

SOLAR POWERED ALCOHOL DETECTION AND VEHICLE CONTROLLING**Santhosh B¹****Muruganandam M²****Jayasankar S³****Mohammed Badar Sulaiyam Abdullah Al Kalbani⁴****Ahmed Said Hamed Al Yaqoubi⁵**

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ABSTRACT

This paper is about to design and development of alcohol detection system in vehicles using alcohol sensor, Arduino and GSM. The proposed system was initially simulated using PROTEUS Simulation software, further it was implemented practically as hardware project. It is very useful to make human safe driving and overcome the accidents. In the proposed system we have utilized an alcohol sensor to detect the drunken level of the driving person, this sensor will detect the alcohol level and it will give the analog signal to the Arduino, in such a way that the Arduino will detect the alcohol level and control the vehicle. The LCD display will display the status of the system. If the alcohol is detected, it will indicate with red LED indication along with buzzer sound. Also, it will send a SMS along with the GPS location to the respective persons like civil, police station or any other responsible persons. Hence this type of project is really useful for saving the human life from accidents.

Keywords:

Accident avoidance, Alcohol sensor, Arduino Mega, Proteus Simulation, GSM SIM 900A, GPS NEO-M8N Module, Vehicle control.

INTRODUCTION

Alcohol can effect on the person ability in a strong way, it reduces all brain function which drives the person to subconscious stage. The people under alcohol influence pose a serious threat on whole society. Drunk driving is one of the most significant health problems in all around world. It is a major reason for road accidents and fatalities globally, so even though the police are attempts to prevent these accidents, they cannot recognize the drunk driver who is about to set off.

The system is providing safety for the public, whenever a drunken person enters in to the vehicle, it will detect the alcohol and immediately it will give a buzzer sound indication, LCD will display the status, also it will turn off the vehicle through the vehicle ignition system [1]. It is giving the automatic safety system, here there is no communication to other person in order to intimate the issues.

Presently the technology in transport increasing rapidly hence the number of vehicles also increasing rapidly. In such a way that the road accidents also increasing intensely. The reason for the major road accidents are the drunken driving. We have been reading more about drunk driving car accidents in the headlines recently, all around the world. In the published work they find the value of alcohol level which is consumed by the driving person. Here the Arduino, alcohol sensor and GSM are used, to detect the alcohol and control the ignition system and sending the SMS to the respective persons. There is no location detection present in the published work [2].

In this published work, the alcohol detection system is utilized with an alcohol sensor. Whenever the alcohol value is increased above the set threshold value then, the system will stop the vehicle. Also here the GSM SIM 900A module is used for sending the SMS about the alcohol consumption to the civil or police [3].

Here the power and energy utilized for the proposed project also to be considered, there is energy consumption analysis is done [4]. There are different control techniques were followed such as Fuzzy Logic Controller, Artificial Neural Network Controller and some soft computing technique etc., for the PMDC motor [5, 6 & 7]. In the proposed project the PMDC motor is used as a vehicle motor. The renewable energy is utilized in the proposed project, hence few literature is focused on the renewable energy system such as solar power and its maximum power point tracers [8, 9 & 10]. Some of the converters were used for driving the motor using the PWM techniques [11, 12 & 13].

From the above literature, it has become our duty to design solar powered alcohol detection system to stop the drunk drivers and reduce the adverse impacts due the drunks. The proposed work is very useful to stop the danger before it gets worse. People who are psychologically and mentally unstable because of alcohol, it can destroy the lives who mean a lot to others and destroy themselves. This paper is about solar powered drunken driving vehicle avoiding system using alcohol sensor, Arduino, GPS and GSM. The proposed system will help a lot in reducing the amount of damage who threatened society and people lives.

OBJECTIVES

The main objective of this paper is to fabricate the alcohol detection system in vehicle using MQ3 Alcohol sensor, Arduino, GSM and GPS. The specific objectives are to design the circuit diagram for the alcohol detection, to fabricate the alcohol detection circuit with motor control circuit, to develop the Arduino code for the proposed project and to test the performance of the fabricated circuit.

METHODOLOGY

Figure 1 shows the block diagram of proposed system, the main elements in the block diagram are Solar panel, Charge controller, battery, Arduino Mega, MQ3 Alcohol Sensor, Vehicle Motor, LED, LCD display, Buzzer, GSM and GPS.

