

Integrated Automatic Control Systems for Headlight Modes and Wiper Speed

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Abstract

The focus of this research is on headlight modes and integrated automated control systems for wiper speed. When driving at night, the majority of motorists utilise their high lights. The individual moving in the other direction finds this uncomfortable. For a brief while, a bright glare blinds the motorist, which increases the risk of nighttime traffic accidents. The suggested solution automatically turns high beam into low beam to reduce glare in order to prevent such occurrences by detecting the approaching vehicle using an LDR sensor. The suggested model incorporates an automatic wiper system that uses a rain sensor to detect the rain and its density. Based on the rain density, the wiper speed is automatically adjusted as designed in order to prevent the issue. Alcohol is detected using a gas sensor, and if any is found, the machine will be shut down immediately.

Keywords: *Rainfall sensor, Atmega8, Gas sensor, LDR sensor, Wiper Motor*

INTRODUCTION

Driving at night is extremely dangerous due to automobile headlights. When travelling at night, the majority of automobiles have strong, bright lights. The

individual moving in the other way feels uncomfortable as a result and is briefly subjected to an abrupt gaze. This is brought on by the other vehicle's powerful headlight beam approaching it from the

other direction. This eliminated the need for the driver to manually turn the high beam into the low beam, which was not always done, and reduced the glare impact by sensing the light intensity value of an oncoming vehicle.

The wiper is a crucial part that is utilised to remove rainfall or any other water from the windshield of the car. The current technology requires the driver to physically operate the wiper switch and turn on and off the control stalk, which reduces their ability to focus while driving. This approach is therefore suggested as a solution to these issues. This project's goals are to modernise an outdated car system by adding an automated wiping system, to enhance the system by incorporating a rainfall sensor, and to create a simple application that will work with the system flawlessly. In this project, the programming and rainfall density have an impact on the wiper speed.

In addition gas sensors are used to detect presence of alcohol and if sensor detects alcohol entire system will be disabled.

Troxler effect

It is known as the Troxler effect to refer to a brief blindness. It is often referred to as the "fading effect." According to a

research, glare occurs when our eyes are exposed to a light source that is 10,000 lumens or brighter. The rods and cones in our eyes are overexposed, which results in this glare. Even after the glare source has been eliminated, an afterimage that causes a blind spot still exists in our eye. The Troxler effect is the name given to this phenomena.

Light Dependent Resistor (LDR)

© The conductivity of a Light-Dependent Resistor (LDR), a kind of semiconductor, varies according to variations in light intensity. A resistor known as an LDR is one whose resistance falls down as incident light intensity rises. It displays photoconductivity as a result. LDR is used in the circuit to transform the brightness of the oncoming vehicle's high beam headlights into an electrical signal.

Wiper and Rainfall sensor

The wiper is a crucial part that is utilised to clean any water or rainfall off the windscreen. Wipers are constructed with the purpose of removing water from a windscreen. The majority of automobiles have two windshield wipers, one on the rear window, and one on each headlight. The rubber blade, the wiper arm holding the blade, a spring linkage, and pieces of the wiper pivot are the wiper components

that are visible from the exterior of the automobile.

The presence of rain is determined via a rain sensor. When a raindrop passes through the rain board, it may be utilised as a switch, and it can also be used to gauge how hard the rain is falling. It is wired to the controller so that it can sense rain and activate the wipers automatically. Additionally, the program's corresponding code will provide a speed control for the wiper that is based on rainfall density.

AVR microcontroller

AVR microcontrollers are widely utilised in many different applications, especially in embedded technology and project development. Most commands are executed by the AVR microcontroller in a single cycle of execution. The 8-bit AVR microcontroller belongs to the RISC family. The computer's instruction set with this architecture is not only lower in size but also quicker and easier to use.

Gas sensor

A gas sensor is a device that detects the presence of gas in an area. This sensor interacts with a gas to measure its concentration. Each gas has a unique breakdown voltage, i.e., the electric field

at which it is ionized. Sensors identify gases by measuring these voltages.

When a gas interacts with this sensor, it is first ionised into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element, which is conveyed to the processor unit through output pins in the form of current.

