Smart Controlling Strategies In Electric Vehicles

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Abstract- *This paper presents research work done in various control strategies used in electric vehicles. In the last few decades, automobile industry has been at its peak for developing revolutionary technologies to create a safe environment for both the driver and the vehicle while driving on the road and to make them less prone to accidents. Two major causes of road accidents are fault detection using analog means or non-accurate information about the vehicle parameters and the ignorance of driver. This paper presents the digital framework of a control system with integrated system of sensors connected to microcontroller and proper alert and warning system. This paper also focuses on smart automatic control systems like headlamps, rain sensing wipers, reverse parking sensors. Rain sensing wiper system that detects rain and starts automatically and stops when the rain stops. The automatic rain sensing car wiper system is not only automatic but also intelligent. The wiper system detects the rainfall automatically and starts itself. The Wiper system is also intelligent. In this paper, Arduino microcontroller is used along with a rain sensor, head-lamps and reverse parking sensors.*

Keywords- Arduino UNO, Parking sensors, Rain sensors, LDR

I. INTRODUCTION

People pay more attention to zero-polluting electric vehicle with the development of environmental protection consciousness. The exploration of driving security of vehicle is one of the most imperative subjects on the planet. Driving around evening time is the primary driver of high rate of car crash. Safety is the main concern working an engine vehicle, aside from functionality. The various technologies are developing today for controlling the different types of parameters in electric vehicle automatically.

The main aim of the paper is to design a various smart controlling strategies such as automatic headlight switching, automatic rain sensing wipers, reverse parking sensors. An automatic dipper is a unit which can automatically judge when the headlight beam needs to be lowered, and which deep the headlamp from which beam is to a dipped beam. The rain tracker automotive rain sensor, sense rain or snow hitting the windshield, and automatically runs the wiper at the rightspeed. An intelligent parking assist system is the technology assists drivers in parking their vehicle.

So in this project, the development of simple and low cost controlling circuits in electric vehicle is presented. This proposed system uses arduino microcontroller. In this project the system is designed to protect the people who are inside the car as well as outside of the car with the help of various sensors like Use of distance sensors, rain sensors and automatic light sensors.

II. SYSTEM DESIGN

Block diagram of proposed system is shown in figure 1.

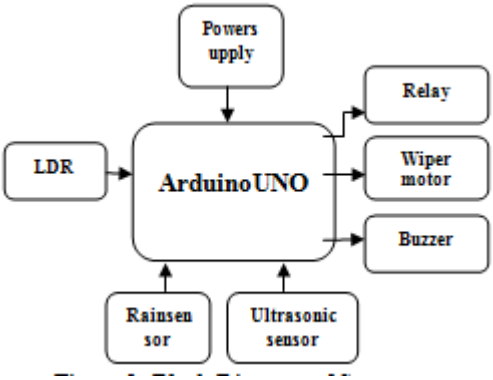

Figure 1: Block Diagram of System

Automatic Headlight Control

When driving vehicle, headlights are required to be turned on before sunset and turn off after sunrise, according to light intensity and any other time of poor light conditions, such as fog, snow or rain, which keeps drivers from clearly seeing people or vehicles less than 150 meters away. The drivers of most vehicles use high bright beam while travelling at night. This causes uncomfortable to the person travelling in the opposite direction. This results into road accidents. To avoid such incidents, we have fabricated a prototype of automatic headlight dimmer.

In this experimental investigation the circuit is a simple assembly of commonly used circuit components with Arduino. This system works by sensing the intensity of light in its environment. The sensor that can be used to detect light is an

LDR. The LDR gives out an analogue voltage when connected to VCC (5V), which varies in magnitude in direct proportion to the input light intensity on it. That is, the greater the intensity of light, the greater the corresponding voltage from the LDR will be. Since the LDR gives out an analogue voltage, it is connected to the analogue input pin on the Arduino. The Arduino, with its built-in ADC (analogue-to-digital converter), then converts the analogue voltage (from 0-5V) into a digital value in the range of (0-1023). When there is sufficient light in its environment or on its surface, the converted digital values read from the LDR through the Arduino will be in the range of 800-1023.

Automatic Rain Sensing Wiper

Every year during the rainy season, more than 2 million people die worldwide because of accidents in the rainy season according to world health organization. People end up dying because of small mistakes. Today's car wipers need human intervention to start the wiper and to control its speed. In this type of manual switching, the driver needs to switch on the wiper when needed and need to adjust the speed of the wiper as required.This causes inconvenience to the driver during rainfall. He can neither concentrate on driving nor focus on the adjustment of the speed of the wiper. This type of scenario leads to accidents. In the current scenario, only luxury vehicles employ intelligent rain-sensing windshield wiper systems. In this paper, we propose an automatic car wiper system which turns on automatically when the rain starts and stops when the rain stops. In this paper, there will be no need for physical intervention of man for controlling car wiper. It is built using Arduino UNO board. A rain sensing module is used for measuring the intensity of rainfall and a DC motor is used for controlling the wiper movements. An LCD module is also attached to the controller for displaying the rainfall intensity. Whenever the droplets of rain fall on the rain sensor, its senses the rain fall and sendArduino the necessary information for the process to carry on. The information sent by the rain sensor is processed by the Arduino and controls the dc motor based on the information processed. The LCD module is to display the information about the speed of the wiper and the intensity of the rain.

