

Design and Development of Vehicle Model Built with Smart Accident Prevention System - A Practical Research Approach

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Abstract—Currently the transportation in India is suffering from many types of accidents, as the life of many passengers of bus or travels is dependent on a single driver, thus a safe driving system is needed for drunk and fatigue cases. As the interaction happened during the development of a new things include investigation of available methodologies, finding the drawbacks in the existing system, creation of new innovative ideas, checking the feasibility of ideas, gathering of relevant information, application of theoretical knowledge for designing of system, verification using computer oriented technologies, finally implementation of best solution gives us the opportunities to fight against the challengingly task is undertaken to eliminate issues in existing accident prevention techniques used in vehicle, came up during that period in Telescopic action responsible new smart things named as Smart accident prevention system. Therefore considering value of the life of many passengers of bus or travels or other vehicles, it is necessary to implement the foolproof smart accident prevention system in vehicles. In this, vehicle model built with smart accident prevention system, there are three techniques used to prevent the accidents and save the life of passengers in bus and travels, the first technique is using an alcohol detecting sensor in vehicle which senses and detect alcohol gases and lock the steering mechanism in vehicle, thus the vehicle don't get start and second technique using infrared sensor in the vehicle to observe the fatigue of driver by the eyes, which is used to glow the LED and start the buzzer to alert the passengers, sited behind the driver cabin and third technique is the use of vibrator below the drivers chair, which also work according to IR sensor and helps in awakening the driver. The GPS and GSM technology is also implemented in this vehicle model that comes to know about the actual location of the vehicle through longitude and latitude via message like "the driver is drunk and driver is in emergency condition". In the developed smart accident prevention system, the Arduino microcontroller programming is done to perform the system and getting the performance output. First research approach step was the essence of the invention is that the complete design and manufacturing of vehicle model in built with smart accident prevention system and trial has been taken for the performance.

Keywords: Concept methodology, Design, Sensors, Smart accident prevention system, vehicle model etc

1. INTRODUCTION

When you think of work-related safety hazards, you probably think about what goes on inside the workplace. But one of the greatest threats to your safety is not in the workplace, but rather on the road. Someone is injured every 18 seconds. Over 2 million of those injuries turn out to be disabling. A person dies in a crash on U.S. roads every 11 minutes. In fact, motor vehicle accidents are the most common cause of death in the United States- more than cancer or heart attacks. When we think about the serious accident, it could change your life- and not for the better. As of now most of the research and implementation on with mechanical this project involves measure and controls the eye blink & alcohol content using IR sensor & alcohol detector. 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. Alcohol detector detects the content of alcohol in the breath and thus it attempts to clamp down alcoholics. This system uses microcontroller, LCD display, alcohol detector, GSM and buzzer. The output of the sensor is directly proportional to the content of alcohol consumed. This output is given to logic circuit to indicate the alarm. This project involves controlling accident due to unconscious through Eye blink & alcohol detector. Here one eye blink sensor and alcohol detector is fixed in vehicle where if anybody loses conscious and indicate through alarm and GSM. The circuit has an alcohol sensor. This sensor measures the content of alcohol from the breath of drunken people. Output of the sensor is directly proportional to the alcohol content. When the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide in the sensor, ethanol burns into acetic acid then more current is produced.

So the more alcohol molecules more will be the current produced. Output of the sensor is then fed to the microcontroller for comparison. The output of the sensors is in the analog nature which should be converted into digital format. This is done by the analogue to digital converter of the microcontroller unit. The microcontroller controls the entire circuit. The GSM sends message and buzzer produces alarm. The working conditions and various constraints were properly studied before carrying out further steps.

2. CONCEPT METHODOLOGY

Many accidents are at least partially caused by fatigue of the driver. This can be happen due to many reasons: poor judgment of the driver, poor driving by the driver, fatigue of the driver, consumption of the alcohol. Once the driver has lost control, it is very difficult to drive the vehicle so as to avoid road accident and prevent the life of passengers and valuable property, it is necessary to have some safety system which will be permanent solution to above problem. Therefore an innovative concept is suggested as given below-

Automated systems provide high security to the drivers and passengers. Eye blink sensor is used to continuously monitor number of times the eye blinks, if eye closes for certain period of time, buzzer indication will be given with a vibrator and a message like "the driver is drunk and driver is in emergency condition" will be sent to the owner of the vehicle. This paper involves measuring the eye blinks using IR sensor. IR sensor consists of two sections. The IR transmitter is used to transmit the infrared rays to our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed then the output of IR receiver is high otherwise the IR receiver output is low. This is to know whether the eye is at close or open position at that condition. This information is compared according to the drowsiness conditions and if conditions are not satisfied then buzzer will be on, passenger get alert. And also when the information sent from the alcohol sensor does not satisfy the respective conditions then the steering gets locked, i.e. the driver is not able to drive the vehicle.

