Protection of Solar Powered Vehicle using Sensor

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Abstract— *At present vehicles are majorly facing two problems. One is fuel (petrol or diesel) and other is accidents. The problems due to fuel are overcome with non-conventional sources like solar, fossil fuels, etc.. Now a day's road accident is a major problem all over the world. Many innocent people are losing their lives. A majority of accidents are due to drunken driving, drowsiness and rash driving. To prevent road accidents we must have particular vehicle protection equipment. To prevent these situations, here we are designing a prototype solar powered vehicle with next generation features. In this paper we are using some sensors to detect ongoing situation like drunken and drowsiness of the driver. So when the driver was unable to handle the situation, then the vehicle will automatically take its control and automatically vehicle is protected.*

Keywords— Photovoltaic system, 8051 Microcontroller, Driver drowsiness detection, Alcohol detection in vehicles, IR sensor.

I. INTRODUCTION

Now a day's road accident is a major problem all over the world. The recent report says [1] that annual average of 700,000 road accidents, 10 percentages occur in India which has overtaken China. The latest annual statistics revealed by the World Health organisation (WHO) in its first Global status report on road safety, 80,000 people are killed on Indian roads due to speeding, drunken driving, less usage of helmets, seat belts and child restraints in vehicles. Another latest report of National Crime Records Bureau or NCRB [2] says that 40 people under the age of 25 die in road accidents all around the world. It states that the drunken driving is a major factor for the rising of death on roads. The drunk driving fatalities in the year 2009, till the 27th November were 11,769. The numbers for 2007 and 2008 were 12,998 and 11,773 respectively. It shows that the problem of drunk driving is far from over. In the 2009 DUI national statistics released by the NHTSA (National Highway Traffic Safety Administration) 11,773 people died in alcohol-related crashes. Most of the accidents occur outside the cities are due to drunken driving and no testing methodology is adopted to avoid these fatalities in highways. Sleep related accidents tend to be more severe, possibly because of the higher speeds involved and because the driver is unable to take any avoiding action, or even brake, prior to the collision. Horne describes typical sleep related accidents as ones where the driver runs off the road or collides with another vehicle or an object, without any sign of hard braking before the impact.

Accidents are also caused due to the intruders coming suddenly in either side of the vehicle i.e. front, left or right. Due to which the driver misses the judgement and meets with an accident. Driver drowsiness resulting in reduced vehicle control is one of the major causes of road accidents. Driving performance deteriorates with increased drowsiness with resulting crashes constituting 20%-23% of all vehicle accidents. The National Highway Traffic Safety Administration (NHTSA) conservatively estimates that 100,000 reported crashes are caused by drowsy drivers each year in the U.S. alone [3]. These crashes result in more than 1500 fatalities, 71,000 injuries, and an estimated $12.5 billion in diminished productivity and property loss many efforts have been made recently to develop on-board detection of driver drowsiness [4]. A number of approaches have been investigated and applied to characterize driver drowsiness using physiological. A driver state of drowsiness can also be characterized by the resulting vehicle behaviour such as the later position, steering wheel movements, and time-to-line crossings whom correspondence should be addressed not intrusive, they are subject to several limitations related to the vehicle type, driver experience, and geometric characteristics and condition of the road. Among these various possibilities, the monitoring of a driver's eye state by a camera is considered to be the most promising application due to its accuracy and Non-intrusiveness. The driver's symptoms can be monitored to determine the driver's drowsiness early enough to take preventive actions to avoid an accident. The ever increasing numbers of traffic accidents all over the world are due to diminished driver's vigilance level. For this reason, developing systems that actively monitors the driver's level of vigilance and alerting the driver of any insecure driving condition is essential for accident prevention. Drowsiness in drivers can be sensed by

- Physiological characteristics
- Driver operation
- Vehicle response

The final technique for detecting drowsiness is by monitoring the response of the driver. By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. The eye blink frequency increases beyond the normal rate in the fatigued state. In addition, micro sleeps that are the short periods of sleep lasting 3 to 4 seconds are the good indicator of the fatigued state, but it is difficult to predict the driver fatigue accurately or reliably based only on single driver behavior. Additionally, the changes in a driver's performance are more complicated and not reliable so in this system second parameter yawning count is also considered [5-9].

