

# *Design and Simulation of Vehicle Engine Lock System by Alcohol Detection Sensor for Ethiopia Driver*

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**Abstract:** In Ethiopia one quarter (1/4) of all road car accident deaths are associated with alcohol. Drunk driver are the major problem of car accident in the world not only in Ethiopia. Now a days it has been a known truth which major part of the car accidents in the world are due to the uneven interruptions, inappropriate driving by the drivers<sup>[1]</sup>. It's a totally unwanted scenario which is true. Therefore the project has been proposed to mechanically lock the motor of the automobile with the use of Arduino Uno microcontroller, if any alcoholic person tries to drive the car/bus/any other engine lock transportation system. This study developed a simulation of alcohol detection and engine locking system by using an Arduino Uno microcontroller interfaced with an alcohol sensor in conjunction with an LCD display and a DC motor to illustrate the concept. The system uses MQ-3 alcohol sensor to continuously monitor the blood alcohol content (BAC) to detect the existence of liquor in the exhalation of a driver. By placing the sensor on the steering wheel, our system has the capacity to continuously check alcohol level from the driver's breath. The ignition will fail to start if the sensors detect content of alcohol in the driver's breath. Additionally, if the driver drinks alcohol while driving, the sensor will still detect alcohol in his breath and stop the engine so that the car cannot accelerate any further and the driver can park by the roadside.

## **1. Introduction**

Day to day we hear a lot of car accidents the majority road accidents are caused by drink driving specially holidays. Drunken drivers are in a risky situation and so, rash decision are made which endangers the lives of road users, the driver inclusive and also question of life and death for the drunken drivers, peoples and others<sup>[2]</sup>. In the problem is being tackled by issuing laws prohibiting the act of drivers getting drunk before or while driving as well as delegating law enforcements agents to arrest and persecute culprits. However, effective monitoring of drunken drivers is a challenge to the policemen and traffic officers. The cause for this stems from the natural inability of people beings to be omnipresent as well as omniscience within the similar area and time<sup>[3]</sup>. This limited ability of law enforcement agents undermines every manual effort aimed at curbing drink-driving. Therefore the need for an automatic alcohol detection system that can function without the

restriction of space and time. In this research, the researcher is developing an Auto engine Lock System. The input for the system is from Detection Sensors from Alcohol Breath. The microcontroller keeps looking for the output from these sensors. If there are any detection of Alcohol over the set limit, then the system will lock the Engine. A simulating procedure is activated using a DC motor through the relay and the complete process is under the supervision of an intelligent Arduino Uno microcontroller [4].

## 2. Design method

Micro controller is the heart of this study; because microcontrollers will play a main role in viewing out the effective outputs in any of the global embedded systems and at the similar time these will lead to the little inefficient results due to some additional components. This study system uses effective Arduino Uno microcontroller which will operates monitors and controls the other functional parts of the system. Instead of recurring implementation this may get use of the SFR's that are clever in managing regular troubles deliberately. The study research designed is for the detecting of alcohol using MQ3 alcohol detector which in turn activates the rectifier that initiates the relay over which a signal is transmitted in form of a delay [5]. The DC motor will activated/deactivated by those delay [6]. In this study a motor is very important in engine vehicle system. A rectifier at the side of the relay is given for an input signal from the sensor and it in turn regulates the motor revolutions for a particular amount of time. Other than the essential connectivity problems the programming element in addition to the logical problems had been to be resolved in the efficient use of the microcontroller the researcher is using for the design of the detection system. So for this reason counter/timer circuits, unique registers, interrupt coping with circuits might be very prominent minutes and does not require about the tool chain itself or the schedule simulator engine. (See Figure 1)