3. LITERATURE SURVEY

Several road safety literature databases search for articles on prevention of accidents.

1. Diarmaid O cualain, Dr Martin Glavin have worked on both lane departure working and obstacle detection to create a system that will help the driver to keep the vehicle in lane and avoid any unwanted lane changes they have done several studies regarding obstacle detection and have used image processing technique for the same.
2. Honda has developed a system that utilizes one of these mounted beside the rear view mirror that recognizes the lane vehicle is travelling in.
3. Zehang sun, George bebis and Ronald miller have worked on vehicle detection using optical sensors.

4. On 21 April 2015, Nagpur Indian intelligent system in a car work onto the order to prevent the accidents due to driver fatigue. Previous studies have proposed different method for drowsiness detection like, a) approach focuses on physical changes like staging posture, inclination of diver head etc., b) the approach focuses on measuring physiological changes of driver like eye activity, heart beat rate etc., c) system based on non-intrusive machine vision based concept, d) alcohol gas sensor is used to detect the amount of alcohol present.
5. Mercedes Benz utilize a radar system on the S series cars that can detect obstacles in the path of vehicle, and apply the brakes faster than the driver can.
6. American physicists Roger L. Easton is widely credited as the primary inventor of GPS. The formation of GPS can be traced to the memorandum issued by Deputy Secretary of Defence William.
7. The world first GSM call was made by the former Finnish Prime Minister HarriHolkeri to KaarinaSuonio on July 1, 1991, on a network built by Telenokia and Seimens and operated by Radiolinja.
8. In 1992 the first short messaging service message was sent and Vodafone UK signed the first international roaming agreement.

4. OPERATING PRINCIPLE METHODOLOGY

This smart accident prevention system uses the alcohol sensor, IR sensor for detecting the drowsiness and fatigue of the driver. If the alcohol is detected from the breath of the driver the alcohol sensor gets activated and steering gets locked. Here, controller is used if the input voltage to the controller is 0volt i.e. low then he engine functions as regular, if the input to the Controller is high i.e. +5 volt then the alcohol is detected and the steering gets locked, this alcohol sensor is located near to the steering of the vehicle. Further IR sensor is used to lookout the position of the eye lid; it consists of transmitter and receiver. The IR light is emitted at an angle of the eyes of the driver and if it struck the pupil of the eye and reflects back to the receiver, the input to the controller will low and hence the alarm i.e. buzzer and vibrator gets off. Due to the drowsiness of the driver the blinking frequency reduces and hence the emitted IR rays reflects and output to the controller Is high. Due to the high output the buzzers get operated and the vibrator vibrates. The IR sensor is located at the front glass near the steering of the vehicle and the led is located at the back side of the driver cabin, thus the passengers are able to alert and the Vibrator is located below the driverseat.GPS (Global Positioning System) is satellite based navigation system consist of a network of 24 satellites located into orbit. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world .Normally no subscription fees or system charges to utilize GPS. GPS receiver must be locked onto the signal of at least

three satellites to estimate 2D position (longitude and latitude) and track movement. With 4 or more satellite in sight, the receiver can determine the user 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like speed, distance to destination, time and other. Fig no.4.1 shows the block diagram of operating system. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible and provide information to the responsible person through GSM technology. The GSM modem is a specialized type of modem which accepts a simcard operates on a subscriber's mobile number over a network, just like a cellular phone. It is a cell phone without display. Modem sim300 is a triband GSM/GPRS engine that work on certain frequencies.



Fig. 4.2: Practical Research Model

1-glass, 2-stering wheel, 3-alcohol sensor (MQ3), 4-eye blink sensor (infrared), 5-steering rod, 6-steering chair, 7-vehicle body, 8-vibrator 9-wheels.

The amplified signal is conditioned for the microcontroller. The microcontroller and other component are powered by a separate power supply circuit. The microcontroller is programmed to convert the input signal in volts to the respective value. The computed signal is then displayed.

