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# Driving under Influence of Alcohol Preventer Embedded System

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**Abstract:** This work presents a control system to prevent accidents of automobiles because of drinking, it consists of alcohol sensor interfaced with microchip microcontroller PIC 16F877A as input device, GPS transmitter, relays to deal with electrical pump, and flasher light, as output devices. GPS transmitter send a signal as unknown point to GPS receiver in the police station and by software and an alarm will turn on too. To simulate this a PIC 16F877A interfaced is used with the alcohol sensor as input and LCD LM016L to give the percent of alcohol amount, DC-Motor to indicate about electrical pump, LEDs to simulate flasher light, and mobile phone connected to the PIC to send SMS to another mobile as GPS simulator, this devices act as output as a simulator to the real automobile.

**Key words:** alcohol sensor, PIC, LED, GPS, automobile, control system, LCD.

## INTRODUCTION

This system was discussed in many automobile corporations thatcome from there believes in traffic safety issues, and the main subject was how to prevent such kind of drivers from injuring another people and even themselves. The National Highway Traffic Safety Administration (NHTSA) estimates that costs for the nation-related crashes reach more than $50 billion annuallyaccounting for medical treatment, lost productivity, property damage, and emergency services (NHTSA 2003). Repeat offenders of the driving while intoxicated (DWI) laws represent approximately one-third of the DWI convictions each year. Many of these repeat offenders have had their licenses suspended or revoked but continue to drive. They can do so essentially with impunity because it is very difficult for law enforcement officers to determine that the suspended or revoked driver is on the road so long as he or she does not become involved in a crash, commit a moving violation, or exhibit aberrant behaviour. One way of dealing with this problem would be a system to alert the police when a passing motorist might be driving with a suspended license. Such a system would have to provide the officers with key information about the suspended offender so that it would be unlikely that other (innocent) drivers would be stopped or otherwise inconvenienced. NHTSA therefore sponsored a study to assess, develop, and test a problem driver detection system (PDDS) as a countermeasure to continued driving by individuals whose licenses have been suspended because of violations of DWI or driving under the influence (DUI) laws. The study was accomplished in three phases. The first phase involved an assessment of system feasibility and the development of requirements for a PDDS, An engineering prototype system was developed for testing in Phase II, Phase III involved a 3-month field test of production prototype equipment[4-10].

TOYOTA develop an alcohol detection systems, many vehicles in the United States and elsewhere are already equipped with alcohol detection systems that have the ability to lock up the vehicle's ignition system, makes the driver unable to start his/her automobile if he/she downed one too many alcohol drink.

TOYOTA corporation with transport Canada and Canada safety council developed a system called The Road Safety Monitor which is an annual public opinion survey developed by the Traffic Injury Research Foundation (TIRF) to take the pulse of the nation on key road safety issues.

However, Research indicates that the human brain continues to develop into a person early twenties and that exposure of the developing brain to alcohol may have long-lasting effects on intellectual capabilities. Exposing the brain to alcohol during this period especially before age 21 may interrupt key processes of brain development induced brain damage may continue. The idea that alcohol kills brain cells has long been

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promoted. The early temperance writers made this assertion and also insisted that the alcohol in their blood could cause combustion argument against drinking was dropped long ago but many anti-alcohol writers continue to promote the idea that even moderate drinking causes brain cells to die. Scientific medical research has actually demonstrated that the moderate consumption of alcohol is associated with better cognitive (thinking and reasoning) skills and memory than is abstaining from alcohol. Moderate drinking doesn brain function better into old age. Studies around the world involving many thousands of people report this finding. The study is the first to demonstrate that brain cell production can return after abstinence from alcohol abuse. People who drink too much and are thinking about either reducing or eliminating their drinking should find these findings encouraging, although humans have not yet been tested directly for the positive brain effects.

