

Integrated Automatic Control Systems for Headlight Modes and Wiper Speed

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Abstract

This project deals with integrated Automatic control systems for Wiper speed based on rainfall density and Head light Modes .The drivers of most vehicles use high beam while driving at night. This causes a discomfort to the person travelling from opposite direction .The driver experience a sudden glare for short period of time and causes temporary blindness to the person resulting in road accidents during night time .To avoid such incidents, the proposed model automatically switches high beam into low beam thus reducing glare effect by sensing the approaching vehicle using ldr sensor. In order to avoid the problem, the proposed model implements automatic wiper system which detects the rain and its density by using rain sensor and according to the rain density, the wiper speed is automatically controlled as programmed. Gas sensor is used to detect presence of alcohol and if it found entire system will be automatically disabled.

Keywords: Atmega8, Gas sensor, Ldr sensor, Rainfall sensor, Wiper Motor

INTRODUCTION

Headlights of vehicles pose a great danger during night driving. The drivers of most vehicles use high, bright beam while driving at night. This causes a discomfort to the person travelling from the opposite direction and therefore experiences a sudden glare for a short period of time. This is caused due to the high intense headlight beam from the other vehicle coming towards the one from the opposite direction. This automatically switched the high beam into low beam, therefore reducing the glare effect by sensing the light intensity value of approaching vehicle and also eliminated the requirement of manual switching by the driver which was not done at all times.

Wiper is an essential component that used to wipe raindrops or any water from the vehicle's windscreen. The existing system used to activate the wiper switch manually and the driver needs to switch on and off the control stalk and it will reduce the driver's concentration during driving. Thus, this system is proposed to solve these problems. The objectives of this project are to upgrade the older vehicle system by providing automatic wiping system, to improve the system by using rainfall sensor and to design a basic program that will fully operate with

the system. In this project, wiper speed depends on the density of rainfall and programmed respectively.

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

Troxler effect

Troxler effect is used to describe a kind of temporary blindness. It is otherwise known as the 'fading effect'. A study shows that if our eyes are exposed to a very bright light source of around 10,000 lumens, we experience a glare. This glare is produced due to over exposure of the rods and cones inside our eye. Even after the source of glare is removed, an afterimage remains in our eye that creates a blind spot. This phenomenon is called Troxler effect.

Light Dependent Resistor (Ldr)

Light Dependent Resistor (LDR) is a type of semiconductor and its conductivity changes with proportional change in the intensity of light. A light dependent resistor (LDR) is a resistor whose resistance decreases with increasing incident light intensity. Thus, it exhibits photoconductivity. LDR is employed in the circuit to convert the

intensity of the high beam headlight of the approaching vehicle into electrical signal.

Wiper and Rainfall sensor

Wiper is an essential component that used to wipe the raindrops or any water from the windscreen. Wipers are designed and made to clear the water from a windscreen. Most of cars have two wipers on the windscreen, one on the rear window and the other on each headlight. The wiper parts visible from outside the car are the rubber blade, the wiper arm holding the blade, a spring linkage, and parts of the wiper pivots.

Rain sensor is used to detect the presence of rainfall .It can be used as a switch when rain drop falls through the raining board and also for measuring rainfall intensity. It is connected to the controller in order to proceed automatic function of wiper by sensing rainfall. In addition the speed of the wiper will be controlled based on rainfall density and it will be implemented by respective code in program.

AVR microcontroller

AVR microcontrollers are very popular, used in numerous applications, particularly in project prototyping and also in embedded devices. AVR microcontroller performs

most of the commands in the single execution cycle. AVR is an 8-bit microcontroller appropriate to the family of RISC. In this architecture, the instruction set of the computer are not only less in number but also faster and simpler in operation.

Gas sensor

A gas sensor is a device which 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. Sensor identifies gases by measuring these voltages.

When a gas interacts with this sensor, it is first ionized 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 form of current.

RELATED WORK

The wiper of a vehicle is driven by using piezoelectric effect. Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. The circuit runs automatically when the rain drops presses

the piezoelectric material which generates electricity, which in turn is stored in capacitor till a required voltage, is reached to close the relay system to run the wiper motor.

