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Door Locking Alert and Drunk and Driving Detection using LabVIEW

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ABSTRACT- This paper mainly focuses on door locking alert and drunk and driving detection. The main aim of this paper is to provide safer and ease driving. To avoid accidents due to drunk and driving, a gas sensor is used to measure the blood alcohol content of the driver. Another parameter is to check whether the doors of the vehicle are closed which is done by using a door latch sensor. All processing are done using LabVIEW and NI myRIO is used as the interface.

KEYWORD –Drunk and driving, Alcohol detection Reed switch, Door, Gear motor, LabVIEW, NI myRIO.

I.INTRODUCTION

Driving style can characteristically be divided into two categories: “typical” (non-aggressive) and “aggressive”. Understanding and recognizing driving events that fall into these categories can aid in vehicle safety systems. Potentially Aggressive driving behavior is currently a leading cause of traffic fatalities. One of the causes of aggressive driving is Driving Under the Influence (DUI) of alcohol. According to latest data compiled by the National Crime Records Bureau (NCRB), drunk and driving was responsible for 7,061 road accidents in India in 2015. Accidents due to drunk and driving are the deadliest, there are more fatalities in accidents due to the DUI than in accidents due to other causes.

In this work to enhance the safety, the driver’s Breath Alcohol content(BAC) is checked before he gets into the driving and also while driving with the help of the MQ3 alcohol sensor.

For a safe journey it is important to check all the doors of the vehicle are closed. When it is not closed, it leads to the loss of lives of the passengers. Unexpectedly if a car crash happens, the doors need to stay closed because they absorb the impact, keep you from being thrown out, and help keep the roof from crumpling like a soda can. It is checked by using the reed switch. Reed switches can be operated using a magnetic field generated by either a permanent magnet or current-carrying coil.

In this project NI myRIO is used as the hardware interface between the real time system and LabVIEW software. The NI myRIO has

- myRIO Expansion Port (MXP)
- Breakouts (One Included in Kit)
- USB Host Cable (Not Included in Kit)
- LEDs
- Mini System Port (MSP) Screw-Terminal Connector
- Power Input Cable
- USB device cable
- USB device cable

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II. REED SWITCH

A Reed Switch is similar to a standard switch. It makes or breaks an electrical connection. Unlike a push button switch though, a reed switch works via magnetic field. The reed switch has two contacts the contacts are made from ferromagnetic material, which sealed inside a thin glass which is filled with unreactive gases which keep them free from dirty or any other gases. The outer coverings are sometimes made up of plastic for better protection. The contacts are made up of nickel alloy for better magnetization.. Figure 1(a) represents the reed switch at normally open mode.

There are two fundamental types of reed switches

- Normally closed
- Normally open

Figure 1(a) is a normally closed switch. When no magnetic field is present the reeds are in contact and the electric circuit is complete. When a magnet is moved close to a switch, the reeds repel one another and split apart, the circuit is in open condition.

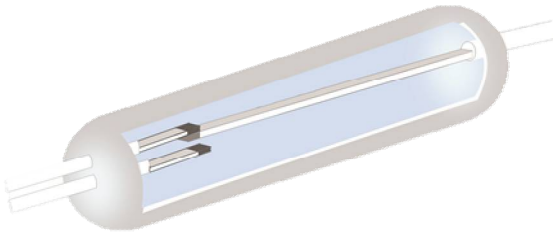

Figure 1(a)

Figure 1(b) is a normally open switch. It works in the opposite way, the two reed switch are made from ferrous material such as a nickel-iron alloy, are positioned so that they are not in contact. When a magnet is moved close to the switch, it pulls one of the reeds towards the other so that they are in contact, and therefore completing the circuit. When the magnets are removed the reeds return to their original position and the circuit is open.

Figure 1(b)

In this project, normally open reed switch is used, to check whether the doors of the vehicle are closed. When the magnet is placed near the switch, the switch becomes close, that is the reed contact get attracted and form a closed circuit.