## MATERIALS AND METHODS

**Blood Alcohol Levels:** Perception and motor skills are impaired by a blood alcohol concentration of as low as 0.05, which is typically two or three drinks for the average adult. Although drivers with blood alcohol concentrations of 0.15 and above are much more likely to be involved in serious or fatal traffic crashes, drivers with lower concentrations remain at substantial risk for less serious crashes. In addition, many drivers are impaired by alcohol in combination with other controlled substances. Low blood alcohol concentrations of obviously impaired drivers are often due to the presence of substances other than alcohol. Gururaj, G.[1] demonstrated the polices used in preventing driving under the influences of alcohol in south Asia, he found that among the one million people killed on the roads during 2000, nearly 75% died in developing countries of the world, about half of them in Asia. Selective examinations of RTIs in the region indicate that they constitute the second or third leading cause of death in the 5-44 years age group. The increase in direct and indirect health risk associated with alcohol usage has been well-documented in recent years. Alcohol is a major risk factor for RTIs as it impairs judgment and increases the possibility of involvement in other high risk behaviors (e.g., speeding, violating traffic rules, etc.). Precise information on the involvement of alcohol in RTIs and deaths is clearly not available from South Asian countries. With the recognition that road safety needs to focus on reducing drinking and driving, many high-income countries have formulated and implemented a number of coordinated, integrated and sustainable programmes based on scientific research. Considering the gravity of the situation, ongoing efforts to reduce the problem and lessons learnt from high-income countries, it is important to change strategies and mechanisms to reduce drink driving in South Asia[1]. Swov[2], stated that: In the Netherlands the legal alcohol limit is blood alcohol content (BAC) of 0.5 g/l., but there were (as yet) no legal limits for drugs and medicines. Especially heavy drinkers, users of several drugs, and young men have higher crash rates. Measures such as lowering the legal alcohol limit for novice drivers, alcohol campaigns and introducing the Alcolock can have positive effects on road safety. Also effective are random police controls, and introducing limits for drugs and the combined use of alcohol and drugs, providing the subjective chance of drivers being caught is high enough and the police have sufficient means to enforce these measures[2].

Adrian K., *et al*.[3]. They described a calculation procedure for estimating the number of crash fatalities in the 2005 Fatality Analysis Reporting System (FARS) attributable to different driver BACs. The procedure first classifies all fatalities by the highest BAC for driver(s) involved in the crash. Then, they used the risk curve developed by Zador *et al*., 1 the number of fatalities specifically attributable to the high BACs is estimated. It is estimated that drivers with BACs at or above 0.08 g/dL were involved in the deaths of 12,945 road users in the United States in 2005 and that, had all these drivers had BACs below 0.08 g/dL, 8,916 of the deaths would have been prevented this is the number attributable directly to BACs at or above 0.08 g/dL. Had all drivers had BACs below 0.05 g/dL, an estimated 11,100 deaths would have been prevented. If all drivers in 2005 had had zero BACs, as many as 13,452 deaths would have been prevented. If all drivers with at least one alcohol-impaired driving conviction within 3 years prior to the crash were restricted to BACs below 0.08 g/dL, 777 deaths could have been prevented in 2005[3].

From reviewing last studies, it is obvious that no technology solutions to prevent driving under the influence of alcohol were implemented. In this paper a simulation for a control system to prevent the driving under alcohol influences is constructed using a microcontroller beside alcohol sensor and other input and output devices. This system consists of the following parts:

**Main Block Diagram:** The following diagram fig. 1 shows how the system components works together to achieve our goals from our system. Also see appendix (1).

The full schematic diagram design and simulation can be seen in fig. 2.

