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Alcohol Detection and Engine Locking of Vehicle using Embedded Model

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***Abstract*—**This paper proposes making vehicle driving safer than before. We have designed an embedded model which is implemented using Atmel AT89S52 microcontroller. We have derived the driver's condition in real time environment and we propose the detection of alcohol using MQ-3 alcohol detector connected to microcontroller such that when the level of alcohol crosses a permissible limit, the vehicle ignition system will be turned off.

Keywords*-Alcohol Detection, Engine locking project, MQ-3 Sensor, Microcontroller AT89S52.*

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I. INTRODUCTION

These days, we hear a lot of accidents due to drunk driving. Drunk driving is inconvenient for pedestrians and a question of life and death for the drunk driver. Drunk driving is a big problem in every part of the nation. In 2011 alone, over 70% of death fatalities were linked directly to drivers who had blood alcohol levels above the legal limit. Though the country has laws to check drunken driving, but its effective implementation is still to be worked upon and in some cases even questionable.

For such purpose we have designed an alcohol detection and engine locking system. Alcohol sensor is attached with the microcontroller. As soon as the alcohol is detected by the sensor the sensor sends the input voltage to microcontroller. If there are any traces of alcohol above the set limit, then the system will lock the vehicle engine which will save the life of the drunk driver as well as the pedestrians.

II. RELATED WORK

As this is an Embedded system- a combination of hardware and software. The Hardware mainly consists of Alcohol sensor MQ3, Microcontroller Atmel AT89S52, 16*2 LCD display, DC motor. The software is basically an Embedded C Programming. Different microcontrollers and sensors are used in different projects and a lot of work is going on in this field. A variety of car manufacturing companies are working on the similar model.

III. HARDWARE SYSTEM

A. *Microcontroller AT89S52*

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters.

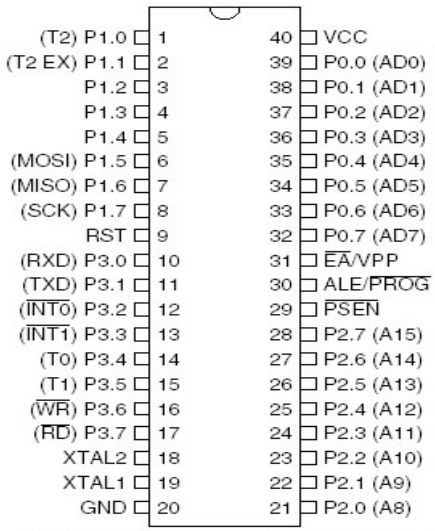


Fig 1: Microcontoller AT89S52

B. MQ-3 Sensor

The Alcohol sensor MQ3 is the heart of this project. It is suitable for detecting alcohol concentration just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration.

Fig 2: MQ-3 Alcohol Sensor

FORMULA TO CONVERT OUTPUT VOLTAGE OF MQ-3 SENSOR TO GAS CONCENTRATION

Deriving Gas concentration from Output Voltage

Here is a the equation which convert analog output to mg/L gas concentration
Mg/L = Analog Voltage in mV x 0.002

Example: Gas sensor voltage is giving output as
2500mV(2.5V) So the gas concentration in mg/L = 2500x0.002 = 5 mg/L

Here is the table for your reference

Mg/L:	0.2	0.3	0.5	1	2	3	5	9	10
Voltage(mV)	100	150	250	500	1000	1500	2500	4500	5000

Fig 3: Deriving Gas Concentration from Output voltage

Limitations of Sensor

The sensor takes 5 mins warm up time(ideally) and practically 1 min to heat so the sensor readings should be avoided as it can go upto 4.5V to 0.5V in this time bracket.

Another limitation of the sensor is its range of detection. The range of detection is around 5 cm. Now considering the low cost of the sensor the following limitation is bound to occur.

C. 16x2 LCD Display

The LCD module is a dot- matrix liquid crystal display that displays alphanumeric, kana and symbols. The LCD used in the project consists of 16 pins (8 data lines, 3 control lines, 2 power lines, 1 contrast line and 2 pins for back light LED connection). Data line and control line are connected to the microcontroller. The LCD panel's Enable and Register Select is connected to the Control Port.

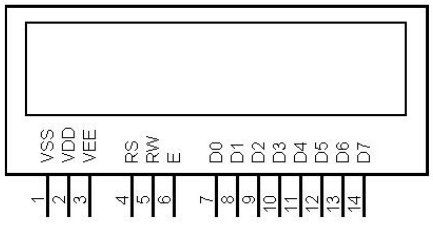


Fig 4: 16x2 LCD Display

D. LM358 Dual Operational Amplifier

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. It can handle 3-32V DC supply & source up to 20mA per channel on a single power supply.