5. DESIGN METHODOLOGY

Fig no 5.1 line diagram of whole setup

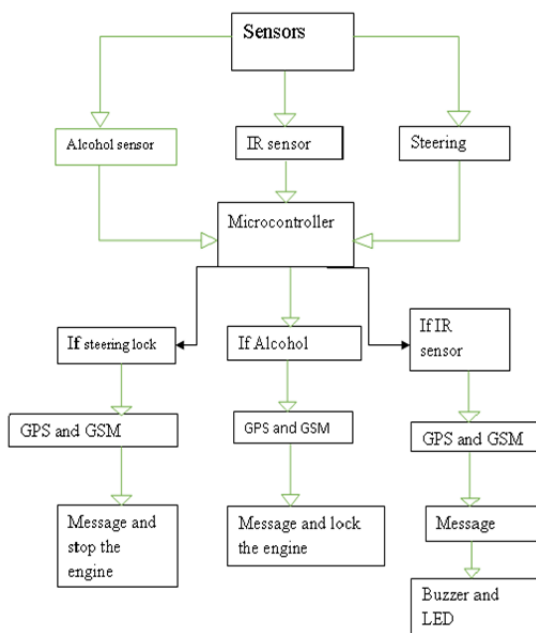


Fig. 4.1: Block Diagram of Operating System

Fig. no.4.2 shows the Practical Research Model. This practical Research model involves a simple principle of displaying the sensed signal from the electrode on the LED through a microcontroller. The sensed signal will be in milli voltage, so it can't be used directly by the other component. So the signal is amplified to an extent that can be processed by other components

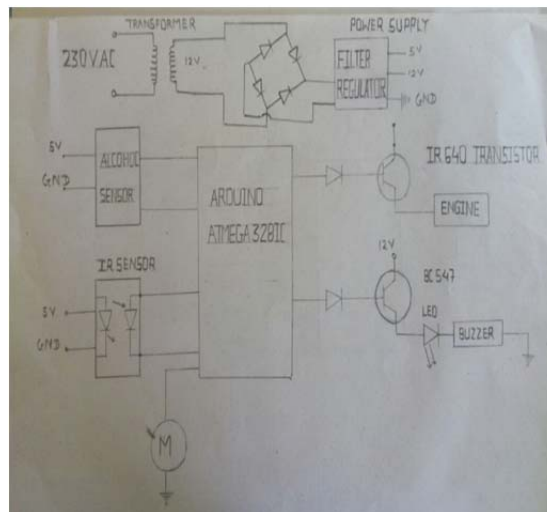


Fig. 5.1: Circuit line Diagram of Operating System

There are various types of sensors depending on the applications like speed sensor, temperature sensor,

But here the purpose is to detect the eye blink when the person is sleeping, to detect drowsiness, so select

IR sensor as per our requirement. Fig.5.2 shows the Eye blink sensor and its characteristics IR sensor are used because of the following reasons

-It is fast, time saved, allowing for more measurements and accumulation of data.

-It facilitates the measurement of moving targets.

-Measurement can be taken of hazardous objects.

-There is no interference, no energy loss from the target. and its Specifications are temperature range- 0 to 70 degree, IR sensor output- 4 to 20mA, Accuracy-+1 and -1% of reading, Supply voltage-24V dc.

Fig no 5.2 shows alcohol sensor have some following characteristics-High sensitivity to alcohol and low sensitivity to benzene., Fast response, High sensitivity, Stable and long life, Simple drive circuit application, They are suitable for alcohol checker, breathalyzer



Fig. 5.2: Eye blink sensor and alcohol sensor

The Specifications are Temperature: 20 degree, Humidity: 65%, O₂ concentration: 21% Resistive load: 200 kilo-ohm, 9.3 mm height without the pins, Sensor resistance: 0.4mg/L,

Heater consumption: 16.8mm diameter,

GPS (Global Positioning System) - The following are the characteristics of GPS

-GPS receiver tracks and uses multiple satellites for fast, accurate positioning and velocity estimate.

-Differential DGPS capabilities using real time,

-WAAS correction yielding position accuracy of less than 3 meters.

-Compact, rugged design ideal for application with minimal space.

-Configurable for binary format data output.

-Flash based program allows new software revision through a website download.

-Non volatile memory does not require battery backup.

-Waterproof design allows continuous exposure to the prevailing weather conditions atmost location.

