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Intelligent Automatic Vehicle Accident Detection and Prevention System

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ABSTRACT
Ever increasing number of fatal traffic accidents around the world can be significantly reduced if modern technology is incorporated within the automobile to access the physical conditions of the driver at regular intervals during the movement of the vehicle and preventive measures are automatically taken for the safety under abnormal conditions. The objective of this project is to design and implement intelligent safety system to vehicle in order to avoid accidents. Alcohol consumption is verified at the starting process of the vehicle using alcohol sensor, if the driver is drunk the vehicle doesn't allow the driver to start the vehicle and also on drive if the driver consumes alcohol vehicle will be automatically parked on to the left end of the road. Drivers drowsiness is monitored using eye blink sensor implemented using IR, upon drowsy state the vehicle will be automatically parked on to the left end of the road. Pulse rate sensors are used to monitor drivers pulse rate, upon abnormal pulse rate variations the vehicle will be parked on to the left end of the road and intimated with a message to the rescue services using GSM along with the latitude and longitude information using GPS. Piezo electric sensors are used to detect in case of any accident to the vehicle and automatically intimate with a message to the rescue services using GSM along with the latitude and longitude information using GPS.

Keywords: Arduino mega, Alcohol sensor, Pulse sensor, piezo sensor, IR sensor, GSM, GPS

I. INTRODUCTION

In modern world, there is an exponential increase in automobile usage with corresponding increase in population. Consequently, the accident rates have also increased due to distinct reasons. Among these, human errors while driving has become a crucial factor.

Fatigue driving & drunk and driving are main contribution to road crashes, Up to 20% of all traffic accidents are believed to be due to drowsy while driving and 40% of traffic accidents due to drunk and drive. Falling asleep while driving cause at least 100,000 crashes annually; 40,000 lead to nonfatal injuries, over 1500 result in fatal injuries.

Active safety systems currently applied in vehicles provide stabilization and better control of the vehicle dynamics, by assisting the driver or improving the dynamic response of the car. The level of incorporating systems into vehicle may vary between two extremes: fully autonomous vehicles, taking over complete control and excluding the driver from control loop or driver warning systems, leaving the initiative for avoidance to the driver.

It is believed that a human-centered semi-autonomous approach might be the better solution by placing the human driver in control loop in these two ways: (1) Augmenting the inputs of driver with appropriate controller inputs for correction, (2) Excluding the driver from the loop when his/her capability is not adequate or agile enough to avoid certain accidents. This intelligent system is a semi-autonomous approach developed for monitoring the driver's condition while driving, which mainly deals with providing safety for the driver and for the passengers by continuously auditing the driver conditions like drowsiness, heart beat rate and alcohol content in the breath of the driver.

Along with which an intelligent detection system is also incorporated to intimate ambulance and rescue services upon accidents along with the

exact location of occurrence of accident to render immediate aid to the drivers and for the passengers.

Thus, this system provides safety and precautionary measures which can be Implemented on vehicles in highways for reducing fatality rate and has the following advantage i.e. to decrease mortality rate and to increase safety levels of the vehicle and also to avoid rash driving.

II. RELATED WORK

There have been several designs proposed in scientific literature to detect driver's drowsiness and subsequently to control the vehicle. A warning system to detect driver's drowsiness by applying image processing techniques on images captured through a video camera and then conducting analysis utilizing a neural network has been proposed by Singh and Bange [1].

The first step in this design is the image acquisition which is done by using video camera installed on the dashboard and then converts it into image frames. The second step is the face detection using Viola Jones Algorithm, followed by the extraction of the eyes' features. Lastly, a neural network trained using back-propagation algorithm on images of eyes in various states (open, drowsy, closed) is used to predict whether the driver is drowsy or not.

An accuracy of 96.7% was obtained by the authors in correctly assessing the drowsiness state of the driver using this technique. Another driver-fatigue monitoring system which uses remotely-located charge coupled device (CCD) cameras equipped with active infra-red illuminators to take video images of the drivers has been designed by Varma et. al. [2].