RELATED WORK

A car's wiper is operated by the piezoelectric effect. The capacity of some materials to produce an electric charge in response to applied mechanical stress is known as the piezoelectric effect. When raindrops press on the piezoelectric material, energy is generated. This power is then stored in a capacitor until the necessary voltage is achieved to close the relay system and operate the wiper motor. The circuit operates automatically.

The illumination modes and wiper speed of an automobile are controlled by a fuzzy logic controller. The wiper system measures the amount and severity of the rain. Additionally, the wiper speed is automatically adjusted according on the intensity of the rain. Depending on the amount of light coming from the other vehicle approaching from the opposite

way, the headlight modes automatically switch from low beam to high beam or from high beam to low beam.

As soon as it detects a car coming from the other way, the automated headlight switching system turns the high beam lighting to low beam. It then switches it back to high beam when the cars pass one another. The prototype is an electrical circuit with a light-dependent resistor acting as the sensor, a potential divider network acting as a comparator to activate

an NPN transistor coupled to an SPDT relay that performs the switching, and a 12 volt power source supplied by the vehicle battery itself.

a sensor for alcohol placed in the car's steering wheel. When the driver turns the ignition on, a sensor checks the amount of alcohol in his breath and, if it detects intoxication, turns the car off. The relay automatically closes and the buzzer sounds when the measured value crosses the threshold.

METHODOLOGY

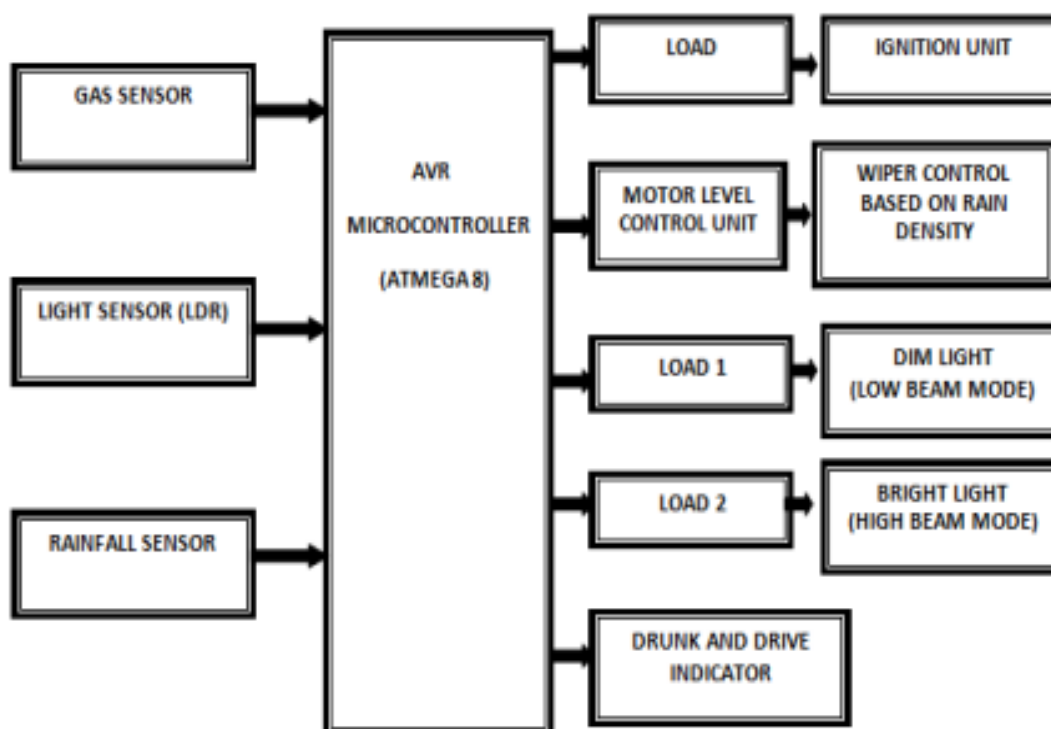


Figure-1 Block diagram of proposed model

Micro Controller

A microcontroller is a device that includes a microprocessor, internal memory, a timer or counter, I/O ports, and other components. A microcontroller's primary function is to regulate a machine's functioning using a fixed programme that is stored in ROM and remains constant throughout the system's lifespan.

AVR Microcontroller Architecture

The AVR employs a "Harvard architecture," which implies that it has

distinct buses and memory for data and programme. This design is seen below. Single level pipelining is used to execute instructions stored in the programme memory. The next instruction is prefetched from the programme memory while the previous one is being completed.

