Intelligent Rain Sensing using Automatic Wiper System

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ABSTRACT
Over the past two decades, the automotive industry has aggressively researched ways to exploit modern computing and electronic advances in the development of safety, reliability, and entertainment technologies for vehicles. With drivers exposed to an ever increasing number of distractions, automatic rain-sensing wiper systems become an even more appealing feature, as they work to minimize the time the driver must take his/her hands off the wheel. Most traditional systems offer intermittent as well as variable speed operation. The traditional wiper system however requires driver constant attention in adjusting the wiper speed .Traditional windshield wiper speed constantly varies according to time and vehicle's speed. Because the manual adjustment of the wiper distracts driver's attention, which may be a direct cause accidents. This is review paper for automatic wier in various method and also explain the basic skeleton for adjust speed of wiper automatically cording to the amount of water on the windshield and in addition with also in advance removal of moisture inside the car while raining. The system activates the wiper to operate in full automatic mode and detect moister using CAN technology.

Keywords
Moisture sensor (SH200), PIC 18F/16F series Microcontrollers with CAN function provisions, temperature sensor, moisture sensor, rain level sensor.

1. INTRODUCTION
Over the past two decades, the automotive industry has aggressively researched ways to exploit modern computing and electronic advances in the development of safety, reliability, and entertainment technologies. 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. Many attempts have been made at constructing an effective, reliable, and cheap rain detection and wiper control system for vehicles speed and intermittent interval automatically according to the amount of rain. 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 sensors 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.

For solving these problems, In this paper, we present the concept using a vision-based smart wiper system that a driver to collect visual information during precipitation this is done Using PIC microcontroller with CAN (Controller Area Network) facilities. Use of CAN controller because that combine the connection between windscreen wiper switch, windscreen wiper motor and windscreen 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. CAN controller has master and slave system. Slave system collect the information about like amount of rain, temperature, moisture from sensor and from various other unit. This information sends it towards mater for father processing. Master analysis that data and take a decision and make logic. The decision include at what speeded the wiper motor rotate, and check whether there is any change in outer and inner temperature if there is small changes then no action to be taken, and if there is vast changes in temperature then which will automatically make the response to the presence of moisture and according adjust that temperature and remove moister inside car windshield.

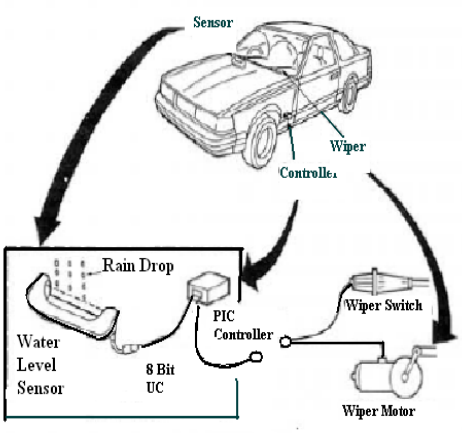

Fig 1. System Implementation On Car

The problem definition is to design a prototype for a PIC microcontroller (PIC18F2580) 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. Development of hardware module and the software has progress. The basic method used for designing the circuit is that a rain level sensor will detect the amount of rain and give the signal to the controller. 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 rain detected. The microcontroller used for the design is PIC18F2580. Here this been confined towards automatic windshield wiper which has a lot of advantages over the basic Technology that is used

normally in today's world. The subsequent sections will describe the basic working 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.

2. PIC18F2580 with CAN facilities

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

In this project PIC18F2580 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. CAN is the de facto standard in a large variety of networked embedded control systems. 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.