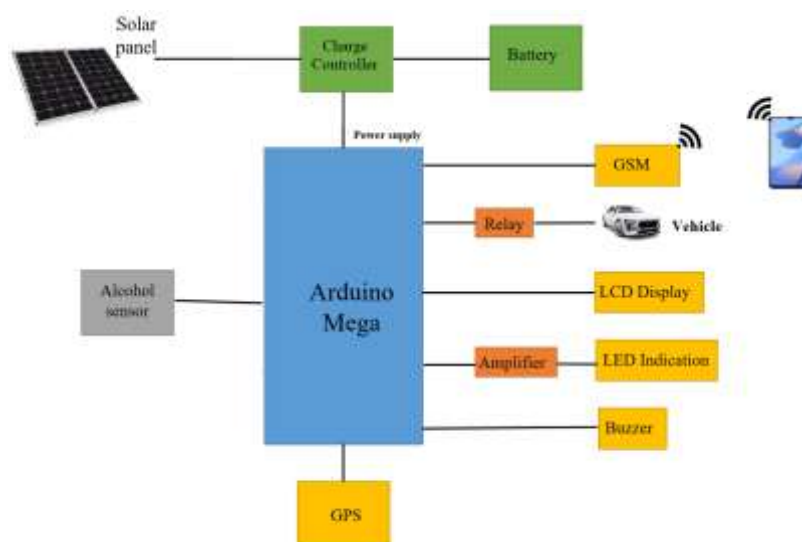


Fig.1. Block diagram of Proposed System

Here the 18V solar panel is utilized for the whole project. The maximum power of solar panel is 40watts, the current at maximum power is 2.22A and the voltage at maximum power is 18V. It uses the monocrystalline cell technology, the panel dimensions are 620x547x35mm and the weight is 4.5kg. The solar charge controller has the features of automatic managing of solar panel and battery in the solar system, it has built in overloading, short circuit, open circuit, lightning and reverse panel protection, it is easy to setup and easy to operate. It is portable

size and suitable for small solar energy system. The specifications are 12V/24V, 20A charging and loading current, it has a USB output of 5V/3V. The battery used is 7Ampere - hour 20HR 12V deep cycle solar battery. The maximum charging current of battery is 2.1A and the dimension of battery is 151x65x94mm. The alcohol sensor is MQ3, it will operate with 5 V DC and it consume 150mA of current. It will give digital or analog output. The main part of the block is the controller, here Arduino Mega is used as controller.

The Arduino Mega 2560 is an ATmega2560 family microcontroller. It is an eight-bit microcontroller, it consumes very low power and giving best performance. It has totally 54 digital and analog pins out of it, 15 pins can be used as a Pulse Width Modulation (PWM) pin, 16 pins used for analog inputs, 4 pins used as Universal Asynchronous Receiver Transmitters (UARTs), It is working with 16MHz crystal oscillator, there is a USB connector to connect the board with the computer to upload the code. It has a power jack and it has an EEPROM memory of 4kb, the stored data in the EEPROM memory will be retained even after the power supply is turned off.

Table 1. List of components for the proposed system

Sl.No.	Items Description	Range
1.	Arduino Mega	ATmega2560
2.	Switch	SPST
3.	Capacitor	1000uF, 25 V
4.	IC Voltage Regulator	IC 7805
5.	Alcohol Sensor	MQ3
6.	Variable Resistor	1 K Pot
7.	Resistor	330 Ω
8.	Liquid Crystal Display	20X4 LCD
9.	LED	Blue, Red, White
10.	Buzzer	5 V
11.	PMDC Motor	5 V
12.	Battery	12V 7Ah, 2.1A
13.	Amplifier Transistor	BC548
14.	Relay Module	5 V
15.	Solar Charge Controller	12 V, 10A
16.	Solar panel	40W, 18V, 2.2A
17.	GSM	SIM900A
18.	GPS	NEO-M8N Module

The output of the microcontroller is controlling the vehicle motor. In the proposed system a 5 V PMDC motor is used as a vehicle motor. Also for the purpose of indications, LEDs, LCD display and buzzers are used. During the Normal mode of operation, a white LED will glow, during the alcohol detection a red LED will glow also the 5 V buzzer will sound. The LCD display will display the status of the system. The GPS NEO-M8N Module is used to detect the location of the vehicle. The GPS module is also work with 5 V. Finally, there is a GSM SIM 900A module is used to send the SMS when it is identified the drunken driving. The list of components used for the proposed system is given in the table 1.

The circuit diagram of proposed system is shown in figure 2. In this project initially we have simulated the proposed system with Proteus simulation software and then it was implemented as hardware prototype module. During the simulation the input supply is taken from the solar panel and regulated the voltage for 5 V using IC7805 regulator IC, in the hardware the solar panel will give 18V, then through the charge controller we are charging the 12 V battery and then from the battery, we are taking the input supply to the circuit through the respective regulator ICs. Here 5V supply is used for the Arduino, LCD, motor, GPS and LEDs etc., for the GSM 6 V supply is used hence 7805 and 7806 IC regulators are used in the circuit for the power supply.