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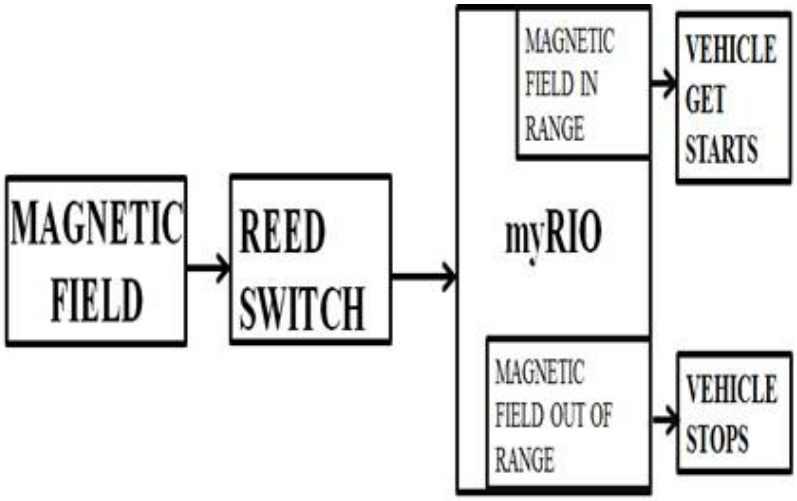

Figure 2

Figure 2 shows the block diagram of the Door locking system. As the reed switch works on the magnetic field, the magnet is placed on the doorways of the car and the reed switch is placed on the clamp of the car. When the door is not closed properly the digital out signal from the reed switch is sent to the myRIO. As per the signal the start and stop of the vehicle is decided. When the magnetic field is within the range then the vehicle starts, this indicates that the door is closed completely. When the magnetic field is out of range then the vehicle stops, this indicates that the door is not closed properly.

The sensor was tested at various conditions and its performance was studied. If the door is not closed properly, the driver is indicated with an LED. This makes the driver to alert the passengers to close the door.

When any of the doors is not closed, the circuit becomes open and the output is read as 0. This indicates that some of the doors are not closed.

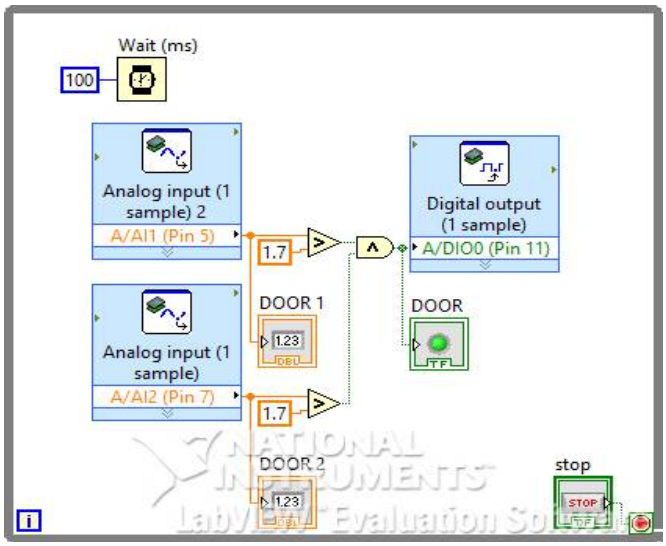

Figure 4

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According to Figure 4, the magnetic field is the analog input and this signal is send to the myRIO. There the signal is compared. With respect to the compared signal the indications are made. If both the analog input are above the Threshold value, then door is closed completely. If both the analog input is below the threshold value, then is door is not closed properly.

III. ALCOHOL GAS SENSOR

Driving under the influences of alcohol will cause:

1) Longer reaction time, which may lead to higher risk of crash, particularly at high speeds;

2) Vigilance reduction including no responses or delaying responding where performance on attention-demanding tasks declines with drowsiness;

3) Deficits in information processing, which may reduce the accuracy and correctness in decision-making. This causes aggressive driving and will be the major cause for accidents.

This paper proposes the detection of intoxicated person and also doesn't allow the vehicle to start in the same case.