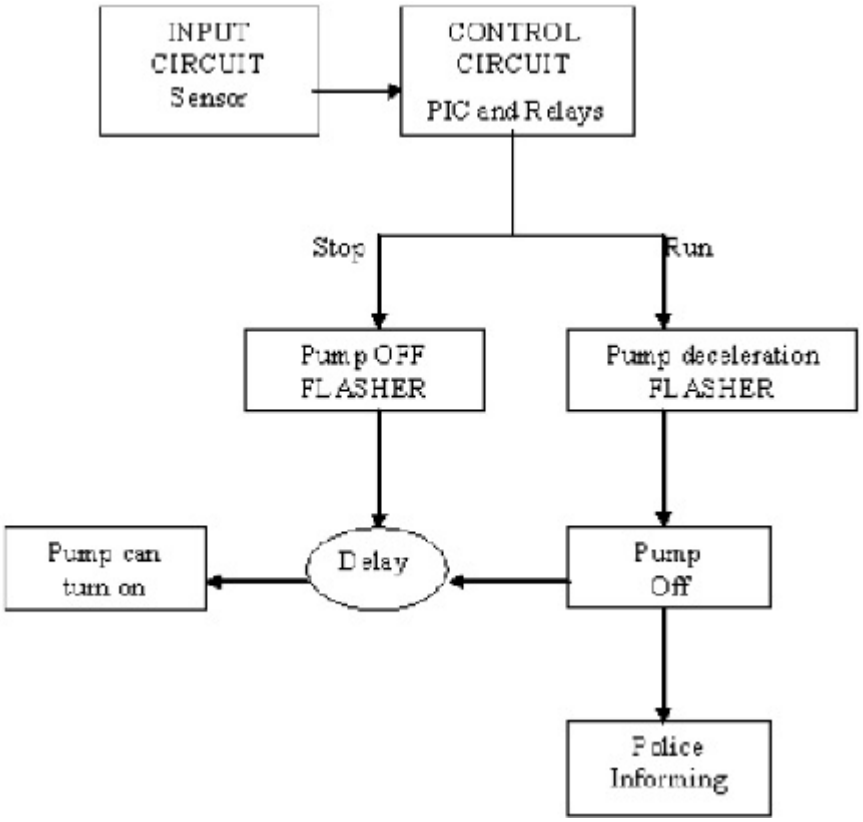
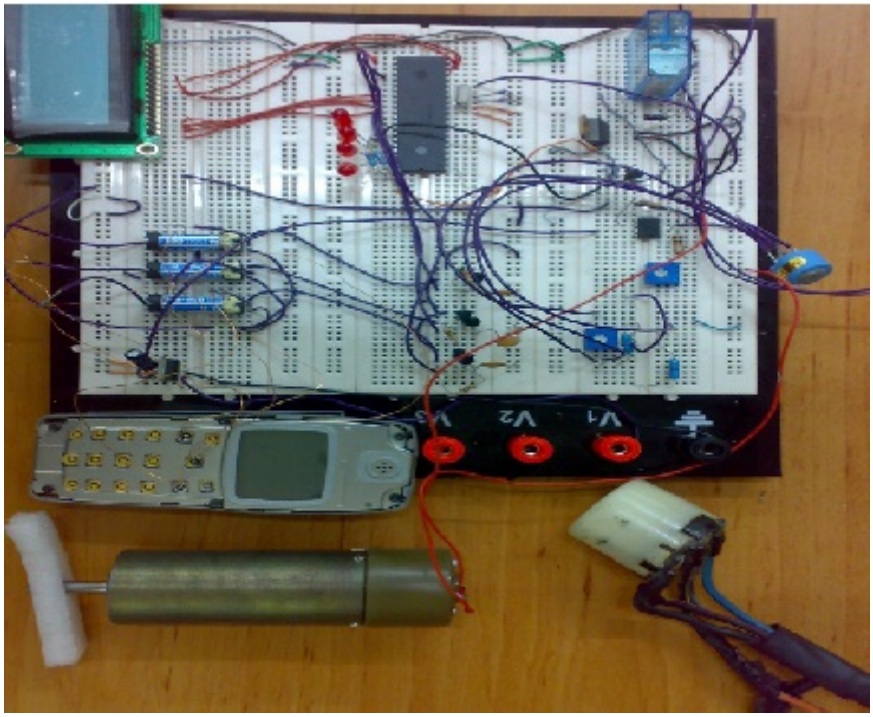