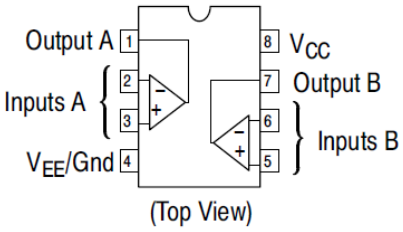


Fig 5: LM 358 Dual Operational Amplifier

E. 9-0-9V 1A Transformer

The 9-0-9V 1A Step down Transformer is a general-purpose chassis mounting mains transformer. Transformer has 240V primary windings and centre tapped secondary winding. The Transformer act as step down transformer reducing AC - 240V to AC - 9V. The Transformer gives two outputs of 9V, 9V and 0V.

Fig 6: 9-0-9V 1A Transformer

F. DC Motor

The DC motor used in the project is DC 1.5V-6V 400 Mini motor which runs at 3000 RPM(@5V) with nominal input voltage as 2V.

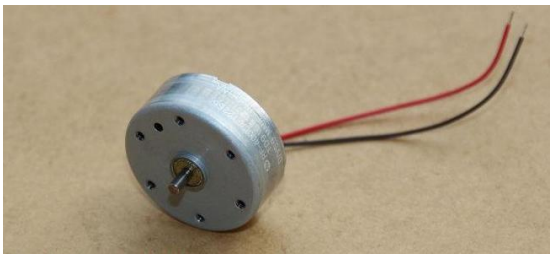


Fig 7: DC Motor

 ISSN: 2321-8169
178 - 181

G. 7805 Voltage Regulator

The 7805 is an integrated three-terminal positive fixed linear voltage regulator. It supports an input voltage of 10 volts to 35 volts and output voltage of 5 volts. It has a current rating of 1 amp. Its output voltage is fixed at 5V.

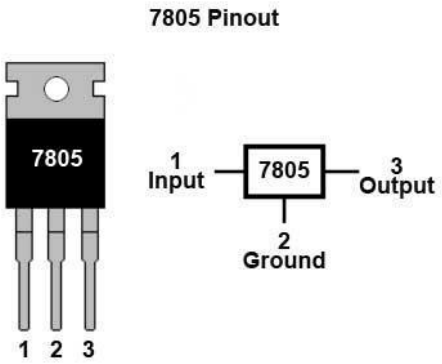
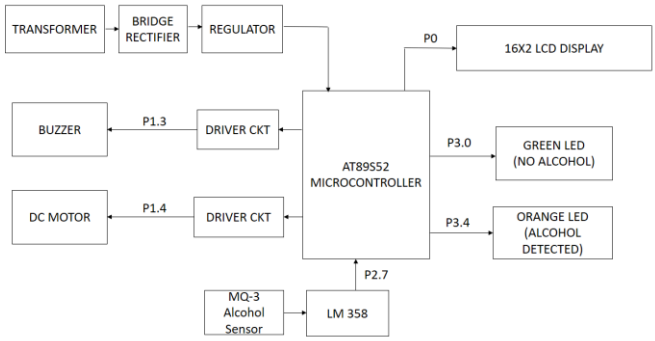


Fig 8: 7805 Voltage Regulator

IV. BLOCK DIAGRAM



V. POWER SUPPLY SECTION

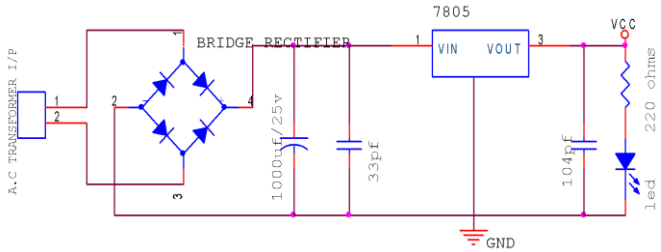


Fig 9: Power Supply Unit

The power supply section consists of 1A transformer, bridge rectifier, filter capacitor and voltage regulator.

The transformer steps down 230V to 9V AC supply, later the bridge rectifier converts AC supply to DC supply. To smoothen the waveform received from the bridge rectifier filter capacitor is used. Later, voltage regulators convert varying input voltage into a constant regulated output voltage.