This paper the vehicles is power by solar panel and involves measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position. This output is given to logic circuit to indicate the alarm. The alcohol sensor will detect the alcohol depends on human breath i.e. if the driver has consumed alcohol, it will be identified by his breath. This project involves controlling accident due to unconscious through Eye blink and drunken. The alcohol sensor is placed in front of the driver. Here one eye blink sensor is fixed in vehicle where if anybody loses conscious and indicate through alarm. The objective of this paper is to develop a system to keep the vehicle secure and protect it by the occupation of the intruders.

II. OVERVIEW OF EXISTING METHODS

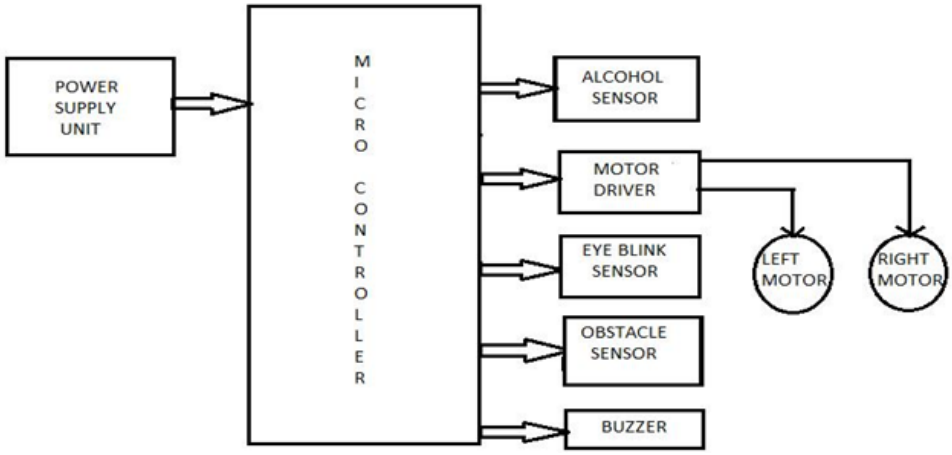
The conventional method used for the detection of blood-alcohol content is the use of Breath analysers. Breath analysers measure the Breath-alcohol content by measuring the amount of alcohol exhaled from the lungs and convert it into the corresponding blood-alcohol content. However, due to their limitations and demerits, Breath analysers are being expelled from their practical implementation. The functioning of Breath analysers is based on the odour and the level of alcoholic ions present in the breath [10]. Thus, it is possible for the drunken driver to take in spices or other smell attenuators to cheat the patrol officers. Though many studies have developed image-based driver alertness recognition systems using computer vision techniques, many problems still remain. First, eye detection remains a challenging problem with no inexpensive or commercial solutions. For some applications, eye feature detection can be satisfactory, but these only used frontal face images taken with controlled lighting conditions. In a car, the constantly changing lighting conditions cause dark shadows and illumination changes, such that effective techniques in stable lighting often do not work in this challenging environment. The performance of current algorithms degrades significantly when tested across different postures and illumination conditions, as documented in a number of evaluations. A second problem is that current systems do not use identification and correlation analysis of various visual measures. Typical visual characteristics of a driver with a reduced alertness level include longer blink duration and slow eyelid movement.

III. IMPLEMENTATION OF SOLAR POWERED VEHICLE USING SENSORS

Recently there has been an enormous increase in road accidents due to sleep deprivation resulting to driver fatigue. The driver loses control of the vehicle when he falls asleep which leads to loss of many lives. The driver is not able to control his vehicle when he is asleep and by the time he realizes it, there is an accident. The vehicle is at a very high speed on highways due to which handling is tough. The Purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents.