## 3. Block diagram of the system

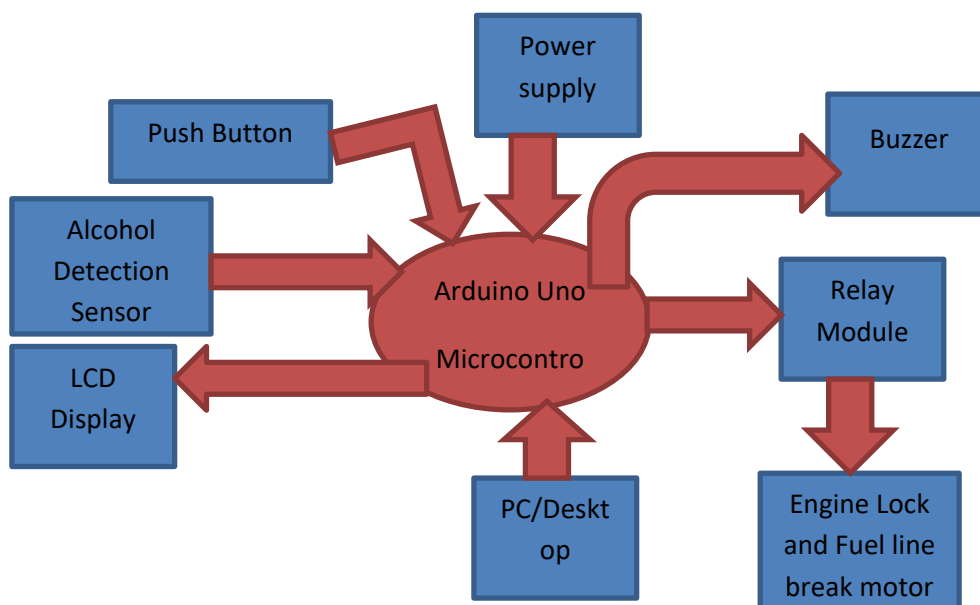


Figure 1: Block diagram

#### 4. Working process of the system

The alcohol sensor senses the amount of alcohol drunk by the driver and it is displayed on the LCD. The ignition system of the car and the fuel brake system are controlled by according to the alcohol level of the driver. For processing analog signals Arduino microcontroller has analog to digital converter which converts analog signals to digital ones. The alcohol sensor MQ3 interfaces to the analog port of Arduino microcontroller and converts it into digital voltage signal. The circuit starts to function when the 9V Direct Current (DC) supply is turned on. Then, the MQ3 sensor used to measure the changes of alcohol of the surrounds. All the operations are controlled by the Arduino to produce the output. The Arduino is a brain of the circuit. The LCD, ignition control system, fuel brake system are the output where they are set. The LCD is used to show the measured changes of alcohol level value. The fuel brake system and ignition control system are function according to the program upload to Arduino microcontroller. The high value of alcohol is sense that causes the relay that connect to ignition system to turn off so the current can't pass therefore the car is not start while low value of alcohol is sense it causes the relay that connect to ignition system to turn on so the current can pass therefore the car is start. Alcohol sensors will detect the alcohol from the surrounding while MQ3 will measure the alcohol level [7]. Arduino is an interface with L293D whether to ON or OFF the fuel brake motors. If the alcohol sensor detects the alcohol greater than the set point then the motor is turn on and break the fuel line and stop the car.

#### 5. Software simulation results and discussions

From system simulation of vehicle engine lock system by alcohol detection sensor following results can be concluded. Model for both normal and drank level of alcohol has been simulated in protuse software. Its parameter such as limit of alcohol has been calculated by microcontroller accurately, Modeling and then simulated. These parameters are varied and the resulting over the limit and normal condition has been studied. For this simulation system process the researcher uses protuse simulation software because of free software online, and then the following results can be concluded.

**Condition one** if the alcohol sensor sense zero alcohol level the sensor send signal zero to microcontroller; microcontroller understand the message and send message normal to LCD display, then LCD displays normal and the green light is turn ON as shown in Figure 2.