Blood Alcohol Content (BAC) is usually expressed as a percentage of ethanol in the blood in units of mass of alcohol per volume of blood. It is expressed as mg/L (milligrams per liter). It is most commonly used as a metric of alcohol intoxication. BAC can be calculated by using a formula

% BAC = breath mg/L * 0.21. Alcohol content in a volume of breath or blood.A 1% blood alcohol content is 10g/L or 10,000mg/L, this level would almost certainly be fatal.

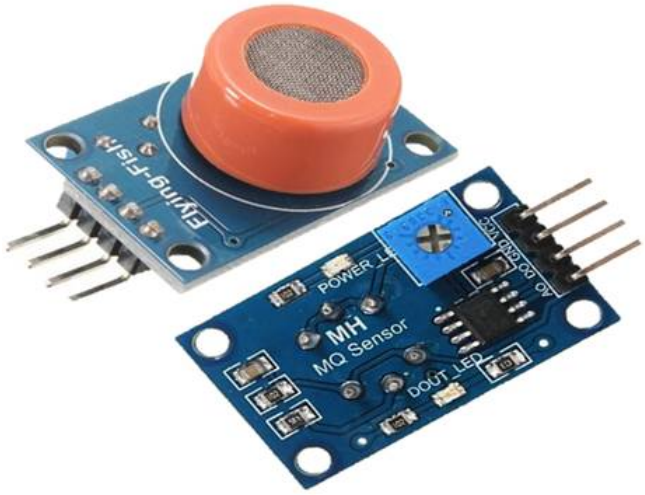

Figure 5

MQ3 alcohol gas sensor module is used to sense the concentration of alcohol present in the breath of the driver. It has high sensitivity to alcohol and small sensitivity to Benzine. It has high sensitivity and fast response time. The drive circuit is very simple, all it needs is one resistor. Here LabVIEW is used as the platform and myRIO as the interface. Figure 9 shows the myRIO pin connections in the MQ3 sensor.

1. Vcc
2. Ground
3. Digital input
4. Digital output.

When the user exhales into the MQ3 sensor, any ethanol present in their breath is oxidized to acetic acid at the anode:

$$CH_2CH_2OH_{(g)} + H_2O_{(l)} \rightarrow CH_3CO_2H_{(l)} + \quad 4H^+_{(aq)} + 4e^-$$

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At the cathode, atmospheric oxygen is reduced:

$O_{2(g)} + 4H^{+}_{(aq)} + 4e^{-} \rightarrow 2H_2O_{(l)}$

The overall reaction is the oxidation of ethanol to acetic acid and water.

$CH_3CH_2OH_{(l)} + O_{2(g)} \rightarrow CH_3COOH_{(aq)} + H_2O_{(l)}$

The electric current produced by this reaction is measured by a myRIO, and displayed as an approximation of overall blood alcohol content (BAC) by the Alcohol sensor.

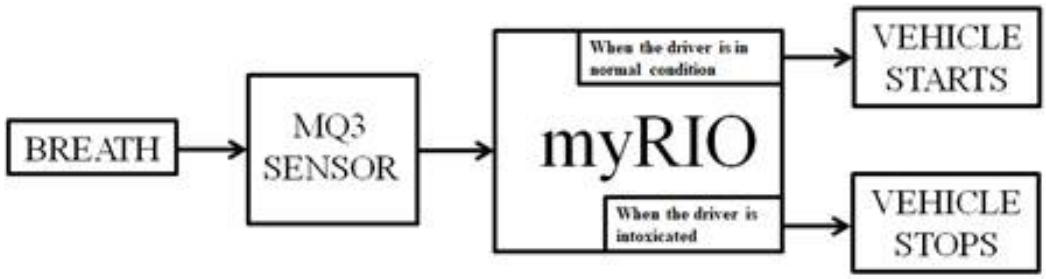

Figure 6(a)

Figure 6(a) describes the process of detecting alcohol in our work. Input of MQ3 sensor is the driver's breath which is the analog input. MQ3 sensor senses the amount of alcohol present in the breath and the analog output is given to the myRIO. If the driver has not consumed alcohol, the vehicle starts and then if the driver is intoxicated, the vehicle does not start.