Block Diagram:

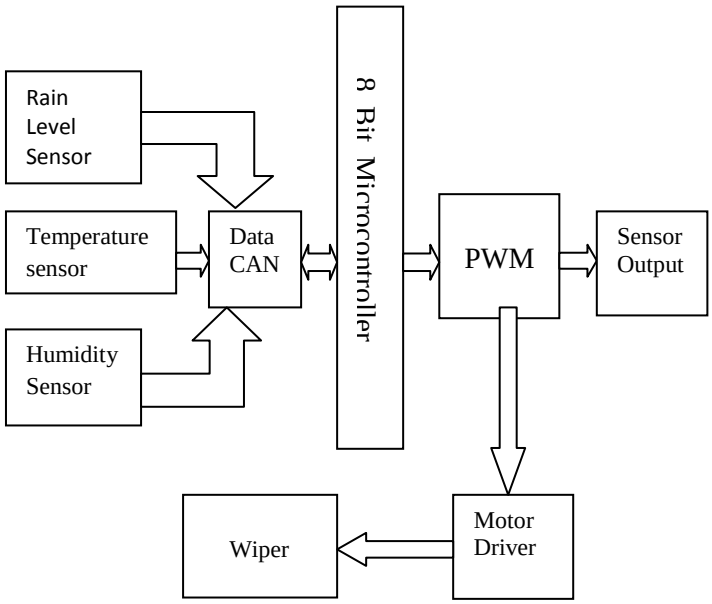

Fig2: circuit diagram

Fig 2 is a block diagram of the controller circuit.

In Fig the three sensor temperature sensor, rain level sensor and humidity sensor are three input section which given to data CAN the receive input and wiper operate automatically by using PWM signal using speed control IC

2.1 Sensor signal input section

The sensor signal from various sensor is fed to CAN

Which is convert the amplitude and send it to the 8 bit microcontroller which converts the amplitude *V*p of the raindrop signal into pulse-width information. This pulse-width information is read into a software counter in the microprocessor to determine the degree of rainfall.

2.2 Output section:

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. and

Humidity and temperature also vary according to the internal car temperature

3. 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.

3.1 Hardware Description*:*

The rain sensor is used to detect the amount of the rain and give the signal to the controller. 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 sensor will 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.These are the basic building blocks of the hardware besides the resistors and capacitors that are required for any electronic circuit

3.2 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.

4. HARDWARE IMPLEMENTATION:

The basic control units of the hardware comprises of power supply unit, control switch, wiper motor, rain level sensor ,motor driver circuit, moisture sensor, temperature sensor and the most important of all 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 detection sensor detects the amount of water level on the windscreen and accordingly sends the signal to the controller.

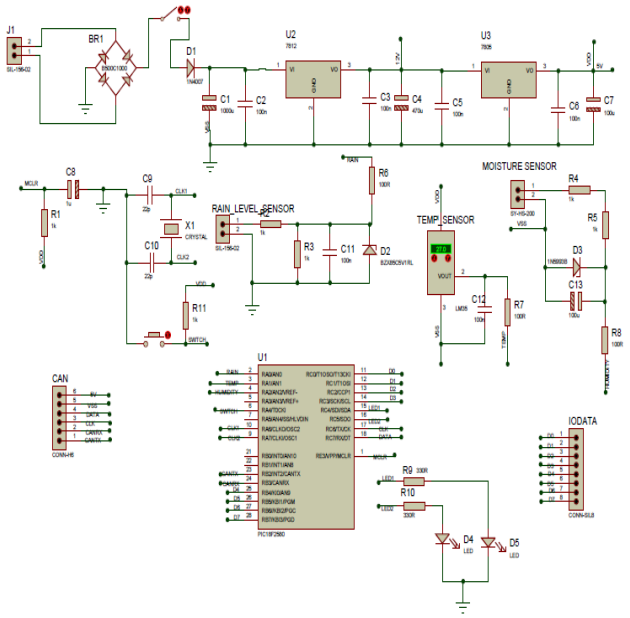

Fig. 3: Control Block

4.1 Temperature sensors

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

4.2 Rain level Sensor (SL-156-02)

Rain level Sensor is a highly versatile device 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 .

4.3 Humidity Sensor(SY-HS-200) :

Humidity Sensor module is used to take input from various physical parameter. like inside and outside temperature and moister . If temperature are varied then adjust that temperature so that moister are not inside windscreen. Humidity sensor gives both moisture and temperature outputs are available in analog as well as two digital formats.

5. CONCLUSION:

We have to developed an automatic wiper control system which is improved version of intermittent wiper system. 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. Our system features high accuracy, high sensitivity, and non-contact measurement. The system are used as component in home automation system because it can detect a sudden rain and notify people in the house.

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