles. Therefore, the design of CAN-based car windshield wiper control method should analyze the traditional control theory of windshield wiper, aim at improve the holistic performance of car, compare the input signals and output signals between the traditional control method and information integrated control method, cancel or utilize the assistant component of electric device applied in traditional control method, and finally implement the transfer from the traditional control method of car windshield wiper to CAN-based information integrated control method.[10].

In this paper, we present the concept using a vision-based smart wiper system that a driver to collect visual information during precipitation. Using PIC microcontroller with CAN (Controller Area Network) facilities. Use of CAN controller because that combine the connection between windshield wiper switch, windshield wiper motor and windshield wiper restoration machine, and related unit. This was originally developed for use in cars but now used in industrial automation and control applications. CAN is a high-integrity serial data communications bus for real-time control applications. Basically to achieve this system we used comparator IC 4049 with PIC microcontroller. IC 4049 used for the rain level detection. As soon as rain level increases which gives the relative voltage to the IC 4049. IC 4049 compare this voltage to the previous voltage and gives the output voltage to the PIC microcontroller the ADC unit inside microcontroller detect the IC input gives the signal to another microcontroller through CAN bus then pass it to the motor controller IC L293D and according to that speed of wiper is vary.

The problem definition is to design a prototype for a PIC microcontroller (PIC18F4580) based vision system aid in windshield assembly which controls the windshield wiper speed based on the amount of water. For this a comprehensive study of sensors, actuators and mechanical design was done. Developed hardware module and the software
separately. When the wiper switch is in the ON position, a rain level unit which is mounted inside windshield glass to detect the amount of raindrops, and controls an optimal wiping timing accordingly.

The subsequent sections will describe the system overview of the windshield wiper where the whole technique of how a windshield wiper works has been described. After that in the third section the hardware and software to be used are described. The fourth section covers the designing part followed by result and conclusion.

II. SYSTEM OVERVIEW OF CAR WIPER SYSTEM BASED ON CAN

In this section, the general working of a is described the PIC18F2580 with CAN facilities and windshield wiper is analyzed.

In this project PIC18F4580 use with CAN facilities. The Controller Area Network (CAN) is a serial bus communications protocol. It defines a standard for efficient and reliable communication between sensor, actuator, controller, and other nodes in real-time applications. The early CAN development was mainly supported by the vehicle industry: CAN is found in a variety of passenger cars, trucks, boats, spacecraft, and other types of vehicles. The protocol is also widely used today in industrial automation and other areas of networked embedded control, with applications in diverse products such as production machinery, medical equipment, building automation, weaving machines, and wheelchairs. In the automotive industry, embedded control has grown from stand-alone systems to highly integrated and networked control systems. By networking electro-technical subsystems, it becomes possible to modularize functionalities and hardware, which facilitates reuse and adds capabilities.

Fig 1 and fig 2 is a block diagram of the active and controller circuit. In Fig at input section we give various level inside the windshield water tank inside that water insert a ground cable. When water level increases a ground cable are in connected state and gives voltage to the to C 4049. The ADC unit inside the PIC microcontroller detect the input voltage from IC 4049 and with the help of CAN bus forward this voltage to another PIC microcontroller. The microcontroller gives PWM signal to L293D motor driver IC and according to that adjust the speed of wiper.

The relay circuit is controlled by microprocessor output. The relay is turned on and off to drive the wiper motor. Pulse-width information corresponding to the diameter and number of raindrops is stored in the microprocessor, and is initialized each time the wiper motor is driven.

III. HARDWARE AND SOFTWARE

This section describes the hardware required for actual implementation and the software used for designing and simulating the test results. The speed of the wiper is controlled electronically with the help of the microcontroller. In the software Description, the programming flow is discussed using MPLAB IDE V 8.30+ for complete Development environment and simulation software Proteus.

A. Hardware Description
The rain level is used to detect the amount of the rain and give the signal to the controller via 4049 IC. The ADC in the controller detects the sensor input and gives the signal to the driver circuit. The motor driver actuates the motor to run at high speed or low speed based on the amount of the rain level detected. The rain level detect the level of water content on the windshield and based on the amount of water deposited on the windshield, the speed of the wiper is controlled. If the water level or the rain dew deposited on the windshield is more, then according to time to fill water tank speeded of wiper move automatically. In that case, the system will turn on the wiper motor to activate at high speed using the driver circuit. If the level of water content is low, then the wiper motor is activated at low speed. Here the speed of motor is directly proportional to the rain level detection. These are the basic building blocks of the hardware besides the resistors and capacitors that are required for any electronic circuit.

B. Software Description

The software used designing and simulating the test results were Proteus 7.0 and ‘C’ 18 MPLAB C language compilers. MPLAB IDE V 8.30+ for complete Development environment. Proteus 7.0 is a Virtual System Modeling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller based designs. This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons. One of the main components of Proteus 7.0 is the Circuit Simulation -- a product that uses a SPICE3f5 analogue Simulator kernel combined with an event-driven digital simulator that allows users to utilize any SPICE model by any manufacturer. Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display for a neat design prior to hardware prototyping.

IV. IMPLEMENTATION OF VISION BASED WINSHIELD WIPER SYSTEM

The basic control units of the hardware comprises of power supply unit, control switch, wiper motor, rain level detection circuit, motor driver circuit, moisture sensor, temperature sensor and the most important of PIC controller. Power supply unit maintains the continuous power to the controller and the wiper motor. Control switch is directly connected to the controller. Motor driver circuit is linked with the wiper motor and the controller. The command it gets from the controller is used to either drive the wiper motor or switch it off. Rain level detection circuit detects the amount of water level on the windshield and accordingly sends the signal to the controller.
other two fig shows the active and control block PCB.

Rain level detection circuit is a highly versatile device which is for automatic wiping of vehicle windscreen when it is wet due to moisture, raindrops or even mud. It measure the amount of water inside tube with respect to time within the windscreen. When water level are increase with respect to raindrops fall onto the windscreen, then system then activates the wiper to operate in full automatic mode. The main features is Automatic wiper activation and deactivation and Intelligent wipers speed control.

V. CONCLUSION

Up till now we have to developed CAN controller for an automatic wiper control system which is improved version of intermittent wiper system. And after that the full automatic wiper system implemented This wiper system reduce cumbersome wiper operation and improve driver’s level comfort. It will give a new dimension of comfort and aid to the drivers who work at night and traffic prone areas where they already have to concentrate on brakes and clutch. The removal of controlling the wipers during rain will provide them much ease and help them concentrate on the basic ABC (accelerator, brake and clutch) of driving.

REFERENCE

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