**Fig. 1:** Main block diagram.



**Appendix (1):** Photo of the hardware used.

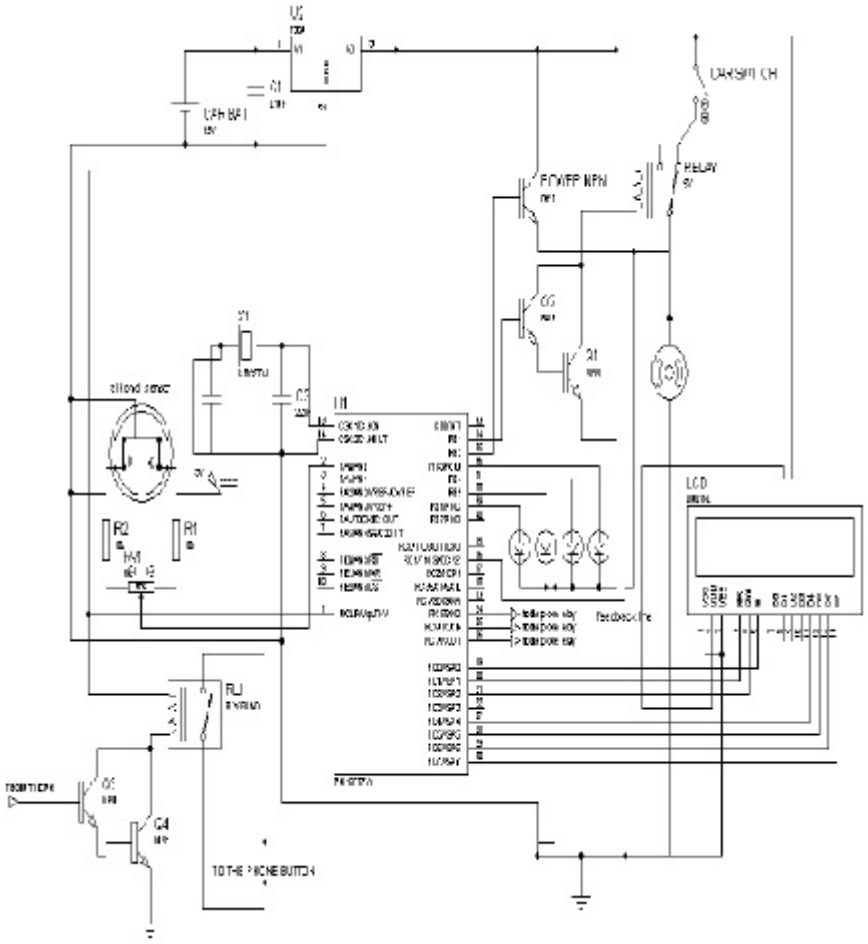



**Fig. 2:** Full schematic diagram

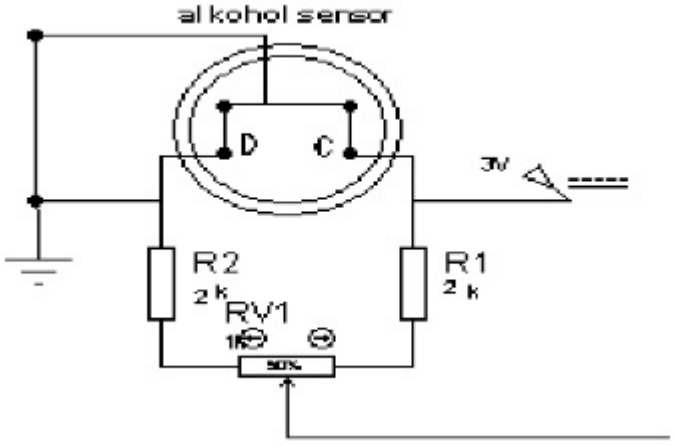



**Fig. 3:** Sensor schematic diagram.

**Sensor Circuit:** MR5 13 type alcohol sensor through alcohol absorption on the metal oxide semiconductor generates hot conduction and electronics conduction change principal, the white coil resistor change detecting gas concentration. MR5 13 consists detecting. Element and compensation element, both elements are placed in a Wheatstone bridge circuit, when the alcohol concentration appears, the detecting element resistor reduces, bridge circuit voltage output changes, the voltage will increase according to the alcohol concentration increase, it is used at150mV which is 5% of total voltage that can detected from the sensor, as