Automatic Reverse Parking Sensor:

Parking a car in congested parking lots and tiny spaces is a tedious job and the important thing is that you must be very careful while reversing so that you do not damage the car. A problem that often concerned by the driver is the areas which cannot be seen by side view and rear view mirrors, which is called as blind spot region of vehicle. Vehicles in the adjacent lanes of the road may fall into these blind spots, and a driver may be unable to see adjacent vehicle using only the car's mirrors. Other areas that are sometimes called blind spots are those that are too low to see behind and in front of a vehicle. Also, in cases where side vision is hindered, areas to the left or right can become blind spots as well. In several accident cases, it has happened because of the driver's inability to monitor the blind spot region well. The main objective for this project is that the car can automatically brake when driving in reverse due to obstacles when sensor senses the obstacles. And also to eliminate the blind spot regions by sensing the vehicle in sideways by the sensors and reducing accidents and the driver could safely change lanes on roads.
Principle of the parking sensor mainly depends on an electromagnetic otherwise ultrasonic sensor principle. The ultrasonic sensor is the main unit that is responsible for measuring the distance. Whenever the driver uses reverse gear, then parking sensors get triggered and transmits ultrasonic signals. When these signals strike the near object, immediately they get replicated and again they are captured by the parking sensors. Depending upon the elapsed time among sending & recapturing of signals, engine control unit measures the distance from the vehicle to an object. When the car moves toward an object, then the alarm system gives an alert to the car driver with an audible sound to prevent the vehicle.

A. Hardware Implementation:

1. Arduino UNO

The Arduino Uno isan open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analogue input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the ArduinoNano andLeonardo. Figure 2 shows board of Arduino Uno.

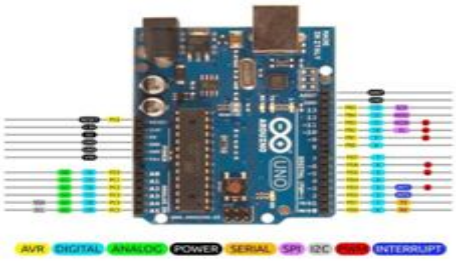

Figure 2:Arduino Uno

Specification of Arduino Uno:

- Operating voltage: 5V
- Input voltage: 7 to 12 V

2.LDR:

Photo-resistor can be applied in light-sensitive detector circuits photo-resistor is an active component that decreases resistance with respect to receiving luminosity (light) on the component's sensitive surface. The resistance of a photo resistor decreases with increase in incident light intensity; in other words, it exhibits photoconductivity. In the dark, a photo resistor can have a resistance as high as several megaohms (MΩ), while in the light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photo resistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photo resistor can substantially differ among dissimilar devices. Moreover, unique photo resistors may react substantially differently to photons within certain wavelength bands. Light Dependent Resistor is a variable resistor that is controlled by light intensity. LDRs are made of high resistance semiconductor material, Cadmium Sulphide that exhibits photo conductivity.

Figure 3: LDR Light Sensors

Specifications of LDR:

- Operating voltage: 3.3V to 5V DC
- Operating current: 15ma
- Output Digital- 0V to 5V, Adjustable trigger level from preset.
- Output Analog- 0V to 5V based on light falling on the LDR
- LEDs indicating output and power.

3. Rain Sensor

A rain sensor is a switching device activated by rainfall. The rain sensor works on the principle of total internal reflection.An infrared light beams at a 45-degree angle on a clear area of the windshield from the sensor inside the car. When it rains, the wet glass causes the light to scatter and lesser amount of light gets reflected back to the sensor.

Figure 4: Rain Sensor

Specification of rain sensor:

- Power supply voltage: 3.3 to 5V
- Digital switch output and analog voltage output.
- LM393 comparator; Comparator output signal waveform is good, driving ability is 15mA.
- Voltage rating: 5V

4. Ultrasonic Sensor:

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

The ultrasonic sensor works on the principle of SONAR and RADAR system which is used to determine the distance to an object. An ultrasonic sensor generates the high-frequency sound (ultrasound) waves. Ultrasound is acoustic (sound) energy in the form of waves having a frequency above the human hearing range. The highest frequency that the human ear can detect is approximately 20 thousand cycles per second (20,000 Hz). This is where the sonic range ends, and where the ultrasonic range begins.

