Vehicle safety tracking and monitoring system with alcohol detection and seat belt control system.

Omkar Rane
School of Electrical Engineering
B.Tech , Electronics & Telecommunication Engineering
MIT Academy of Engineering, Alandi(D), Pune, Maharashtra, India.

Abstract— On a survey that has been done recently, said that nearly 75% of road accidents occur due to drunken drive, with a range of 45% to 68% in small cities. They also conveyed that overall of 56 accidents and 14 to 15 deaths occur on our roads per day due to not wearing the seat belts. In the already available system, the alcohol sensor is kept on the car steering and thereby controls the vehicle according to the presence of alcohol. But road safety is indeed important in other aspect that is the reason we are controlling the system based on the seatbelt wearing and monitoring speed of vehicle.

Index Terms— ESP-32 Espressif development board with Tensilica Xtensa LX6 32-bit microprocessor, MQ3 alcohol sensor, mechanical relay, solid state relay, switch, MEMS sensor i.e MPU-6050 module, hall effect sensor, temperature sensor, GPS,ignition control,seat belt control,Internet of things,cloud platform,GUI,android application.

1 INTRODUCTION

In recent epoch, there happens to occur lot of road accidents due to drunken driving and rash driving. Boulevard safety has become one of the major concerns in today's life. Drinking and driving is already a serious public vigor problem, which is likely to emerge as one of the most noteworthy problems in the near prospect [1]. Not only drunken drive, but also driving rudely without wearing seat belts in cars causes a lot of tragic lethal deaths. Seat belt is one among the key safety measure used in vehicles like cars to avoid major injuries to the driver driving the vehicle [2]. Advanced life saving measures, such as electronic constancy control, also show momentous undertake for reducing injuries, e.g., crash analysis reports proves that more or less 34% of tragic traffic accidents could have been prevented with the use of electronic constancy control [3]. Due to driver carelessness there occur to demand chief road accidents within the city, but outside the city, accidents mostly occur due to drunken driving [5]. Presently, there transpire diverse technologies to reduce individual work and time intricacy. Microprocessor on development boards is one such thing, which is defined to be a small chip or incorporated circuit that can be programmable to function the peripherals connected to it.

ESP32 based development board has a microprocessor which is an open source it has support for WIFI, on chip temperature sensor, hall sensor.one more benefit it that we can use same Arduino IDE and micro python for programming this development board. It has support for real time operating system [6]. The proposed system aims at reducing the road accidents and fatal deaths due to drunken and rash driving, over speeding. The system looks for the presence of alcohol consumption of the driver and locks the ignition if positive. The lock on the car ignition is released. The driver has worn seatbelt. The updates of the car start and its progress are recorded and notified to the particulars via internet on cloud platform. The broadcast of indication from various sensor like alcohol sensor, seat belt switch can be monitored on android application. The wireless technologies are also concluded using cloud technologies with the help of soft computing techniques [5]. Since the realm of our application is based on embedded systems, which is devoted to peculiar tasks, delineation developers can optimize it reducing the expanse and fare of the product and increasing the consistency and performance [7]. The existing system provides an environment where the driver cannot start the ignition when the driver is drunk above the verge value. In former systems, they have not yet implemented vehicle controlling along with seat belt control. There exists vehicle controller using alcohol detection and seat belt control system separately but the idea of controlling the seat belt of cars according to the alcohol content present in the blood of the driver is the proposed system. That is, if the driver is seemed to be drunk, then the seat belt slot is covered up, making it unable for the driver to wear the seatbelt. Unless or otherwise, if the sensor at the slot makes sure that the seatbelt is locked, the micro controller shuts the engine off. Thereby if the ignition is off, then we cannot start the car. But on either case, if the alcohol is not consumed also, the driver must ensure that he/she wears the seatbelt properly in order to make the micro controller release the ignition lock. We are using the MEMS sensor technology based MPU 6050 sensor module which has accelerometer, gyroscope and temperature sensor on single module. In monitoring system GUI, we can monitor acceleration data of vehicle so we can see whether vehicle is over speeding, based on gyroscope data we predict rash driving of driver. On board temperature on system can help to avoid fire in internal car system. External temperature sensor present on MPU 6050 module can monitor temperature inside vehicle.GPS module

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will send live updates of vehicle location on map. Effect of magnetic interference on system can monitored by hall sensor values because in today world electrical equiments are studied and tested for electrical and magnetic interference.