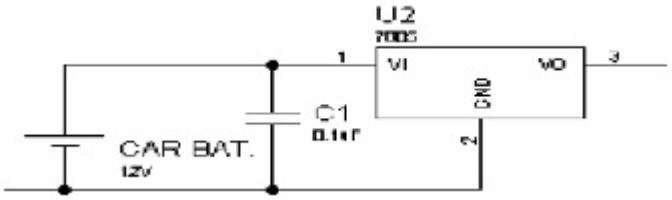



**Fig. 4:** Voltage regulator schematic diagram

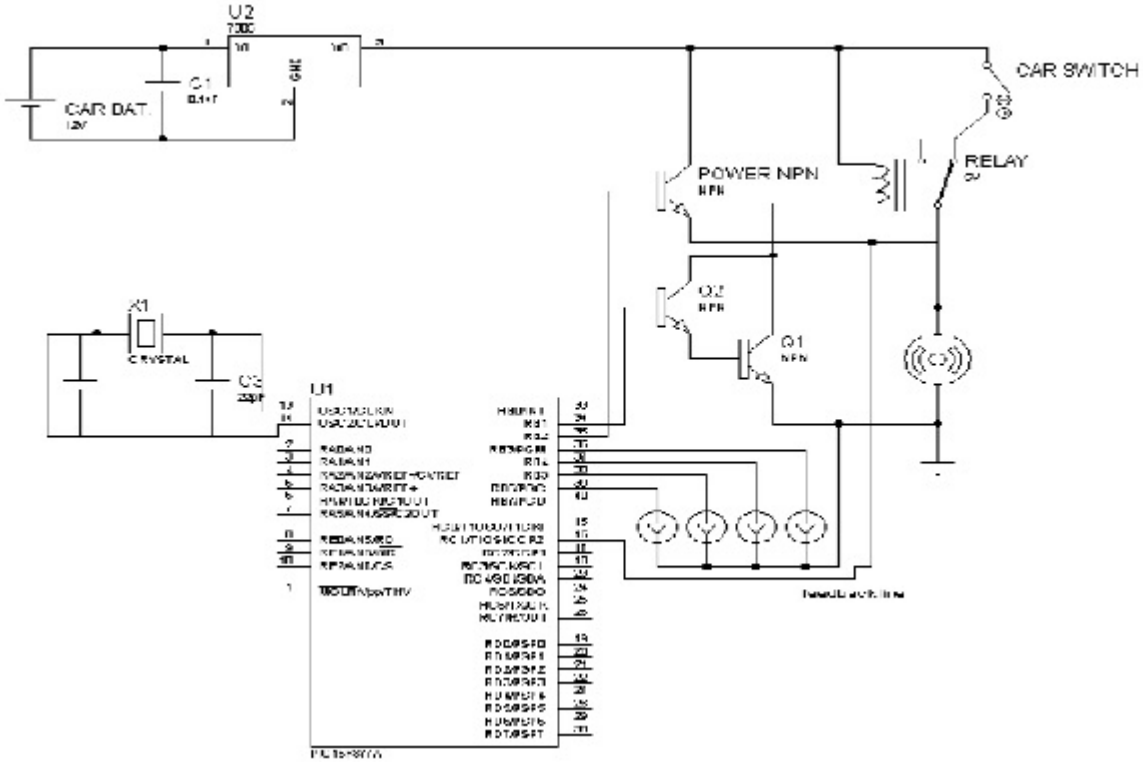



**Fig. 5:** Pump deceleration, pump OFF and flasher light schematic diagram.

detecting value by putting 210ohm resistance at the potentiometer by using voltage divider. MR513 alcohol sensor in our design installed in bridge then by taking the signal that out from output terminals to the microcontroller PIC16F877A in port A Pin 2(A1) to make signal processing[4-10]. See fig. 3.

**Regulator:** This circuits function is to make regulation on automobile power supply 12V~5V to be able to dealing with microcontroller since it rated to 5V. See fig. 4.

**Pump Deceleration, Pump off Circuit, and Flasher Lights:** This circuit is designed by relay and power transistors and Darlington transistors the relay used to switch our circuit under software condition that we want, this can until we connect Darlington transistor to be able to derive the current needed for relay to operate then by this we can use it now as pump off mode for the system because it connect in the base to port B, pin (B1) then when pin (B1) is high the transistor is switch on then high current will flow into the relay For pump declaration mode we use power transistor as switch to send from microcontroller port B pin (B2) that was connected to the base of the transistor, some signals high an low with different widths to decrease the electrical fuel pump flow of fuel, this was simulated as motor device The feedback line will check if the motor is ON or OFF to know what the mode that we will deal with, and finally the flasher light will controller from out software from port(B) pins(B3, B4, B5, B6). See fig. 5.

**SMS:** SMS is used from mobile as simulation system for GPS this system is describe by 3 diagrams comes from PIC signal which was programmed previously to specific users to inform them about automobile position and number. The ports (C5, C6, C7) are connected to Darlington transistor and relay to connect it to down,