Fuzzy logic controller controls a car wiper speed and headlight modes. The wiper system detects the rain and its intensity. And, according to the rain intensity, the wiper speed is automatically controlled. Headlight modes automatically changes either from low beam mode to high beam mode or from high beam mode to low beam mode depending on the light intensity from the other vehicle coming from the opposite direction.

The automatic headlight switching system switches the high beam lamp to low beam as soon as it senses a vehicle approaching from

the opposite direction and switches it back to high beam when the cars pass each other. The prototype is an electronic circuit that incorporates the use of a 12 volts power supply which is provided by the car battery itself, a light dependent resistor which acts as the sensor, a potential divider network which serves as a comparator to trigger an NPN transistor connected to an SPDT relay which does the switching.

An alcohol sensor embedded on the steering of the car. Whenever the driver starts ignition, the sensor measures the content of the alcohol in his breath and automatically switches off the car if he is drunken. If the measured value reaches the threshold, relay cut off automatically and the buzzer produces sound.

METHODOLOGY

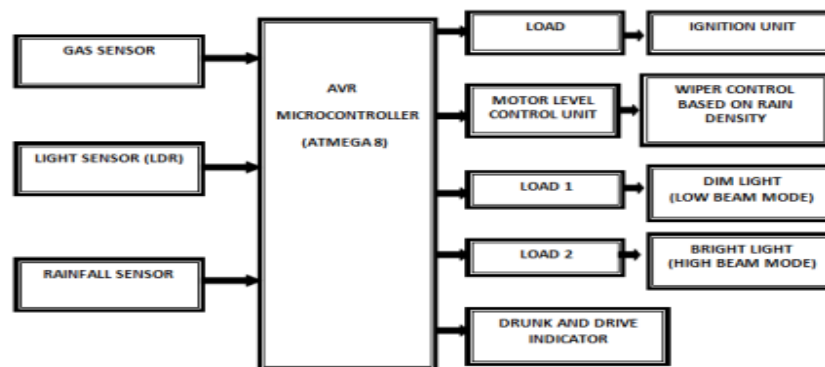


Figure-1 Block diagram of proposed model

Micro Controller

A Microcontroller is one that has microprocessor features together with internal memory, timer/ counter, I/O ports etc. The main use of microcontroller is to control the operation of a machine using a fixed program that is stored in ROM and that does not change over the lifetime of the system.

AVR Microcontroller Architecture

The architecture of the AVR is shown

below, it uses a “Harvard architecture” thus it has separate buses and memories for data and program. Instructions in the program memory are performed with a single level pipelining. While one instruction is being achieved, the subsequent instruction is prefetched from the program memory.

This thought allows instructions to be performed in every CLK cycle and that suggest AVR runs at around 1 MIPS / MHz.