This idea enables for the execution of an instruction per every CLK cycle, which implies that AVR operates at a MIPS rate of about 1 per MHz.

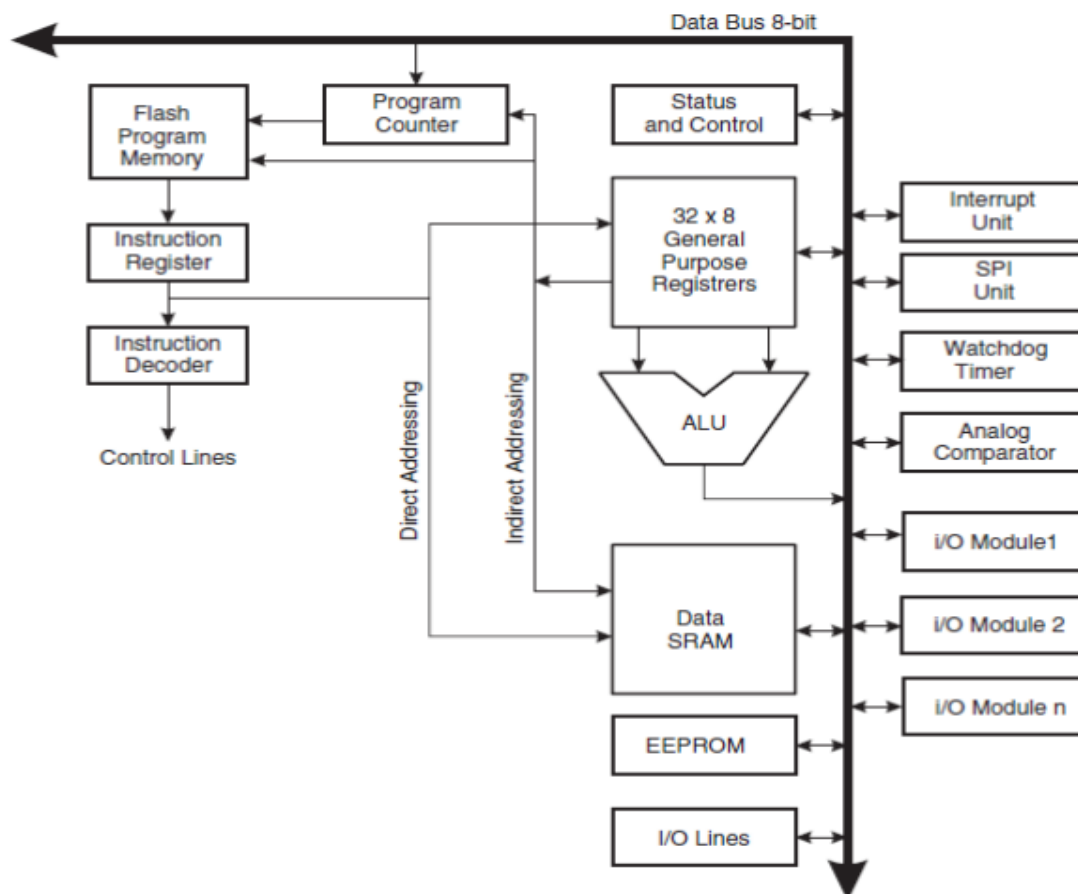


Figure-2 AVR Architecture

Atmega 8-description

The Atmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. The ATmega8 achieves throughputs approaching 1 MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.

Pin Description

Vcc (PIN NO: 7) Digital supply voltage.

Gnd: (PIN NO: 8) Ground.

Port B (PB7 – PB0):

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running.