Simultaneously the heart beat rate of the driver is monitored and detected using R-peak detection algorithm [4] by taking an ECG (Electro Cardio Gram) signal of the driver. The detected heart beat rate is compared with the normal value (60-100 beats/minute) to predict whether the driver is in safe hands to drive. Turan and Gupta [5] have proposed a system to detect driver's drowsiness by measuring the changes in the geometric features of the driver's face (eyes and mouth) during yawning.

Morris et al. [6] have proposed the eye blinking detection method using spatio-temporal filtering and

Lucas-Kanade feature tracking to locate the position of the head and to extract eyelid movements. They have reported 95% eye-blink detection result but head movements affect the variance map computation and cause a sharp drop in performance. Sirohey et al. [7] proposed a method where Manual breathe analyzers were used to detect the alcohol content where in the driver should manually take a alcoholic test to start the vehicle.

III. PROPOSED SYSTEM

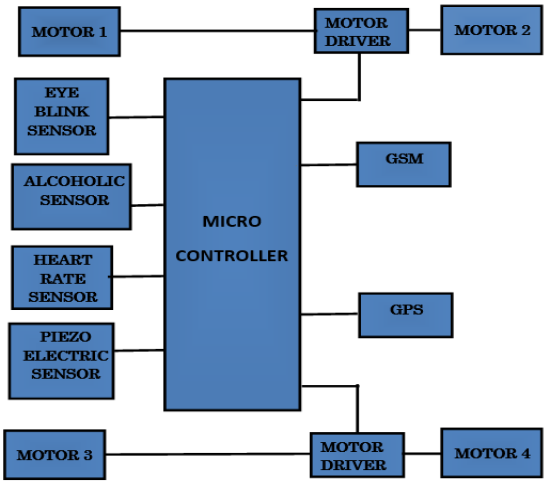


Fig 1: Block digram of the proposed system

The proposed system is a part of multi input control automated sytem.fig 1 shows a detailed block diagram of the system which use Arduino as its main controller and other analog and digital sensors to provide safety to the driver.

1) Arduino microcontroller set

Since the proposed system is a part of a multi input control system a careful selection of the microcontroller unit is required. It represents the "brain" of the system. It must have special characteristic and specification to cover the required input/output ports and peripherals for the system design. Arduino ATmega 2560 is used for this purpose. The Arduino microcontroller is selected as the main controller of the system.Arduino is one of the energy friendly products.

The Arduino Mega2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts.

If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

The ATmega2560 has 256 KB of flash memory for storing code (of which 8 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM. Each of the 54 digital pins on the Mega can be used as an input or output. The Atmega2560 on the Arduino Mega comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer.

A SoftwareSerial library allows for serial communication on any of the Mega's digital pins. The ATmega2560 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. The Arduino Mega2560 can be programmed with the Arduino IDE software.

2) Alcohol sensor

The sensing element detects the alcohol content from the breath of the driver continuously and amplifies it to give a switching pulse output .it detects the alcohol content continuously to sense the drivers drunken state and alerts the driver. An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers. The alcohol sensor **(**MQ3) is efficient among all the other sensors with fast response, high sensitivity, stable life and a simple drive circuit.

3) Piezo sensor

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge.

4) Pulse rate sensor

The pulse rate sensor is based on the principle of photo plethysmography. It measures the change in the volume of blood through any organ of the body which causes the change in light intensity through that organ. Heart beat can be measured based on the optical power variation as light is scattered or absorbed during its path through the blood as the heart beat changes. Light emitted from the light emitting device is transmitted through any vascular region of the body such as earlobe and received by the detector. Light emitted by the light emitting device is reflected by the regions.

5) IR sensor

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses. fixing the sensor in front of driver seat so that the sensor monitors the eye movement of the driver periodically. If the eye lid of driver is not showing any change for a period, the caution will be given to the driver. This sensor should be fixed in such a way that it shall sense the eye movement when the driver bends or sets erect.

The blinking of eye is necessary in this project, since it is used to drive the device and to operate events. Eye blink detection must be done. time greater than the human eye blinking time then consider an event called "blink", for which the set of operations will be followed. Eyeballs are monitored with their white colour using sensor if colour other than white such as black or beige or other shades of brown are sensed for more than 15 seconds then a high signal is given from sensor to the Arduino to automatically park the vehicle.