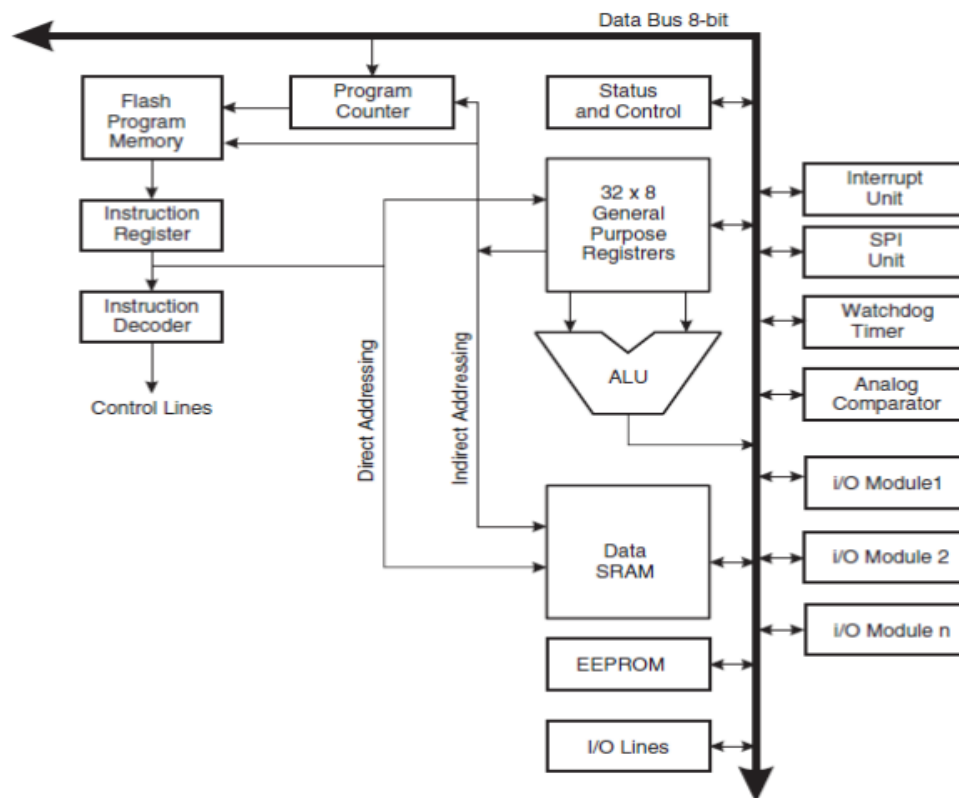


Figure-2 AVR Architecture

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.

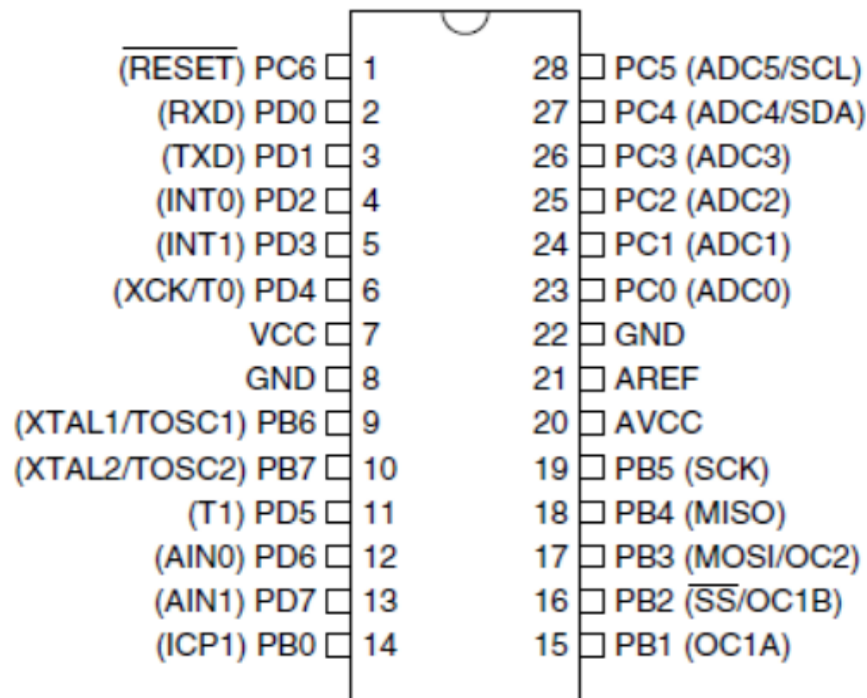


Figure-3 Pin configuration

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.