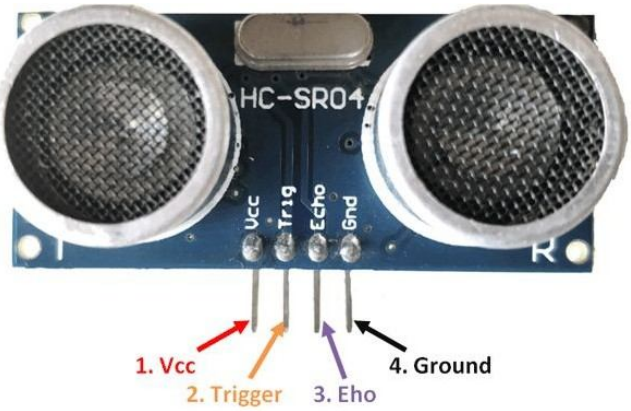

Figure 5: Ultrasonic Sensor

Specifications of ultrasonic sensors:

- Operating Voltage: +5V
- Theoretical measuring distance: 2cm to 450cm
- Practical measuring distance: 2cm to 80cm
- Operating current: <15mA
- Operating frequency: 40 HZ

B. Software Design

Next part of design procedure is software design. For coding purpose, C language is used. Flowchart for same is provided in figure 5.

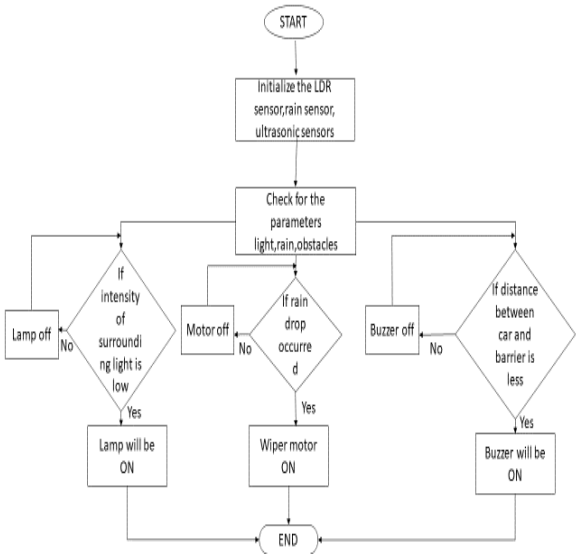

Figure 5: Flowchart

III. RESULT

The practical results obtained by interfacingAurduino with sensors(LDR, rain sensor, ultrasonic sensor) are shown in following figures.

- In case of LDR when darkness rises to certain level the headlights turn on.(shown in figure 6)
- In case of rain sensor, when raindrops are sense by the sensor it sends signal to Arduino and starts the wiper motor.(shown in figure 7)
- In case of ultrasonic sensor, when the distance between the car and obstacles is less then buzzer is turn on.(shown in figure 8)

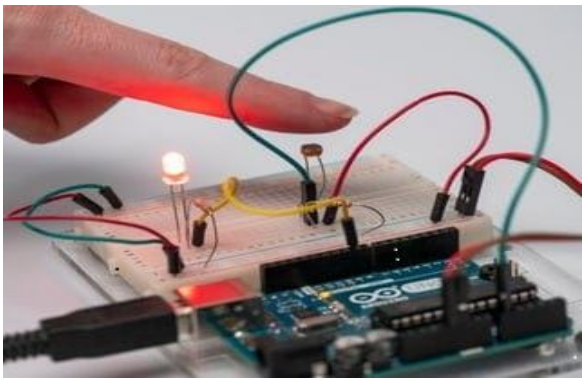

Figure 6: Interfacing of LDR with Arduino

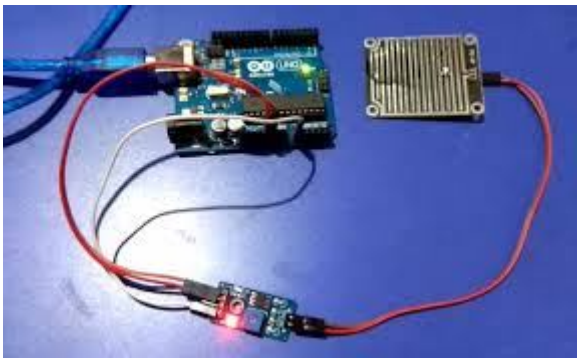

Figure 7: Interfacing o rain sensor with Arduino

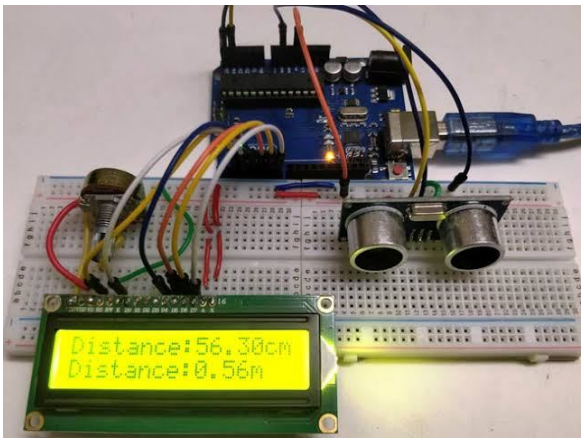

Figure 8: Interfacing of ultrasonic sensor with Arduion

IV. CONCLUSION

From the paper it can be conclude that, by introducing the concept of smart controlling in electric

vehicle.It may take time to the highest level of semi-automatic and fully automatic phase, but with the accumulation of intelligence technology, together with the formulate of the relevant laws and regulations and the acceptance of people, smart vehicle technology will achieve rapid growth and ultimately promote the smart car popularity.

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