6)Motor driver

The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two Hbridge. H-bridge is the simplest circuit for controlling a low current rated motor**.**

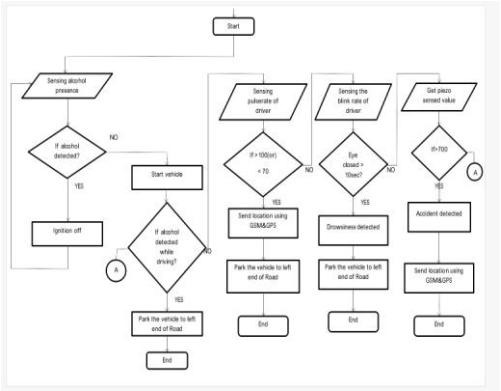
7) GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band**.**

8) GPS

GPS makes it possible to precisely identify locations on the earth by measuring distance from the satellites. GPS allows you to record or create locations from places on the earth and help you navigate to and from those places.

IV. FLOW CHART



V. WORK DESCRIPTION

Auto ignition off on alcoholic detection that is Alcohol consumption is verified at starting process of the vehicle, if driver is drunk then the vehicle doesn't allow the driver to start the vehicle. If alcohol content is sensed in driver's breath while the vehicle is on drive the vehicle is automatically parked on to the left end of the road If the driver is drowsy, an eye blink sensor implemented using IR sensor is used to sense the blink count and is compared with normal eye blink count and upon abnormal blink movement, the speed of the vehicle is controlled automatically to park the vehicle to left end of the road. Immediate tracking of accidents: If any accident occurs then a piezoelectric sensor detects it and short message service along with location will be sent to predefined numbers. Pulse rate sensors are used to constantly monitor the driver's pulse rate and if driver's pulse is found to have abnormal rate then automatically park the vehicle to the left end of the road and intimate through short message service using GSM along with the latitude and longitude location by using GPS.

VI. EXPERIMENTAL RESULT

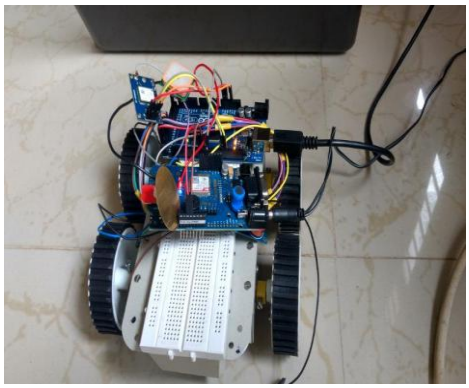


Fig 2: IAVADPS

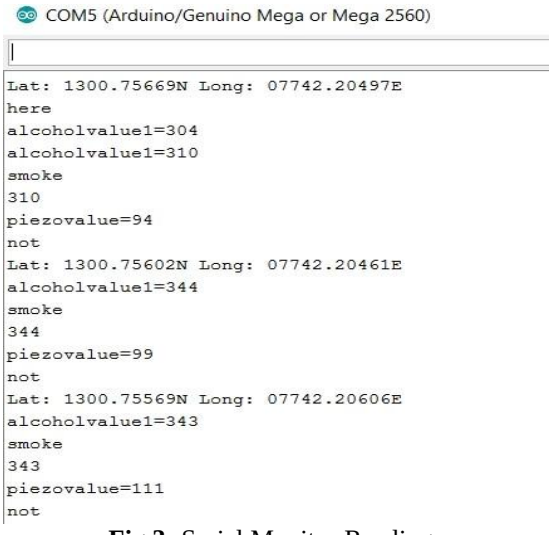


Fig 3: Serial Monitor Readings

VI. CONCULSION

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VII. FUTURE SCOPE

Eye blink sensors can be used to monitor blink rate of the driver for detection of drowsiness. While parking the vehicle to the left hand of the road, PIR sensors or ultrasonic sensor can be implemented to detect any obstacles and to be parked accordingly without causing any accident. High end sensors can be deployed for better accuracy and efficiency.

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