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

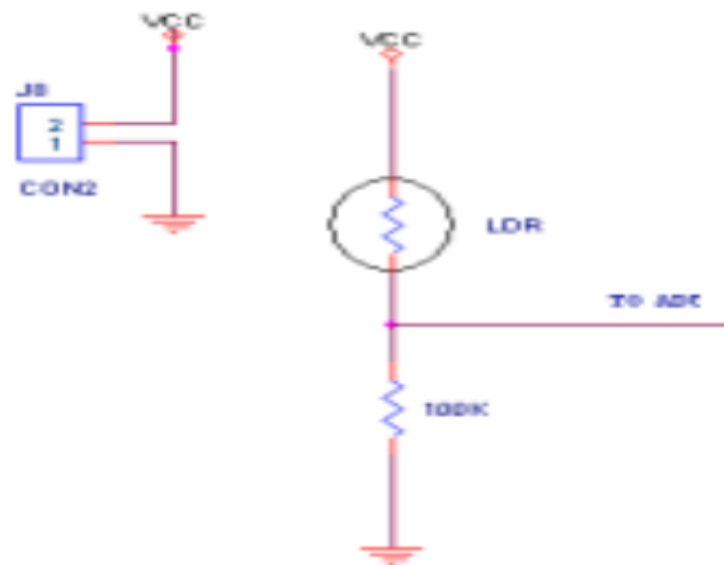


Figure-4 LDR Circuit

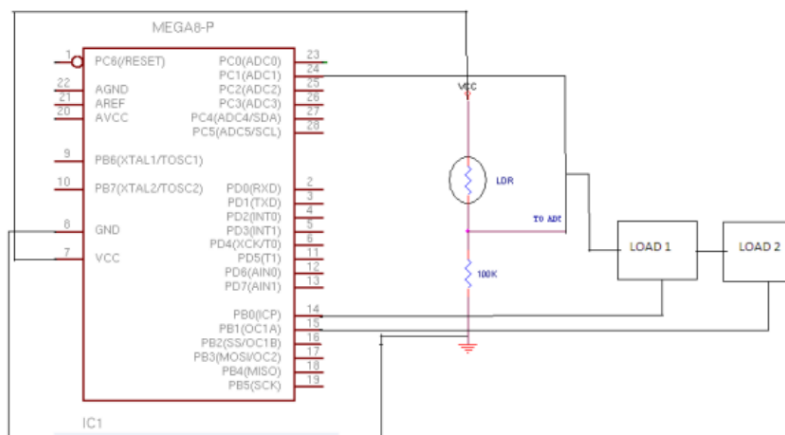


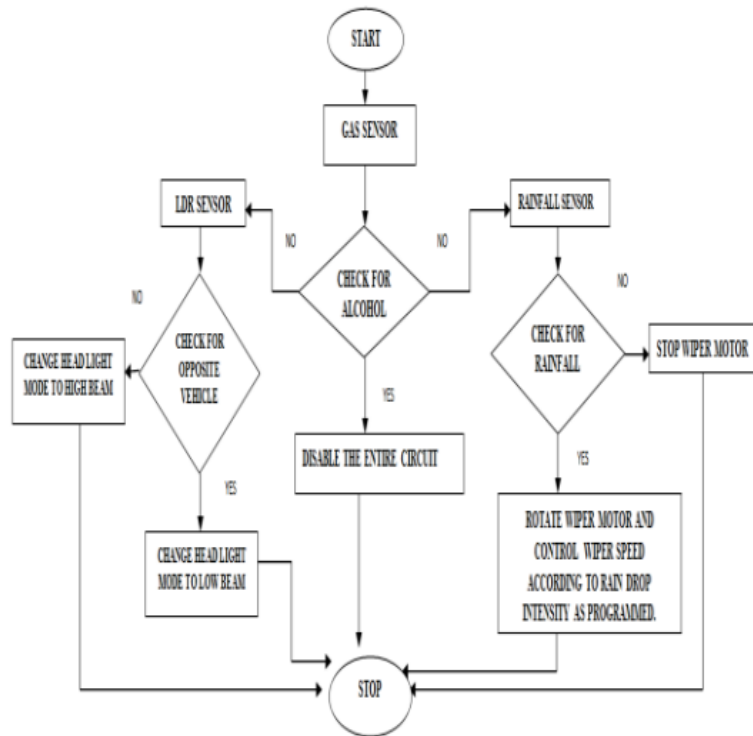
Figure-5 Interfacing LDR and load to controller

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:



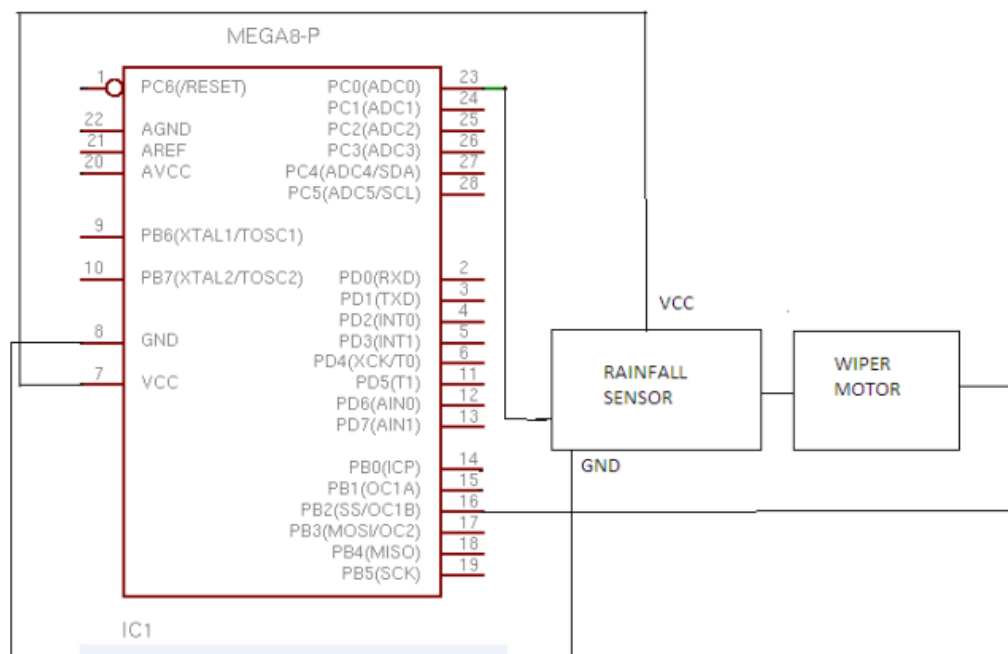


Figure-6 Interfacing rain sensor and wiper to controller

Some vehicles are now available with driver programmable intelligent windscreen wipers that detect the presence and amount of rain using a rain sensor. The sensor automatically adjusts the speed and frequency of the blades according to the amount of rain detected. These controls usually have a manual override.

The supply voltage for the rainfall sensor is given by the 5v from the controller and the circuit is grounded by the common ground pin the controller. Wiper motor the output of the rainfall sensor is connected to the PB2 pin in the controller, due to the rainfall

intensity the wiper speed is gradually increased and decreased.

SOFTWARE DESCRIPTION

Win AVR

AVR microcontroller have EEPROM memory built in which adds a lots of abilities storing constant values, calibration data, and other data that may be read and changed at any time during program flow. Ion couple projects I have used EEPROM for storing last device configuration. WinAVR is a suite of executable, open source software development tools for the Atmel AVR series of RISC microprocessors hosted on the Windows platform. Includes

the GNU GCC compiler for C and C++.A collection of open-source utilities that are especially designed to target Atmel AVR microcontrollers and aid developers in their programming.

Programming

Programming microcontrollers and the all the other development related activities that are to be expected when handling a very specific kind of devices will certainly need a specialized toolkit. RISC microprocessors that are utilized by devices of the Atmel AVR type are a good example, even if this may be little or even not at all familiar to the vast majority of users.

Nonetheless, those who are interested, studying or actually working in this particular area, might have come across WinAVR, the package that is especially designed for Atmel AVR processors. There are many components included in this collection of tools, most of them runnable via command-line, but each having a precise task to carry out.

After the setup of this bundle is complete, you will be able to get acquainted with all the utilities and libraries that were installed onto your system. The first step would be to

consult the documentation that accompanies the toolset and which can shed some light on the intricacies of using each piece of kit.WinAVR is fully equipped with everything starting from C libraries, compilers and assemblers, including a debugging solution, as well as simulation and emulation programs. In case you opted to have it put onto your system during the installation procedure, Programmer's Notepad will also be present and you can make the most out of its programming editor and Integrated Development Environment (IDE) capabilities.

All things considered, it's safe to say that WinAVR is certainly a must-have for all those involved in the programming of Atmel AVR microcontrollers. Clearly a toolkit for professionals, this utilities package will surely be appreciated by those with experience in this field 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

When a gas interacts with this sensor, it is first ionized 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 form of current.

This sensing element is subjected to current through connecting leads.

Wipers that automatically recognize a developing visibility problem and clear the glass before the driver can react to the problem.

The system is programmed to automatically activate and alter the speed and rate of the wiper blades to keep outward visibility at all

times. A rain-sensing wiper system does not clean the windshield any better than a manual system; it simply monitors outward visibility and automatically activates the wipers.

Wipers must be re-activated, however, if the vehicle has been turned off and re-started.