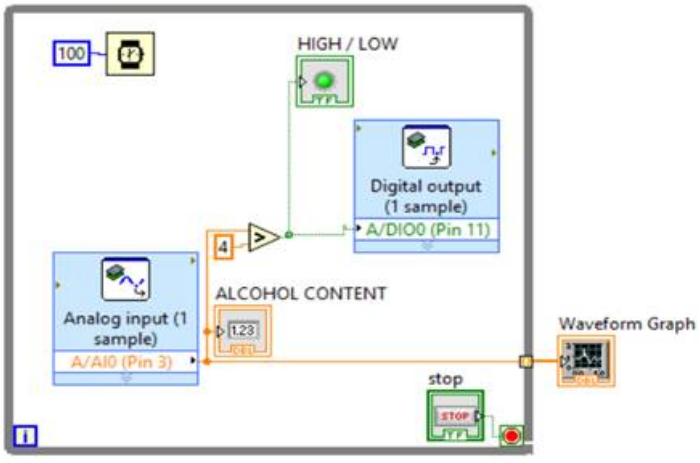

Figure 6(b)

MQ3 sensor senses the alcohol content in the driver's breath. Analog output of the MQ3 sensor is given to the analog input of the myRIO. The analog value is compared with the calibrated value which is done according to the acceptable limit for driving. If the analog value is above the acceptable limit, it means the driver is intoxicated. Hence the vehicle will not start. If the analog value is below the acceptable limit, it means the driver is in normal condition. Hence the vehicle will start. This is shown in the Figure 6(b).

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IV. MOTOR DRIVER IC:

Figure 9

As shown in Figure 9, IC L293D is the driver IC which is used in this project, common DC gear head motors need current above 250mA. There are many integrated circuits like ATmega16 Microcontroller, 555 timer IC. But, IC 74 series cannot supply this amount of current. When the motor is directly connected to the output of the above ICs then, they might damage. To overcome this problem, a motor control circuit is required, which can act as a bridge between the above motors and ICs (integrated circuits). There are various ways of making H-bridge motor control circuit such as using transistor, relays and using L293D/L298.

Geared DC motor as shown in Figure 14, can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motoris counted in terms of rotations of the shaft per minute and is termed as RPM. The motor runs at 1200 RPM.

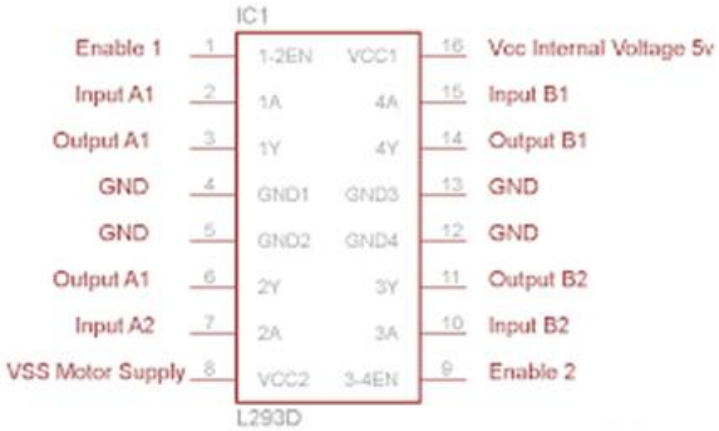

Figure 10

In this project two gear motors are used. The connections are given as per the above circuit diagram. 5V power supply for IC is given from the myRIO first pin which generates 5V in default. 9V DC supply is given as the power supply for the gear motors. The safety and the efficient parameters are given as per the above mentioned connections in the section [II], [III], [IV]. The setup is implemented on a prototype which is made up of acrylic sheet. Figure 11 shows the pin configuration of IC L293D.