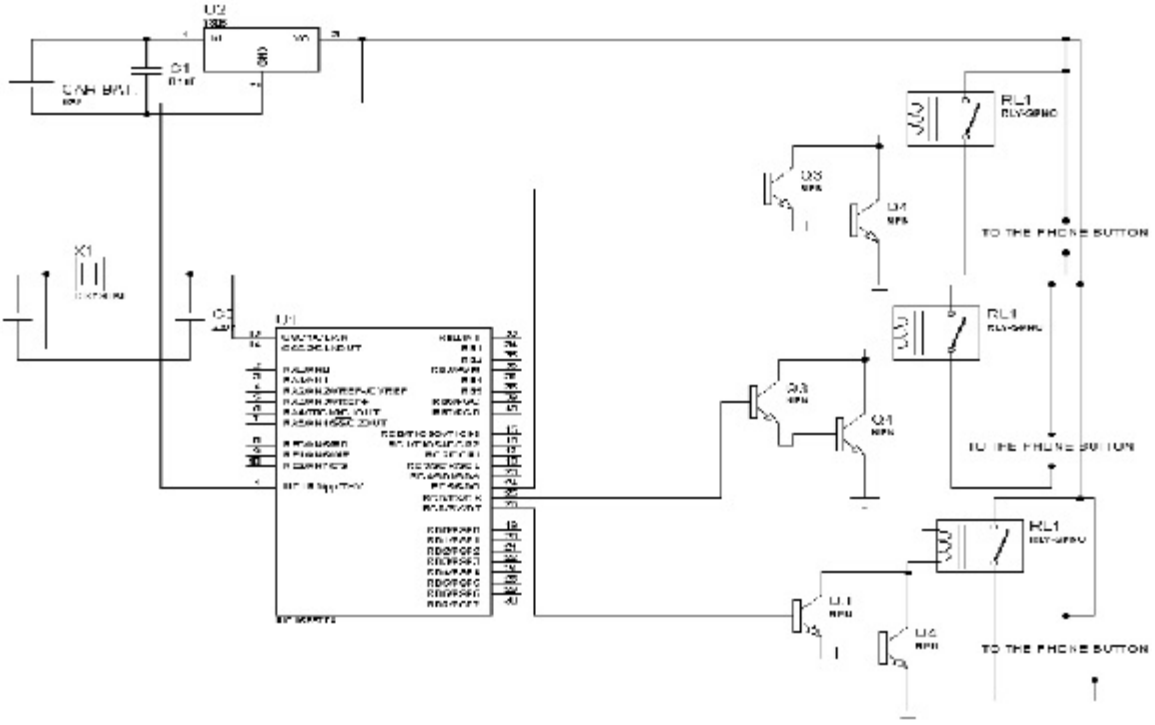



**Fig. 6:** SMS schematic diagram

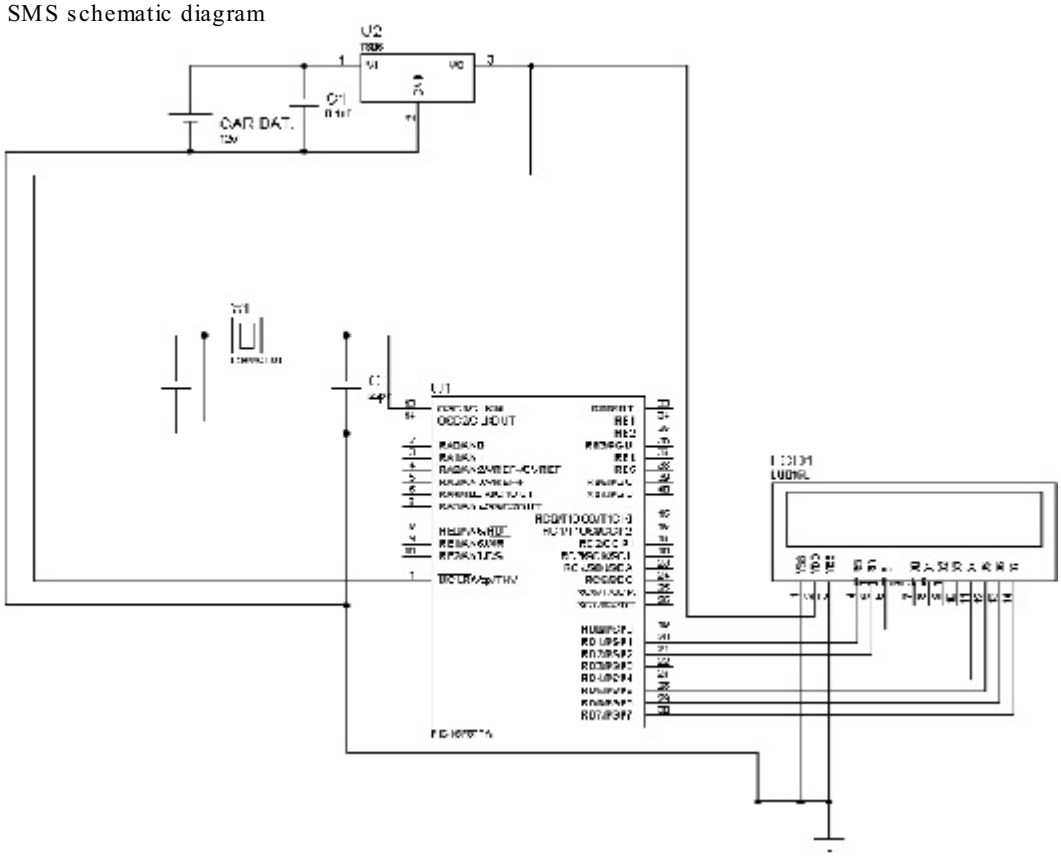



**Fig. 7:** LCD connection schematic diagram.

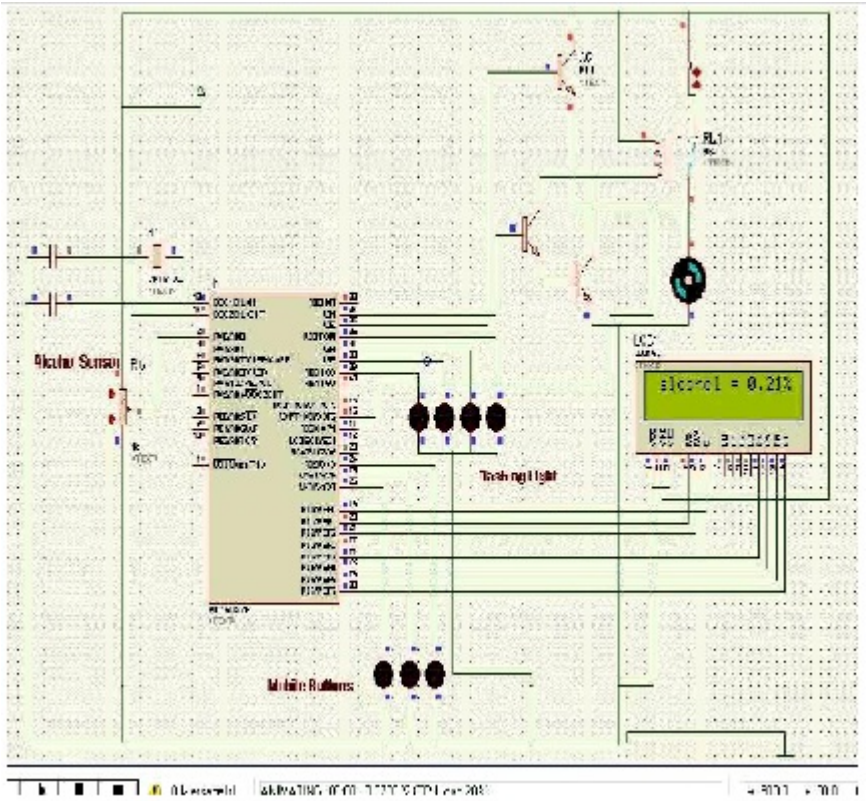



**Fig. 8:** Normal Situation (ALCOHOL%<0.21)

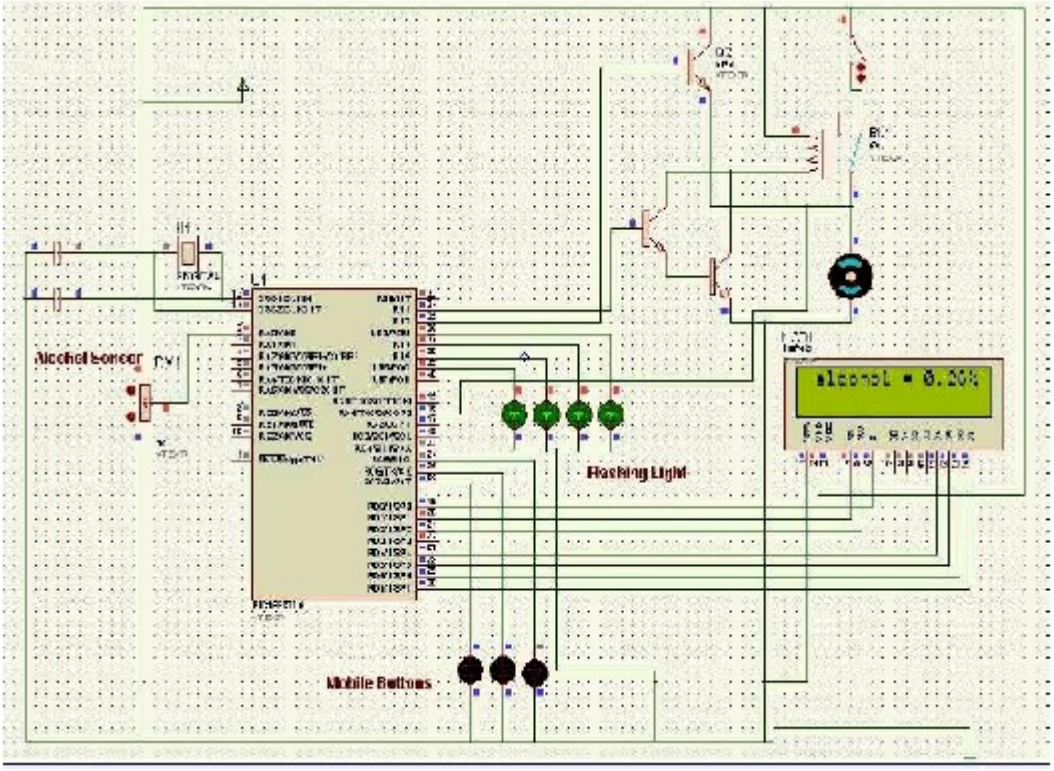



**Fig. 9:** Up normal situation while automobile is not working.

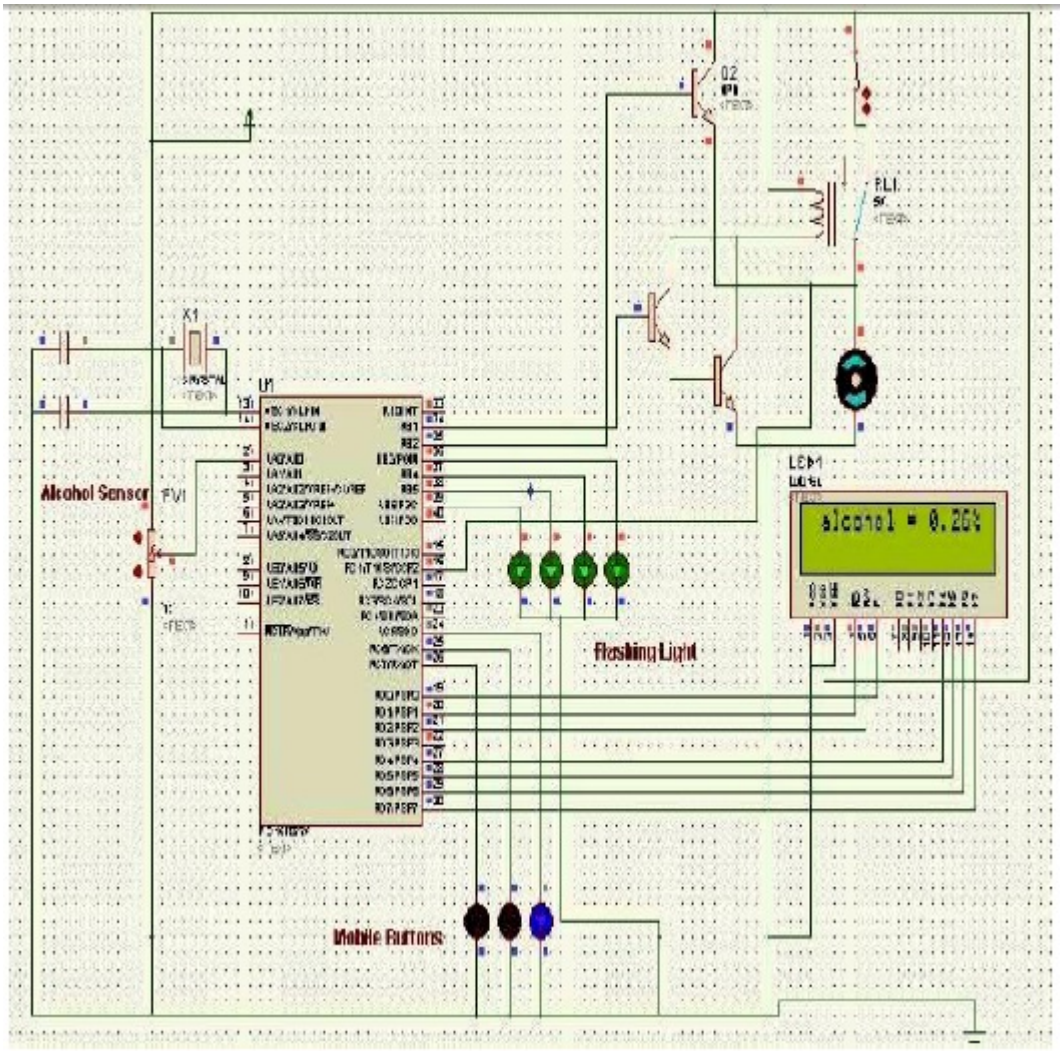



**Fig. 10:** Up normal situation while automobile is working.

menu and, cancel pins in the mobile. This will make to send various combinations of signals from the microcontroller to the mobile which was calibrated to Specific people. See figure (6) below.

**LCD Connection:** The LCD is connected to port (D) as described in library that is used as indicator about the amount of alcohol that it will be detected from the sensor.