Now the Technical specifications of GPS are

Size: 61 mm (2.4 inches) in dia and 19.55 mm ht

Weight: 1. GPS 18 *USB: 3.7 (105g) 2.GPS 18*PC:6.3(180g) 3.GPS 18*LVC 5m (5 m cable)

Colour: black, Case material: polycarbonate thermoplastic that is waterproof to ICE 60529 IP*7 level, Cable length: GPS 18*USB: 2 meter, GPS 18*PC:2 meter, GPS 18*LVC:5meter

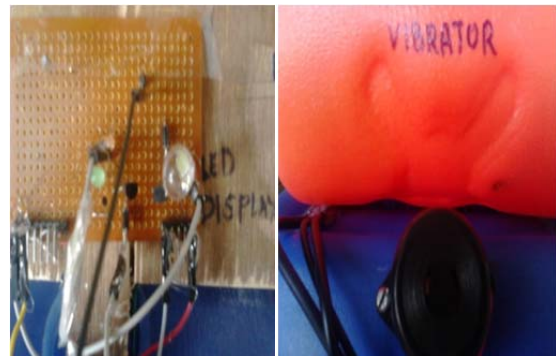


Fig 5.3: Microcontrollers and Vibrator

6. TRIAL ON PRACTICAL MODEL AND RESULT.

6.1. Trial on alcohol sensor

The range of alcohol sensor is set. The alcohol gets detected within this range limit. The sensor is set up to certain alcohol range, thus we maintain it up to sensing the alcohol composition in marker.

Input – Smell of marker ink

Output – shows fig.6.1 the output of alcohol sensor Ignition stop, i.e. the engine which is started, after detecting alcohol, it is stopped, and a text is send on the mobile of the owner through GSM.

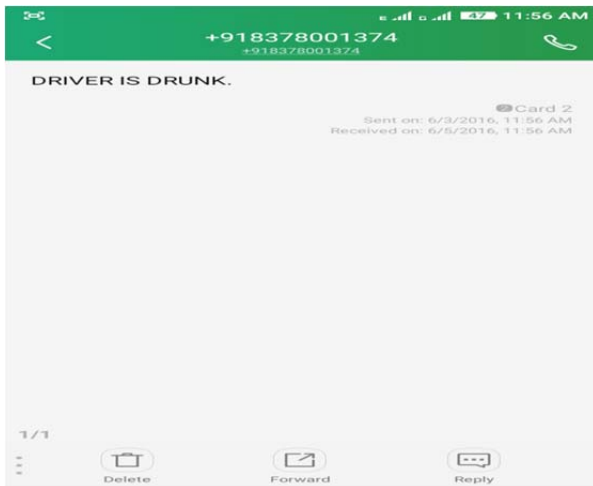


Fig. 6.1: Output from alcohol Sensor

6.2. Trial on Infrared eye blink sensor

This sensor is mainly useful for government bus or any travel bus, which consist of more amounts of passenger. The driver who is feeling fatigue must be noted by the passenger, and thus they can alert the conductor, or allow to stop the vehicle for certain time period. Input – Eye of driver is closed. Rays transmission by transmitter and receiver is stop, driver is feeling fatigue. Output- shows fig.6.2 the output of eye blink sensor Led blinks, which helps in alerting the passenger with the buzzer. Thus the passenger get alert and allow to stop the vehicle, until the driver come back from the fatigue mode.

6.3. Trial on Steering Wheel for location through GPS

This is used to locate the coordinate after accident, i.e. it is used for positioning the vehicle, according to longitude and latitude. Input- Lost balance on steering, it rotates with certain unwanted rpm. Output –The unwanted rotation of steering, leads to accident, thus there is a need to locate the position of vehicle after accident, it is done by GPS, a text is received about the position of the vehicle.

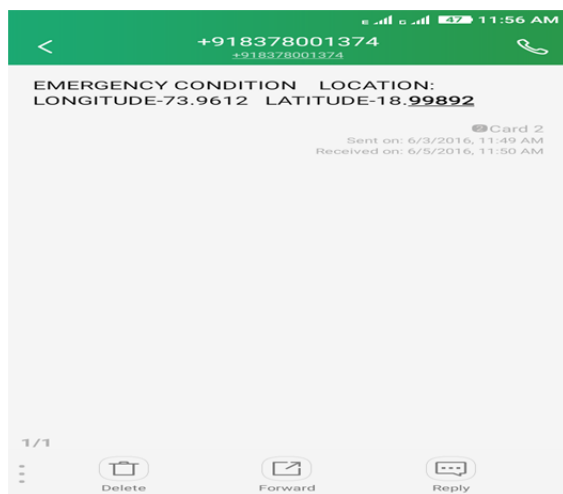


Fig. 6.2: Output from eye Blink Sensor

7. CONCLUSION

From the design of experimental setup, it presents architecture for automatic adaption to control the fatigue of a driver and to alert the passenger. Our approach is based on the prevention of many lives in public sector transport; it is due to the driver's fatigue and alcohol consumption, accidents keep with yearly increasing. This practical Research model shows the fatigue detection using alcohol sensor to avoid the accidents. Eye blink sensors are also taken in consideration even if the alarm sounds are not capable of awaking the driver. Hence In this practical Research model, we have worked out to avoid accidents.

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