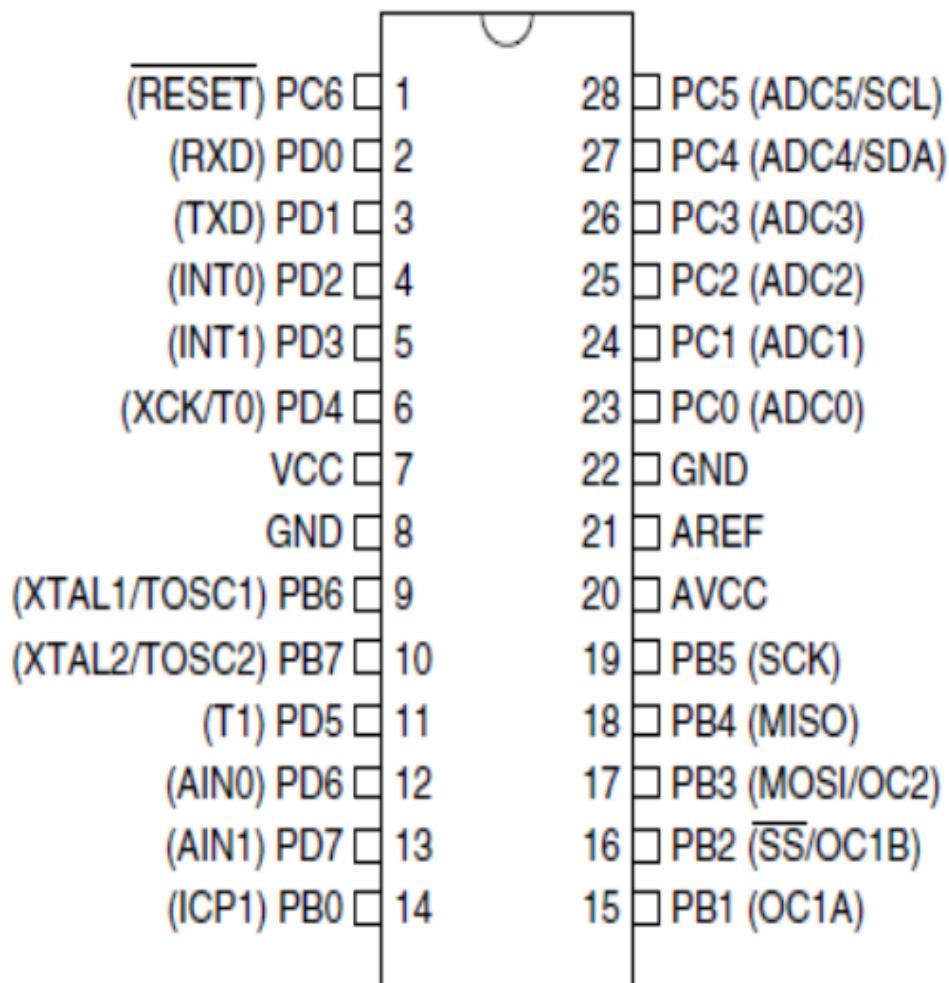


Figure-3 Pin configuration

Aref:

AREF is the analog reference pin for the A/D Converter.

Port C: (PC6 –PC0)

Port C is an 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port C output buffers have symmetrical drive characteristics with both high sink and source capability