Figure-9 Desired Parts of Hardware

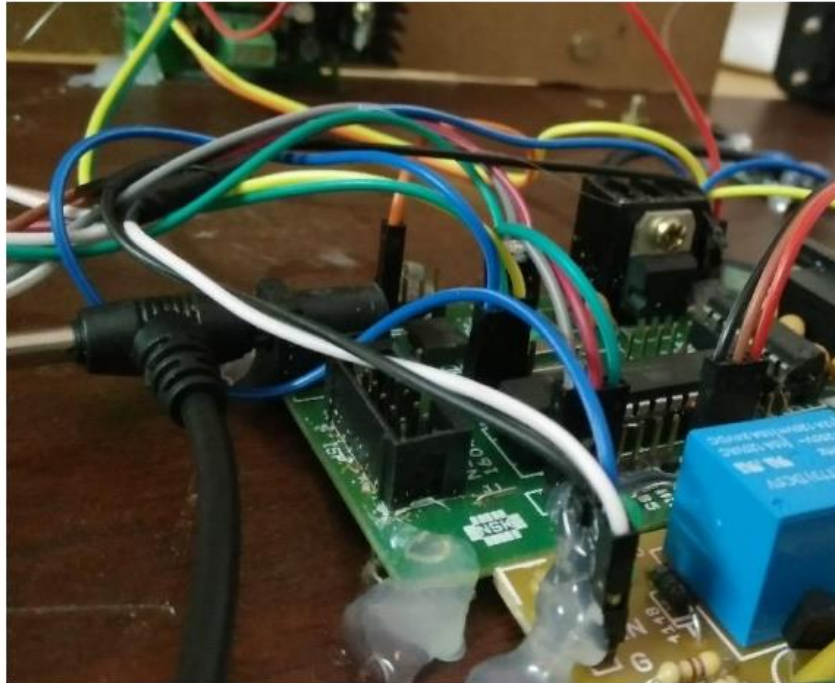


Figure-10 Integration Testing Methods

The above figure referred to be the Integration Testing concepts. By analyzing these sensors there will be no more errors and the result will be experimented successfully.

Thus the manual operation of turning wiper on, off is replaced by automatic wipers. The less amount of glare of light is faced by the driver of vehicle. Automation in this system gives push to the smart car system concept.

PROGRAMME OUTCOMES:

Environment and Sustainability

Environmental sustainability is the rates of renewable resource harvest, pollution

creation, and non-renewable resource depletion that can be continued indefinitely. If they cannot be continued indefinitely then they are not sustainable.

Proposed project deals with prevention of accidents due to carelessness of driver when they manually operate the wiper systems or manually switching the head light modes during driving. To avoid this problem automatic control systems are used. It prevents accidents which is socially benefit and also it does not emits any radiation and does not cause any pollution to environment. Energy will get waste when the speed of motor is constant for even during rain drops.

We planned to reduce the speed of wiper according to rainfall density. Proposed model is also energy conservable.

Standard

Accident due to Troxler Effect can be overcome by detecting vehicles on opposite side by using LDR sensor and automatically switching the headlight mode from high beam to low beam. Manual switching of wiper motor speed can be solved by automatically switching wiper speed according to rain drop density by using Rainfall Sensor. Gas Sensor is used to disable entire circuit when detect Alcohol.

Ethics and Cost

Project management is the practice of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria at the specified time. In our project we make an initiative to reduce traffic accidents which held due to distraction of driver during driving. We planned to design integrated circuit for automatic control of wiper speed and switching of head light modes. We execute it with the help of AVR microcontroller and programmed for respective task. Cost efficient as we use

LDR sensors, etc. which was cheaper with expected Throughput.

CONCLUSION

The system will operate automatically without manual action of human beings. The drives do not need to focus on wiper speed, intensity of headlamp. The system will give a new dimension of comfort and aid to the drivers who work during rains at night and traffic prone areas. So, the drivers can more concentrate on the basicABC(accelerator, brake and clutch) of driving. Therefore, this system can provide the safety to drivers. This system is very useful for drivers, and improves drivers comfort level. An automatic headlight mode control of vehicles had been designed using LDR sensing technique. Thus, the system device automatically switches the headlight to low beam when it senses a vehicle approaching from the opposite side using Light Dependent Resistor (LDR) sensor. By sensing rainfall density wiper speed will automatically control and the proposed system also eliminates

FUTURE SCOPE

This project can be enhanced by using renewable resources (i.e) Using solar panel for power supply. Also this project can be

made energy efficient by generating electrical supply with the help of piezo electric effect. Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. This project can be made real time application with the help of electronic control unit.

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