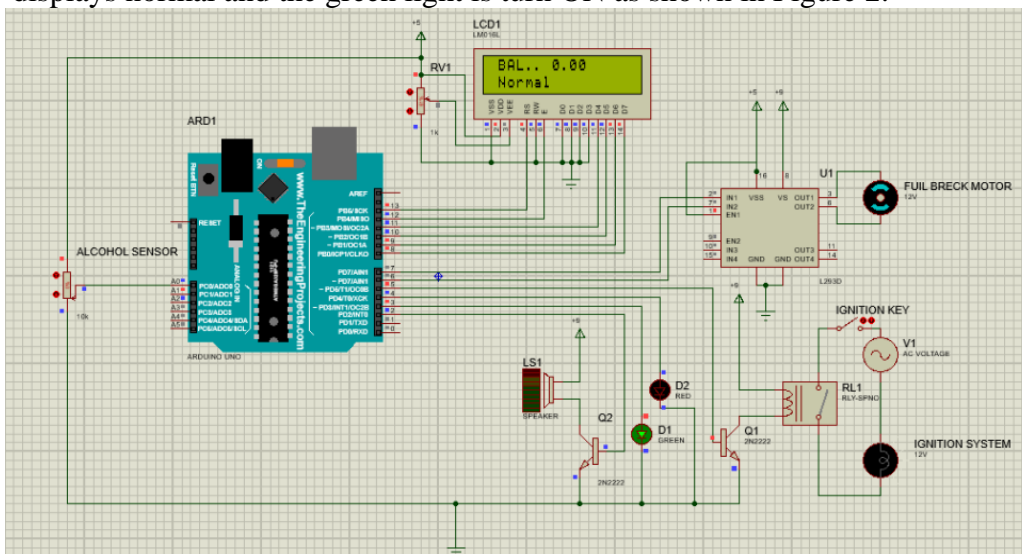


Figure 2: Simulation results normal

**Condition two** if the alcohol sensor sense zero alcohol level the sensor send signal zero to microcontroller; microcontroller understand the message and send message normal to LCD display ,then LCD displays normal and the green light is turn ON.

Then the driver has ready to drive the car as shown Figure 3.

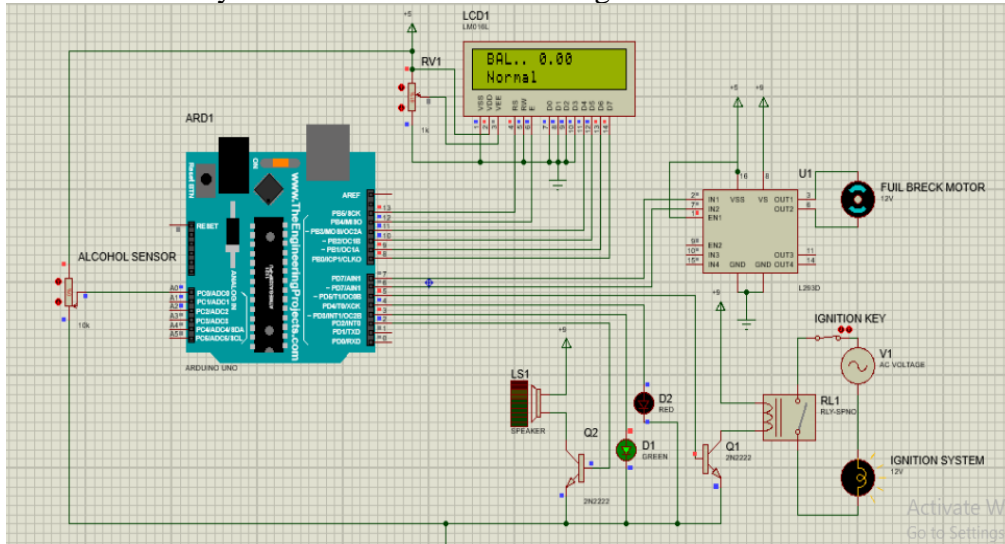


Figure 3: Normal Ignition ready to turn ON

**Condition three** if the alcohol sensor sense some amount of alcohol level then the sensor send alcohol signal to microcontroller and microcontroller understand the information and send signal drank to LCD display then LCD display displays Drank and the red light is turn ON then the fuel brake motor has state to lock the fuel line OFF the car as shown in Figure 4.