2 System Architecture

The main essential ingredient of the proposed system is "alcohol sensor". If the driver alcohol, then it is detected by the alcohol sensor and the output of the sensor goes high to indicate the presence of alcohol or low to indicate its absence. On android application indication led corresponding to alcohol detection and seat belt with glow if driver is not wearing seat belt or he had drunk alcohol. The output of the alcohol sensor is the input to development board.to make system compatible with exiating car battery supply we need to design dc-dc step down converter to with multiple output. We have to interface GPS system to other micro controller-based development board due interfacing limit of sensors on present board.

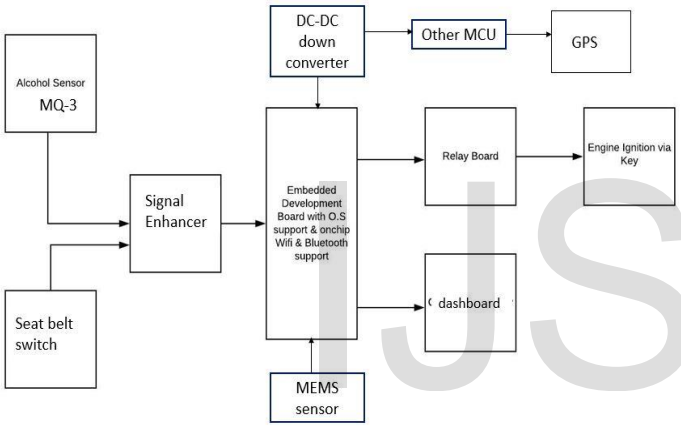

Fig 1: System Block diagram

The switch connected by pull down resistor is used to sense whether seat belt is wored by driver. It is used in here to detect whether the seat belt is worn. To avoid losses due long-distance in wire, we have to use signal enhancer to sensor signal pins. The outputs from both the sensor is passed to development board where it checks and examines the output. The work of the development board is that, it produces the output as high only if both returns are positive, for that to begin we have to set sensor values as true and if any change in stipulation then turned to false. Now when the comparator sends the yield to the microprocessor as true it sends an input to the relay making the car ignition to start. Or else, if the output of the comparison is false, then it sends an input to WIFI module in order to send a indication stating that either the driver has not wearied the seatbelt or has frenzied alcohol. solid state relay is interfaced to existing ignition system of vehicle to control ignition on detection of alcohol and for seat control system. Dashboard monitoring will be done on android application and user will get live updates of vehicle.GPS is also strapped to the microprocessor which provides the information like spot, instance etc. MEMS (Micro Electro Mechanical) sensor like MPU 6050 will be interfaced to development board and values will sent via internet on cloud and will monitored on android application.

3 Hardware Componets

3.1 MQ-3 Alcohol sensor

It helps to perceive whether the driver has frenzied alcohol or not. It has unwavering and long life, high compassion and faster retort.

Fig 2: MQ3 Alcohol Sensor

3.2 Push-button switch

It helps to detect whether the driver has worn seat belt or not.it has quick response and it has mechanical operation that should placed inside seat belt system of car.

Fig 3: Push button switch

3.3 Solid state relay

SSRs (Solid State Relays) have no movable contacts. SSRs are not very different in operation from mechanical relays that have movable contacts. SSRs, however, employ semiconductor switching elements, such as thyristors, triacs, diodes, and transistors. SSRs are ideal for a wide range of applications due to the following performance characteristics. They provide high-speed, high-frequency switching operations. They have no contact failures. They generate little noise. They have no operation noise. They will avoid unnecessary spark in ignition system.

Fig 4: Solid State Relay

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3.4 GPS

The Global Positioning System (GPS) is a satellite-based universal course-plotting system. Actually, GPS do not enclose the positional statistics [10].