Port D: (PD7-PD0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

LDR Sensor

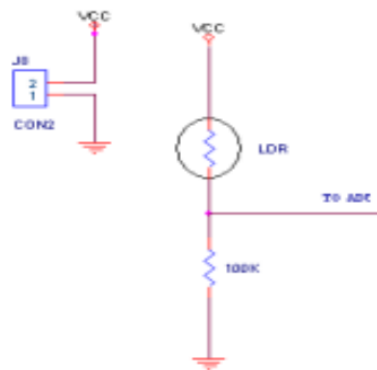


Figure-4 LDR Circuit

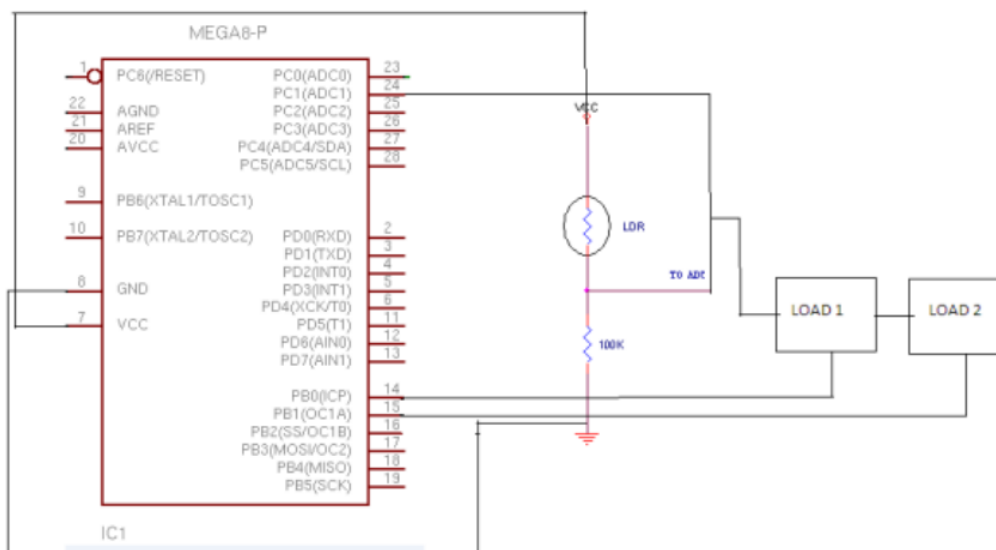


Figure-5 Interfacing LDR and load to controller

In this circuit the power supply for the LDR is given by the Atmega controller by the regulated power supply 5v. The supply

pin in the LDR is connected to the Vcc 5v power supply pin the controller.

Rainfall sensor

Circuit description of rain sensor and wiper:

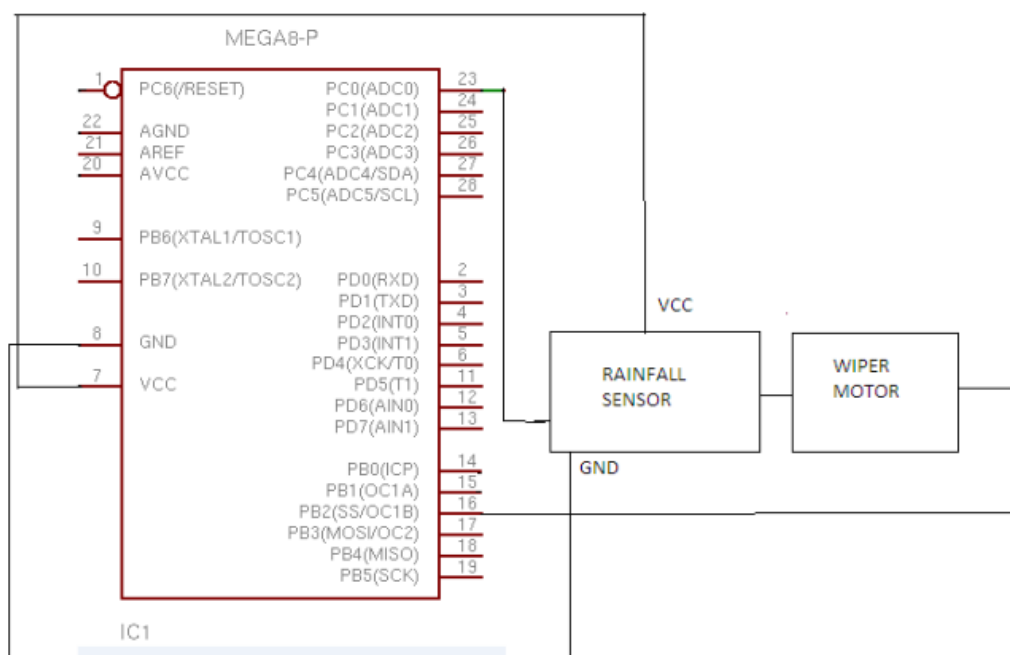
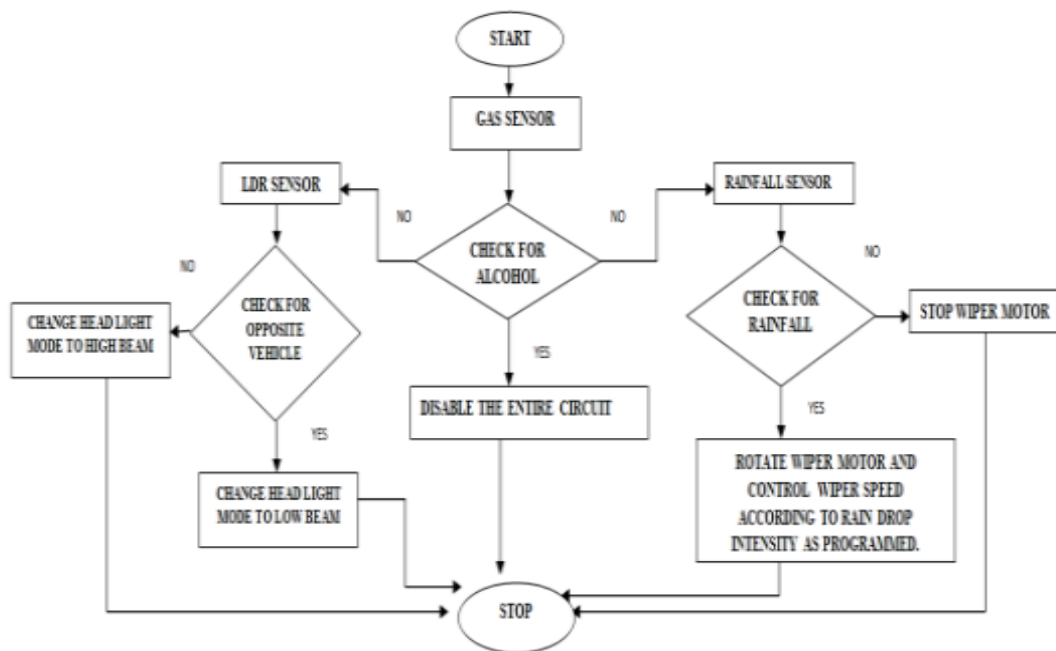