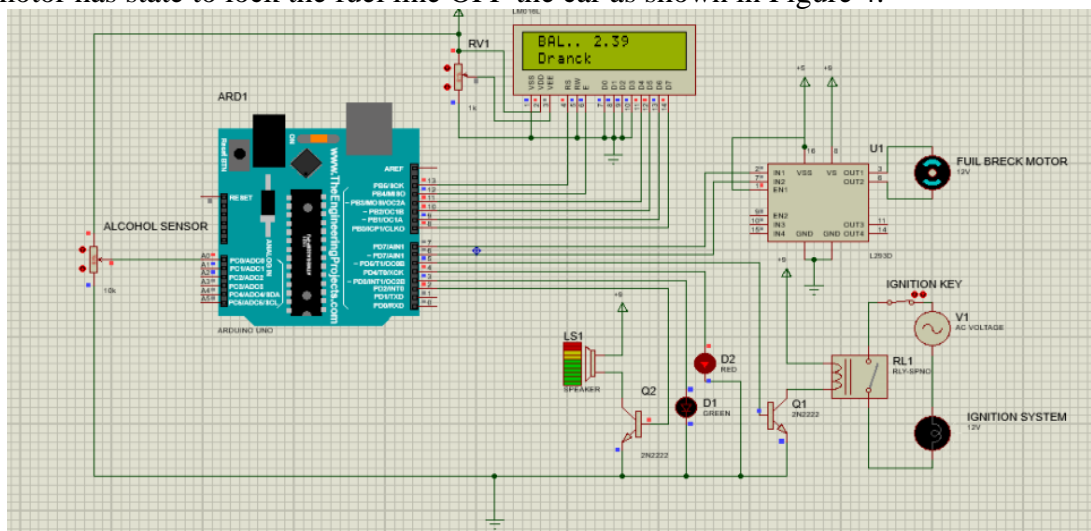


Figure 4: Drank state

**Condition four** if the alcohol sensor sense some amount of alcohol level then the sensor send alcohol signal to microcontroller and microcontroller understand the information and send signal drank to LCD display then LCD display displays Drank and the red light is turn ON then the fuel brake motor has state to lock the fuel line of the car as.

And the ignition of the car is turn OFF shown in Figure 5.

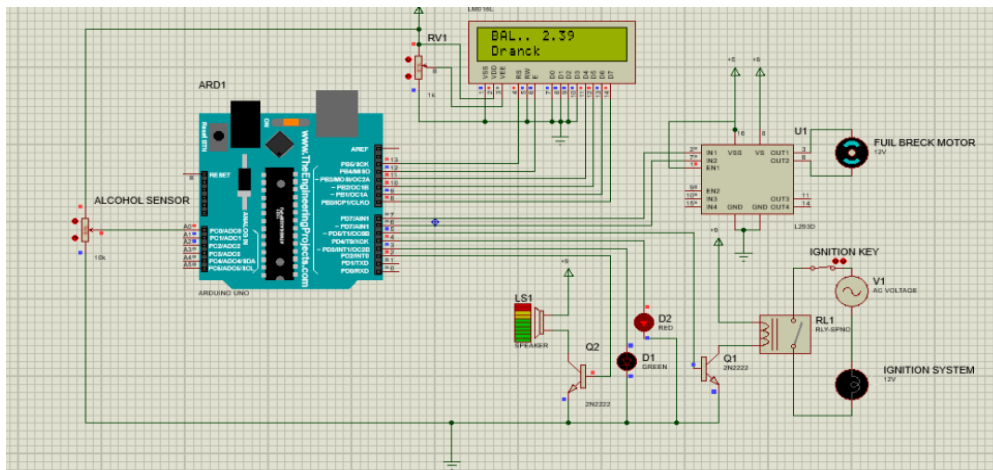


Figure 5: Drank state Ignition OFF

The alcohol sensor starts to sensing alcohol around area of the drive then send analog voltage to microcontroller. The microcontroller set output according to the program. The simulation figure2 show that the alcohol sensor didn't sense alcohol from the surrounding so microcontroller set output to LCD display is normal and amount of alcohol in the given row and column of the LCD display as shown in the above figure 2 then in the same time the fuel line brake motor is start to open the fuel pass and also the indication lamp or green led turn on but in this figure2 the car can't ran away because the driver did not rotate the ignition key.

The second figure 3 show that the same condition but the car has start to go due to the ignition key is lock to the system these current pass properly to ignition system.

The third Figure 4 show the driver drank alcohol above the set point so the system show red indication light then rotate the fuel break motor to close the line of fuel path and the buzzer give a siren sound and also the LCD display on the first row amount of alcohol measured and on the last row display drank.

The last figure 5 has the same situation with figure 4 but if the driver try's to drive the car he/she can't drive because the ignition system is lock by the relay until the alcohol level is lower than the limit of darkness of alcohol.

## 6. Conclusion

After the whole layout of the system, the deviation among the predicted end result and the real end result became very close. The overall performance and efficiency was beyond expectation and from every ramification the Simulation of automatic Vehicle Engine Lock System by Alcohol Detection sensor for Ethiopia was successfully simulated. Hence the researcher has an automatic vehicle engine lock system by alcohol detection sensor controller with the following advantages:

- Low maintenance
- Fully automated
- Simple to use
- Low cost,
- Consume very low energy and
- Ideal for continuous operation this simulation is deals with the designing of automatic vehicle engine lock system by alcohol detection sensor controller.

The most important analysis, the cost of automatic vehicle engine lock system by alcohol detection sensor controller is much less than the currently available in the market and advantage to reduced foreign currency out flow to country. The key point that the researcher determined is that

controlling or making turn OFF the ignition circuit of the car when the driver is over drunk happen otherwise the car ran in the normal condition

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