The main components of the system consists of an eye blink sensor for driver blink acquisition and an adaptive speed controller designed using DC motor by providing pulse width modulation to control the speed of vehicle.

3.1 Block Diagram



3.2 PV Panel

In a photovoltaic cell, light excites electrons to move from one layer to another through semi-conductive silicon materials. This produces an electric current. Converting solar energy into electrical energy by PV installations is the most recognized way to use solar energy.

Solar photovoltaic cells are semiconductor devices; they have a lot in common with processing and production techniques of other semiconductor devices such as computers and memory chips. Typical photovoltaic cell efficiency is about 15%, which means it can convert 1/6 of solar energy into electricity.

3.3 Alcohol Sensor

The alcohol sensor will detect the alcohol depends on human breath i.e. if the driver has consumed alcohol, it will be identified by his breath. The sensor is placed in front of the driver.The sensor has an excellent sensitivity combined with a quick response time. This unit can be very easily incorporated into an emergency light, to give a visual indication to the driver.

3.4 Eye Blink Sensor

It plays important role in this project since it is used to detect the drowsiness of the driver. The eye blink sensor which can be fixed to the driver's eye to monitor the blinking rate. It measures the blinking rate of the driver's eye continuously. Here, in this project we need to set time as 5 second or above it, as "blink event" is different from "common eye blinking". We need to conduct testing for only blink event, and not to find common blinking of human eye.

3.5 Obstacle Sensor

Obstacle sensor is nothing but IR signal it contains transmitter and receiver pairs, it continuously emits IR ray by the transmitter when rays get reflected and received by the IR receiver it sense there is a obstacle in front of the vehicle it is given to microcontroller by using signal condition unit.

3.6 IR Sensor

Infrared transmitter: A device that emits infrared rays. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed parallel to each other. When IR transmitter passes the rays to receiver, the IR receiver becomes conducting due to non-inverting input voltage is lower than inverting input. This circuit is mainly used to for counting eye lid movement.

3.7 Buzzer

A Buzzer or Beeper is an audio signaling device which may be mechanical, Electro-mechanical, Piezoelectric device. A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.

3.8 Embedded Systems

Embedded systems are self-contained programs that are embedded within a piece of hardware. Embedded systems designers usually have a significant grasp of hardware technologies [11,12]. They use specific programming languages and software to develop embedded systems and manipulate the equipment. Embedded systems technologies are usually fairly expensive due to the necessary development time and built in efficiencies, but they are also highly valued in specific industries. Embedded systems are usually set to a specific task that cannot be altered without physically manipulating the circuitry. Embedded system means the processor is embedded into the required application.

3.9 Microcontrollers

Micro-controllers are useful to the extent that they communicate with other devices, such as sensors, motors, switches, keypads, displays, memory and even other micro-controllers. An embedded product uses a microprocessor or microcontroller to do one task only [11, 12]. Microprocessor - A single chip that contains the CPU or most of the computer. Microcontroller - A single chip used to control other devices.

Many interface methods have been developed over the years to solve the complex problem of balancing circuit design criteria such as features, cost, size, weight, power consumption, reliability, availability, manufacturability. Microcontroller differs from a microprocessor in many ways. First and the most important is its functionality. In order for a microprocessor to be used, other components such as memory, or components for receiving and sending data must be added to it. In short that means that microprocessor is the very heart of the computer. On the other hand, microcontroller is designed to be all of that in one.

3.10 DC Motor

Here we are going to use 3 DC motors. Two are of 100 rpm and one is 10 rpm. The breif description of DC motor is given below.

DC motors are broadly classified into three types. They are

- DC Series motor.
- DC Shunt motor.
- DC Compound motor.

DC motors consist of one set of coils, called armature winding, inside another set of coils or a set of permanent magnets, called the stator. Applying a voltage to the coils produces a torque in the armature, resulting in motion. The stator is the stationary outside part of a motor. The stator of a permanent magnet dc motor is composed of two or more permanent magnet pole pieces. The magnetic field can alternatively be created by an electromagnet. In this case, a DC coil (field winding) is wound around a magnetic material that forms part of the stator. The rotor is the inner part which rotates. The rotor is composed of windings (called armature windings) which are connected to the external circuit through a mechanical commutator. Both stator and rotor are made of ferromagnetic materials. The two are separated by air-gap.