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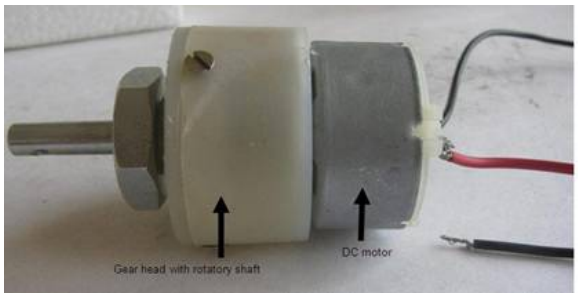

Figure 11

The digital output pin of the myRIO is given to the pin2 and pin7 which are the input pin of the IC L293D motor driver IC. The gear motors which are used to run the prototype is the output. So the pin3 and pin6 which are the output pins of the ICL293D is connected to the gear motor. The enable pin on the right side of the IC, when given a 5V supply enables all the pins on the right side and the same follows for the left side.

V. RESULT

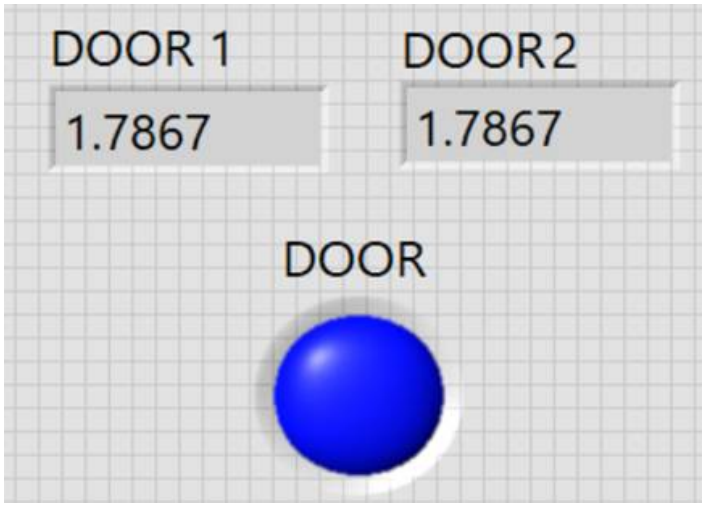

Figure 12(a)

As explained in the section(II) the value from the reed switch is compared with the standard value at which the door is closed completely. Figure(12a) describes all the doors of the vehicle is closed.

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Figure(12b)

Figure(12b) describes the doors are not closed properly and it is indicated by the LED.

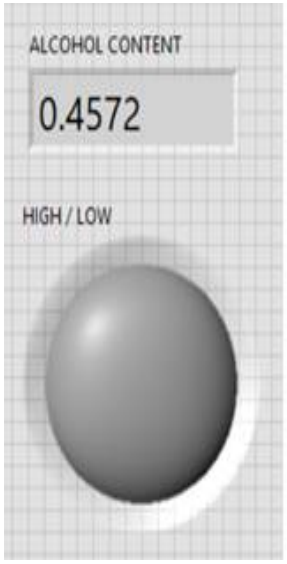

Figure 13(a)

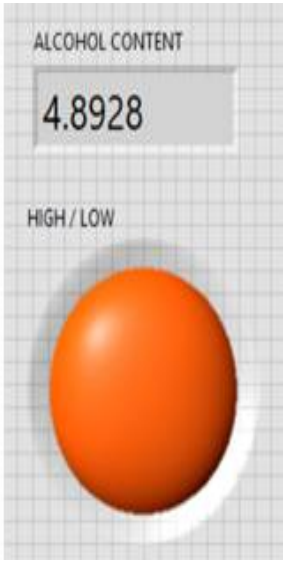

Figure 13(b)

As explained in the section(IV) the values from the MQ3alcohol gas sensor is calibrated under a standard condition and safer limit for driving is found.

Figure describes that the value from the MQ3 sensor is less than the calibrated value which means the driver is not alcoholic.

Figure describes that the value from the MQ3 sensor exceeds the calibrated value which means the driver is intoxicated and the vehicle won't start.

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VI. CONCLUSION

For a comfortable drive it is necessary to check the doors. In this safety enhanced device, the doors are checked first. The signal from the doors through the reed switch is taken to the myRIO. It checks for the doors. If any of the doors is not closed properly ,then the vehicle won't be started and at the same time while driving if the door gets opened up the driver gets an indication about it and vehicle stops.

On a larger scale this can yield a greater efficiency when interfaced through IOT.

.

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