Figure-6 Interfacing rain sensor and wiper to controller

There are now some automobiles with driver-programmable intelligent windshield wipers that use a rain sensor to determine whether or not it is raining and how much. In accordance with the quantity of rain measured by the sensor, the blades' frequency and speed are automatically adjusted. There is often a manual override for these settings.

The controller's 5 volts serve as the supply power for the rainfall sensor, and its common ground pin grounds the whole circuit. The wiper speed is progressively raised and lowered in response to changes in rainfall intensity when the output of the rainfall sensor is linked to the controller's PB2 pin.

SOFTWARE DESCRIPTION

Win AVR

Built-in EEPROM memory on AVR microcontrollers offers a lot of features for storing calibration information, constant values, and other data that can be read and updated at any moment during programme flow. I've used EEPROM to save the most recent device settings in a few applications.

For the Atmel AVR line of RISC microprocessors, WinAVR is a collection of open-source, executable software

development tools hosted on the Windows operating system. contains the C and C++ compiler GNU GCC. a group of open-source tools that are specifically created to support programmers working with Atmel AVR microcontrollers.

Programming

A specialised toolbox will undoubtedly be needed for programming microcontrollers and all the other development-related tasks that may be expected when working with a very specific type of device. Even though the great majority of consumers may have little to no experience with them, RISC microprocessors used in Atmel AVR devices are an excellent example.

However, WinAVR, the software package created specifically for Atmel AVR chips, may already be familiar to individuals with an interest in studying or working in this field. This toolkit consists of several components, the majority of which may be launched from the command line and each of which has a specific duty to complete.

You will be able to familiarise yourself with all the programmes and libraries that were installed on your system when this bundle's setup is complete. The documentation that comes with the toolset should be read in order to have a better

understanding of how to use each component of the kit. WinAVR comes with everything you need, including C libraries, compilers, and assemblers, as well as a debugging tool, simulation, and emulator applications.

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libraries, compilers, and assemblers, as well as a debugging tool, simulation, and emulator applications.

This utilities bundle, which is obviously a toolbox for experts, will undoubtedly, be valued by people with knowledge in this area of development.

EXPERIMENT RESULTS AND ANALYSIS

By analyzing each sensors, testing concepts will be explained. The below figure represents the Gas sensors and Rainfall sensors respectively.



Figure-8 Gas Sensor Sensing

This sensor interacts with a gas by first ionising it into its component parts, which are subsequently adsorbed by the detecting element. The element develops a potential difference as a result of this adsorption, and this difference is sent as current to the processing unit through output pins. Through connecting leads, electricity is applied to this sensor device. Automatic windshield wipers that recognise when there is a potential issue with sight and

clear the windshield before the driver can respond to it. To ensure constant outside visibility, the mechanism is set up to automatically turn on and adjust the wiper blades' speed and rate. A rain-sensing wiper system just monitors outside sight and turns on the wipers automatically; it does not clean the windshield any better than a manual system. However, if the car has been stopped and started again, the wipers must be re-activated.