VI. CIRCUIT DIAGRAM

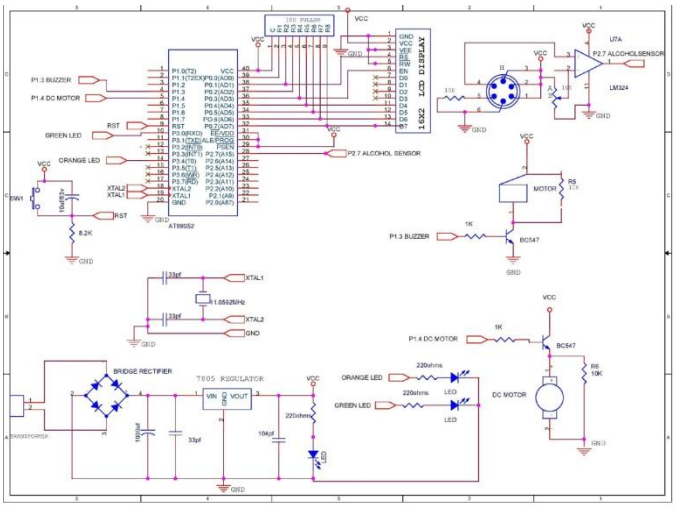


Fig 10: Circuit diagram

VII. SOFTWARE SYSTEM

Embedded Software deals with languages like ALP, C, VB etc. Here we have used Embedded C Programming. Embedded C is set of language extensions for c programming which introduces number of features not available in normal C. Its key characteristics are:

1) Simple to learn, understand, program and debug.
2) C Compilers are available to almost all embedded devices and there is a large pool of experienced C programmers.
3) Provides easy management of large embedded projects.

VIII. EXPERIMENTS AND RESULTS

EXPERIMENT 1: ALCOHOL SENSOR WORKING RANGE

SNo.	RANGE (in cm)	RESULT
1	10cm	NOT DETECTED
2	7.5cm	NOT DETECTED
3	5 cm	DETECTED

EXPERIMENT 2: TEST OF DIFFERENT ALCOHOLIC BEVERAGES

Beverages	Alcohol % by volume
RUM	42.8
Whisky, Brandy	42.8
Wines	8-15.5
Beers	2-10

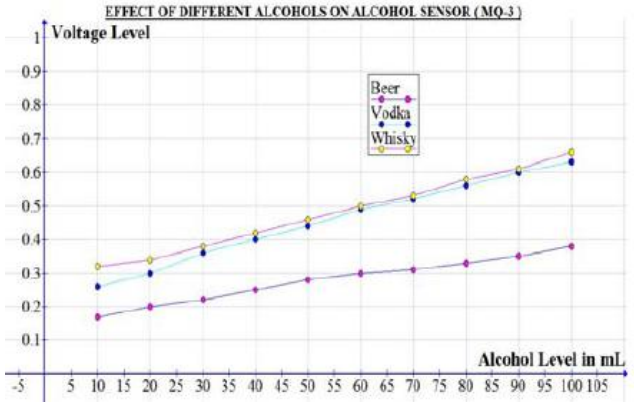


Fig 11: Effect of Different Alcohol Drinks on MQ-3

IX. PROJECT CIRCUIT

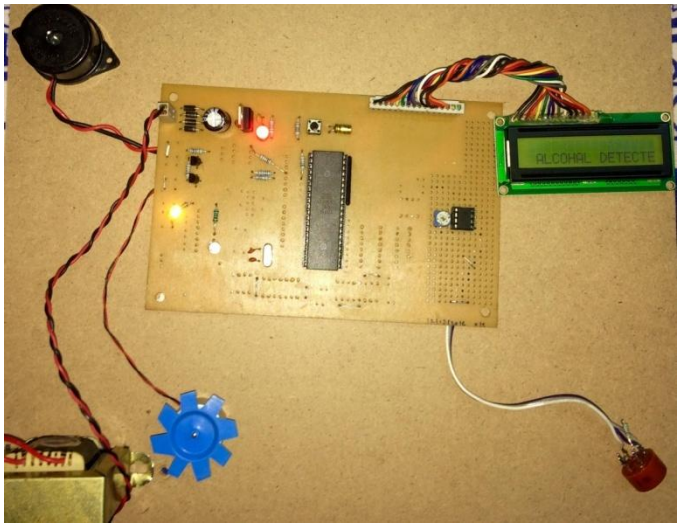


Fig 12: Project Circuit

When the alcohol is detected, and its output voltage is above 3.5 V the alcohol sensor sends a signal to the microcontroller and the motor is stopped, buzzer is active, and the orange LED glows and the simultaneous output is sent on the LCD display.

X. FUTURE ENHANCEMENT

The project can be extended to an improved version for preventing drunk drivers from getting on the road with new concept car filled with advanced alcohol detection sensors. These new sensors check a person's odors, sweat, and driver awareness to see if they can drive their car. If they're not quite sober, the car locks up the ignition system thereby preventing the driver from getting on the road. In addition to the breath analyzers, skin sensors can also be provided for more safety. A GPS Module and GSM can also be implemented to make the family members aware about the driver condition along with the location of the driver.

XI. CONCLUSION

This is a developed design to efficiently check drunken driving. By implementing this design, a safe car journey is possible decreasing the accident rate due to drinking. By implementing this design, drunken drivers can be controlled so are the accidents due to drunken driving. Government must enforce laws to install such circuit in every car and must regulate all car companies to preinstall such mechanisms while manufacturing the car itself. If this is achieved the deaths due to drunken drivers can be brought to minimum level.

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