Fig 5: GPS

3.5 MPU-6050 MEMS Sensor

The MPU6050 IMU has both 3-Axis accelerometer and 3-Axis gyroscope integrated on a single chip. The gyroscope measures rotational velocity or rate of change of the angular position over time, along the X, Y and Z axis. It uses MEMS technology and the Coriolis Effect for measuring. On the other hand, the MPU6050 accelerometer measures acceleration in the same way as explained in the previous video for the ADXL345 accelerometer sensor. Briefly, it can measure gravitational acceleration along the 3 axes and using some trigonometry math we can calculate the angle at which the sensor is positioned. So, if we fuse, or combine the accelerometer and gyroscope data we can get very accurate information about the sensor orientation.The MPU6050 IMU is also called six-axis motion tracking device or 6 DoF (six Degrees of Freedom) device, because of its 6 outputs, or the 3 accelerometer outputs and the 3 gyroscope outputs.It uses I2C interfacing with development board.

Fig 6: MPU 6050

3.6 Pull down resistor

As pull up resistors, Pull-down resistors also works in the same way. But they pull the pin to a low value. Pull-down resistors are connected between a particular pin on a microcontroller and the ground terminal. An example of a pull-down resistor is a digital circuit shown in the figure below. A switch is connected between the VCC and the microcontroller pin. When the switch is closed in the circuit, the input of the microcontroller is logic 1, but when the switch is open in a circuit, the pull-down resistor pulls down the input voltage to the ground (logic 0 or logic low value). The pull-down resistor should have a higher resistance than the impedance of the logic circuit.

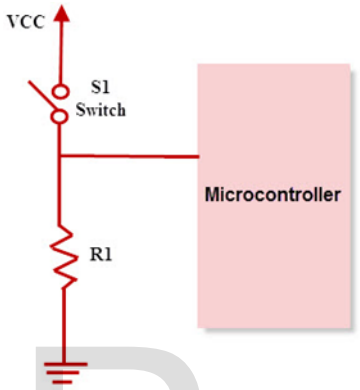

Fig 7: Pull-down resistor interfacing with microcontroller.

4 SOFTWARE DESIGN

The development environment is done by merely a set of Embedded C functions that can be called from the code. The Flow Chart of the system is shown in the figure 4. At first, we have to initialize the system with the basic values that alcohol is not detected and seat belt is not put up. So, when the system is started, the sensor automatically starts sensing for the presence of alcohol. If the alcohol is present, then the system automatically locks the seat belt slot and in turn locks the seatbelt, by which ignition can never be started. The controller decides whether to twitch the detonation as all the utilities are carried out by it. If alcohol is not detected, then even on keying, the controller looks for input from the IR sensor. Only if the seat belt is lay on properly, the system makes the car ignition to start all through keying. In case of driver drinks during driving, the ignition system will robotically stop. Therefore, the details of the car like spot and time are updated from the GPS to the users or the owners on android app dashboard.

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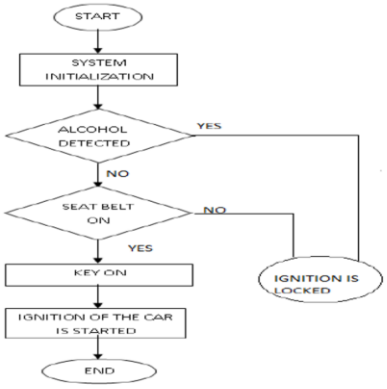

Fig 8: System flow chart

Fig 11: Andriod app-based dashboard for monitoring alcohol sensor, on board temperature, external termperature, acceleration and gyroscope values as well effect of magnetic field on system by on chip hall sensor.

5 RESULTS

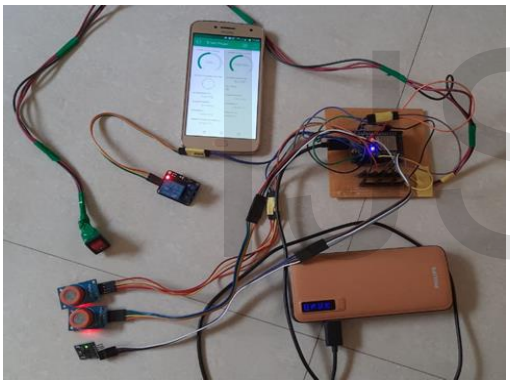

Fig 9: Normal functioning of engine when seat belt is worn by driver and there is no alcohol detection. So iginition relay is on.