Figure-9 Desired Parts of Hardware

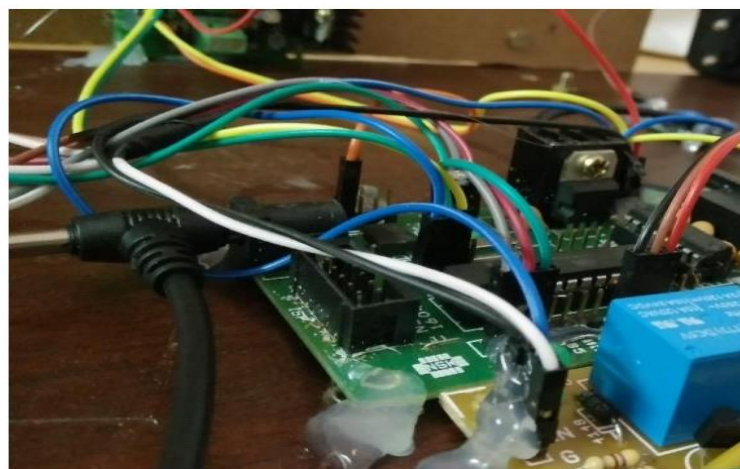


Figure-10 Integration Testing Methods

The aforementioned image illustrates the concepts of integration testing. Thanks to the examination of these sensors, there won't be any more mistakes, and the result will pass testing.

Consequently, automatic wipers replace manual wipers. The glare from light has been lessened by the car's driver. The automation of the system encourages the concept of the "smart car."

PROGRAMME OUTCOMES:

Environment and Sustainability

Sustainability in the environment refers to the pace of pollutant production, renewable resource exploitation, and non-renewable resource depletion that can be sustained indefinitely. They are not sustainable if they cannot go on indefinitely.

The goal of the proposed initiative is to reduce crashes caused by negligent drivers who manually activate windshield wiper systems or adjust headlight settings while driving. Automatic control mechanisms are employed to prevent this issue. It does not release any radiation or pollute the environment, but it also reduces accidents, which is a social benefit. Even during rainfall, a motor running at a steady speed wastes energy. According to the depth of

the rain, we intended to slow down the wipers. The suggested model also uses less energy.

Standard

By employing an LDR sensor to detect cars on the opposite side and automatically adjusting the lighting mode from high beam to low beam, accidents caused by the Troxler Effect can be prevented. A rainfall sensor may be used to automatically adjust the wiper motor speed based on the density of the raindrops, eliminating the need for manual wiper motor speed switching. When alcohol is detected, a gas sensor is utilised to shut down the entire circuit.

Ethics and Cost

The practise of starting, planning, carrying out, controlling, and concluding a team's activity in order to achieve certain objectives and satisfy defined success criteria within a given time frame is known as project management. Our study aims to lessen traffic accidents brought on by distracted driving. We intended to create an integrated circuit for automated wiper speed control and headlight mode switching. We put it into action with the aid of an AVR microcontroller and programme it to carry out the required duty. as we employ LDR sensors, etc.,

which were less expensive with the anticipated throughput.

CONCLUSION

The system will run automatically without human intervention. The drivers do not need to pay attention to the headlight intensity or wiper speed. The technology will provide a new level of comfort and assistance to drivers who operate their vehicles at night, during inclement weather, and in locations with heavy traffic. Drivers may so concentrate on the ABCs of driving more readily (accelerator, brake, and clutch). As a result, this method can guarantee drivers' safety. The comfort level of drivers is increased by this technique, which is quite beneficial. Utilizing the LDR sensing method, an automated headlamp mode control system for cars was created. As a result, when a vehicle is detected coming from the opposite side, the system device immediately turns the headlight to low beam utilising a light-dependent resistor (LDR) sensor. The suggested method also removes manual wiper speed control by automatically detecting the amount of rainfall.

FUTURE SCOPE

Using sustainable resources will improve this project (i.e., solar panels for power

supply). By using the piezoelectric effect to provide an electrical supply, this project may also be made more energy-efficient. The capacity of some materials to produce an electric charge in response to applied mechanical stress is known as the piezoelectric effect. With the assistance of an electronic control unit, this idea may be turned into a real-time application.

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