## RESULTS AND DISCUSSION

**Simulations:** In order to make sure that the system will run on the hardware design, a simulation must be done, in this system the simulation done in three situations which are:

1. Normal situation.
2. Up normal situation while automobile is parked.
3. Up normal situation while automobile is working.

Every situation will be explained bellow:

1 -Normal situation:

When driver start his automobiles engine and while he was not a drunk, every things runs normally the automobile motor will rotates (in simulation) as shown in Fig.8, no flashing light will be active and no SMS will be sent.

2-Up normal situation while automobile was parked:

When the driver want to start his automobile engine and he is a drunk, the sensor of alcohol will sense the alcohol percentage then automobile engine will not rotates as shown in Fig.9 and flasher light will start flashing and no SMS will be sent.

3-Up normal situation while automobile is working:

When the automobile is working and the driver drink while driving the sensor of alcohol will sense the alcohol percentage then automobile engine will start to decelerate and SMS will be sent as shown in Fig. 10.

**Discussions:** By using this system the number of accidents will be decreased to a touchable percent. This system can be used by governments in order to make it as a law before that should be used in any automobile. .This system can be applied on any automobile or motor cycle because the system needs only a power supply between 7-12 volt. The cost of this system is low if it is compared with the world systems that applied on the modern automobiles. Alcohol sensor is accurate enough to sense the alcohol not by direct breath only but by the whole automobile environment. Sending message to the police prevents the drivers from drinking alcohol through driving again.

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