3.11 Hardware used

The following hardware components are used

- 8051Microcontroller
- Eye Blink Sensor
- Alcohol Sensor
- Obstacle Sensor
- LCD & LED Indicators
- Relay
- Power Supply (solar panel)

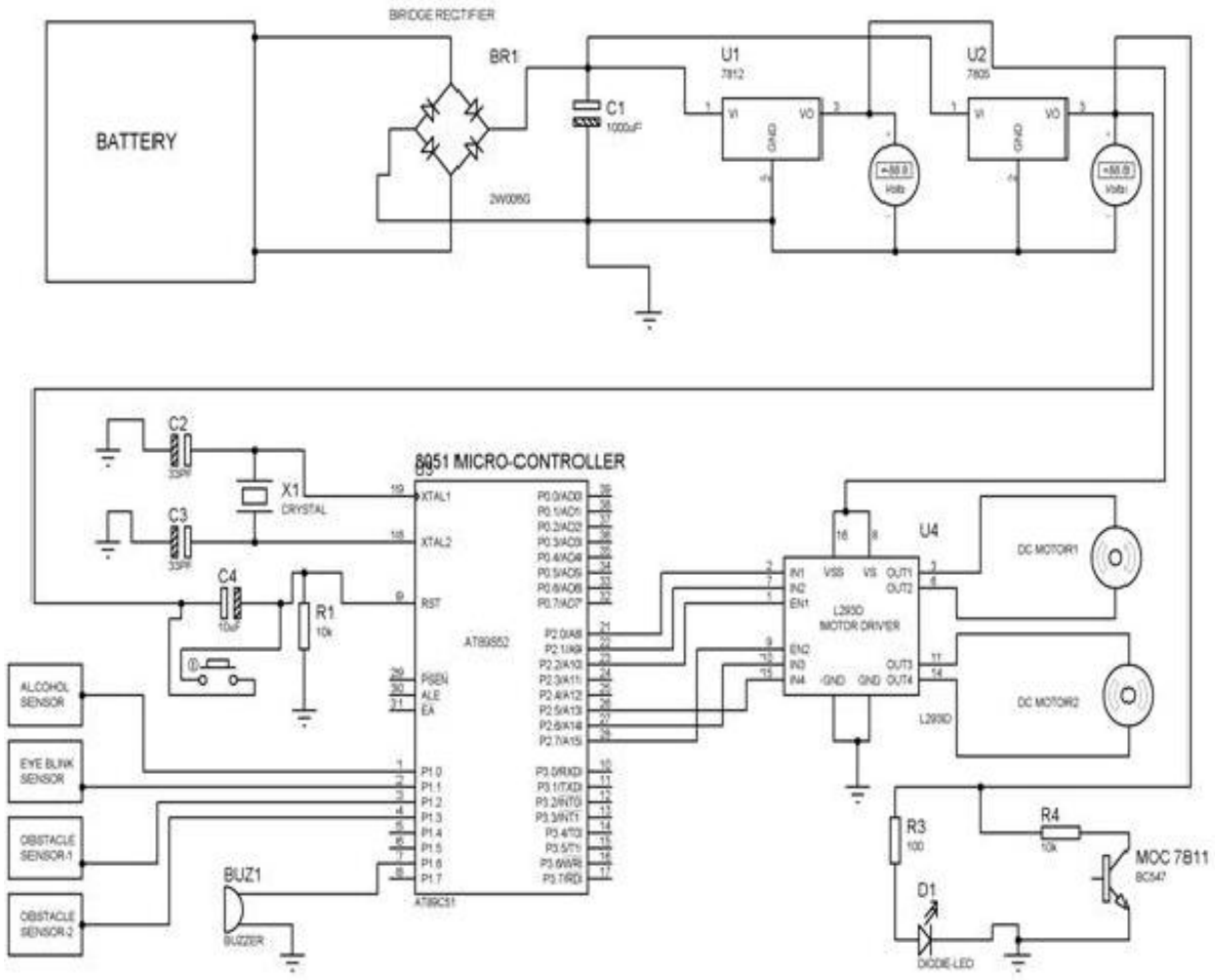


FIG.2: IMPLEMENTED SCHEMATIC DIAGRAM

Specifications of 25W Solar Panel:
Nominal Peak Power (W_p) 25 W monocrystalline
Output power tolerance (W_p) +/-5%
Maximum Power Voltage (V_{mpp}) 16.8 V
Maximum Power Current (I_{mpp}) 1.49 A
Open-Circuit Voltage (V_{oc}) 21.2 V
Short-Circuit Current (I_{sc}) 1.79 A
Solar Cell Efficiency (η_c) 13 %
Module Efficiency (η_m) 10 %
Length x Width x Height, 680x340x28mm
Maximum System Voltage DC 1000V
Weight (Wind) Bearing Potential 60m/s (200kgs/sq.m)
Hailstone Impact Resistance Steel ball dropped from 1m height.

IV. RESULTS

By using non-conventional solar source we are feeding battery and by using alcohol detector we are detecting the alcohol consumption of the driver. If alcohol detector senses the alcohol level, then the vehicle restricts to certain speed limit mode, otherwise it operates in normal mode. Now by using the eye-blink sensor, we are detecting the drowsiness of the driver by eye closures per minute and the obstacle sensor detects the vehicles in the path of parking and the vehicle gets automatically parked, when the driver was unable to control the vehicle by turning ON the LED lights

FIG.3: HARDWARE IMPLEMENTATION OF SOLAR POWERED VEHICLE USING SENSORS

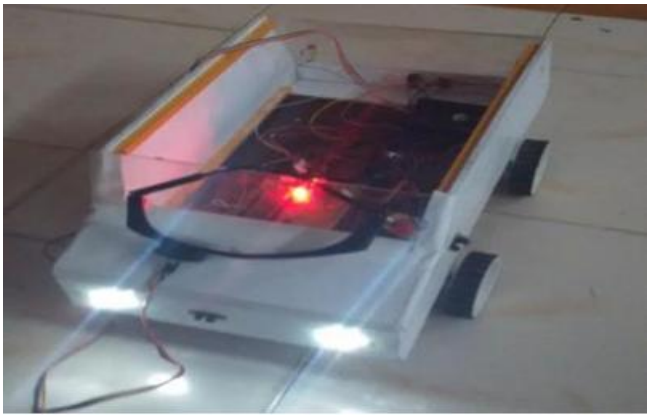


FIG.4: WORKING OF SOLAR POWERED VEHICLE USING SENSORS

FIG.5: MOVING OF SOLAR POWERED VEHICLE USING SENSORS

V. CONCLUSION

This is because of the fact that the driver is not able to control his vehicle when he is asleep and by the time he realizes it, there is an accident. The vehicle is at a very high speed on highways due to which handling is tough and getting the vehicle to halt in such a condition is difficult. Due to this many automobile companies are trying to research onto how an accident which occurs due to driver fatigue can be prevented. In this project we will generate a model which can prevent such an incident. The Purpose of such a model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to avoid accidents. The main components of the system consists of an eye blink sensor for driver blink acquisition and an adaptive speed controller designed using DC motor by providing pulse width modulation to control the speed of vehicle. Advanced technology offers some hope to avoid these accidents up to some extent. So, we as an engineer need to take some action against this and provide the desired solution. For the safety of the human being some automation is made. In this paper by using some high quality sensors, which helps in manipulating cause of accidents. This report consist of different applications combined together to fulfill the safety precautions. We experimented this application to provide the prevention of accident due to drowsiness of the driver and disturbing intruders. We have made the vehicle and driver secure against such severe problems

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