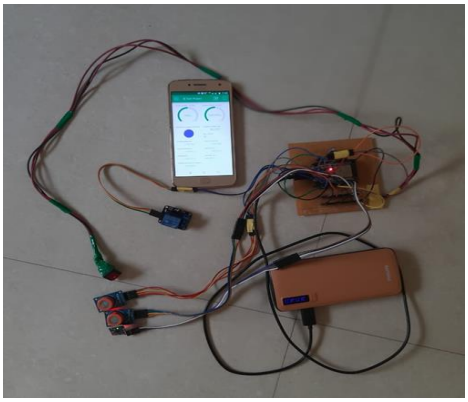

Fig 10: functioning of system when seat belt is not worn by driver and there is alcohol detection in car. So iginition relay is off. On dashboard android application we can see detection led glowing on app

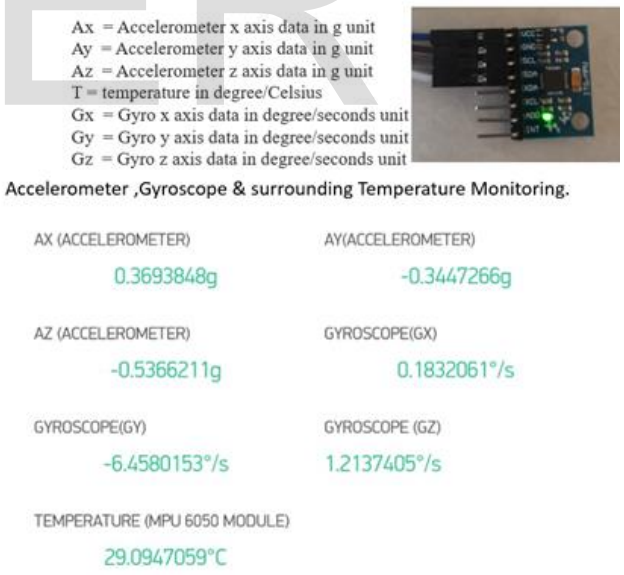

Fig 12: Monitoring of value of MPU-6050 on android app based dasboard.

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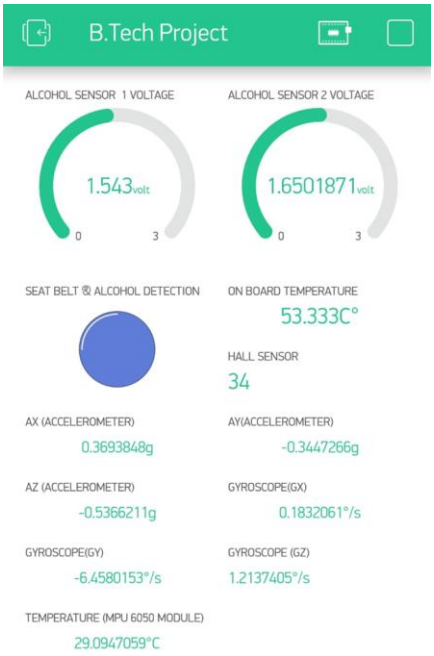

Fig 13: Glowing of indication LED widget when system detects alcohol consumption and when seat belt is not worn by driver.

6 Future scope

This system can be implemented alongside with mishap impediment scheme and manage larceny scheme. That is to identify and avert accidents before it happens. We can use the heart rate sensor to compute the heart beat and when it varies highly, and then it is known that accident may occur. This system can be implemented by a approach in which GSM sends a message to the nearby police station, to the hospital and also to the ambulance that is positioned near, whenever accident occurs in order to save the wounded ones. We can also add a camera that might serve as a black box (like the one in aero plane) to capture the snap of events so that we may know the reason beyond accidents. with the help of advance machine learning approach, we can do analysis of drivering skills.

7 Conclusion

The proposed system checks for the drunken drive and avoids it effectively. Nowadays, with emerging technologies, the automobile industry uses various sensors and controllers to provide an equipped environment. Taking advantage of this phenomenon, we have developed a mechanism for providing secured driving near the seat belt buckle. The driver is not permitted to drunken driving and also without the seatbelt. Even if the accident happens then evidences like over speeding and rash driving can be collected from this system.

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