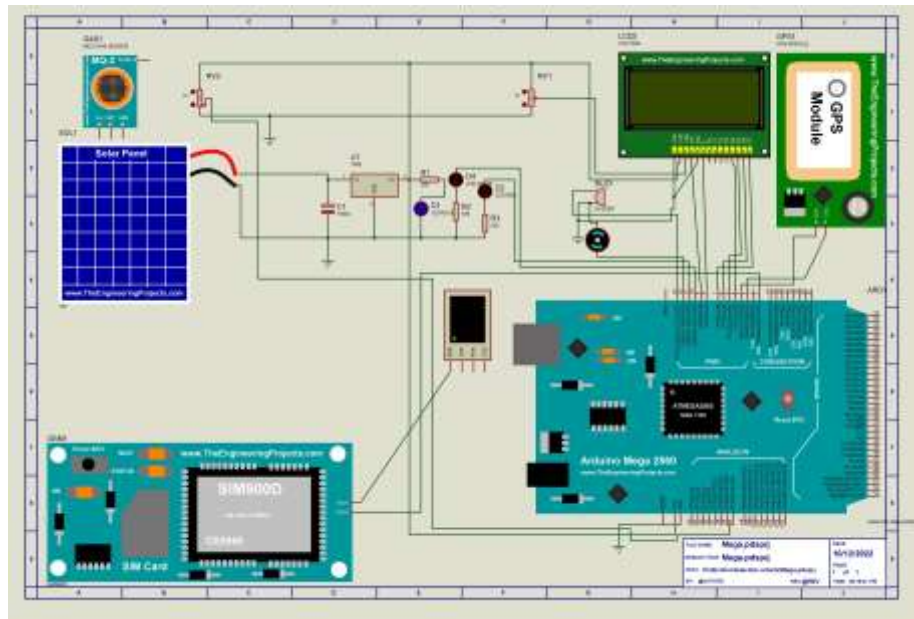


Fig. 2. Circuit diagram of proposed system

In the Arduino pin number 10, 11 are used for the white and red LEDs, pin 12 is used for the motor and the pin 13 is utilized for the buzzer. The MQ3 alcohol sensor is connected in the analog pin A4. GPS is connected in the pin 2, 3 and the GSM is connected in the pin 0, 1 of the digital pins. The LCD displays are connected in the digital pins 4, 5, 6, 7 for data inputs and the pin 8 and 9 used for reset and enable purpose.

RESULTS AND DISCUSSION

In the Proteus simulation the MQ3 alcohol sensor is not giving proper analog output, hence we have used the 5V potential divider for the alcohol sensor instead of MQ3 alcohol sensor, the sensor output is connected to the Arduino mega analog pin A4. When the Analog input is zero it is considered as alcohol not detected and when we apply some voltage then it will be considered as alcohol detected.

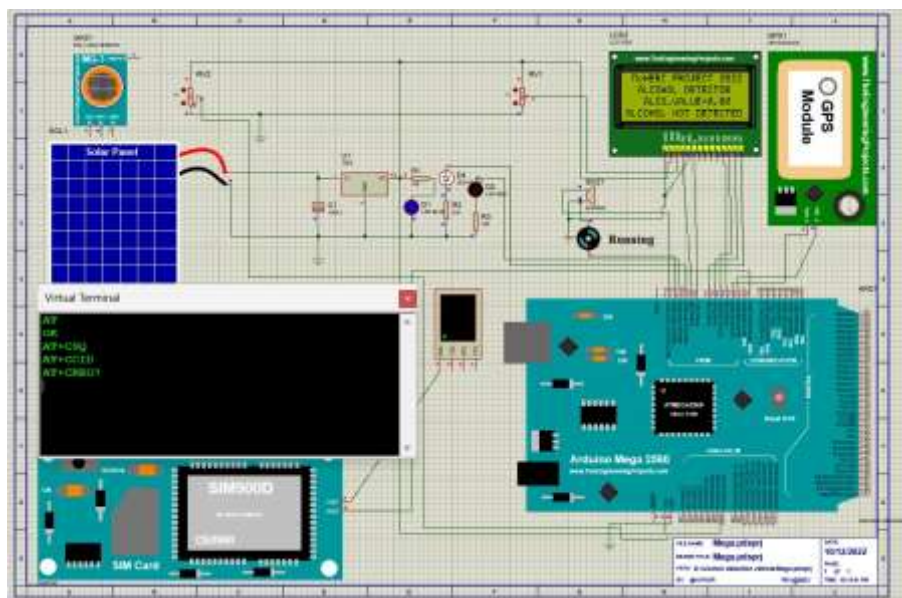


Fig. 3. Circuit diagram when not detecting the alcohol

During the normal mode of operation, the alcohol value is showing as 0.00 in the LCD display, the power LED which is blue in color is ON, the white LED is ON to indicate the alcohol not detected and the red LED is OFF, the buzzer is also OFF, the vehicle motor is running normally. The normal mode of operation which is not detecting alcohol is shown in figure 3. During this mode the GPS is turned ON and it is detecting the location, also the GSM ON and it is ready for sending SMS to respective mobile number.

During alcohol is detected, it will show the value of alcohol which depends on the alcohol concentration, the alcohol value of 1 to 100 % is mapped as 0 to 5 V analog value. Now the LCD display, displays the respective alcohol value, the white LED is OFF and the red LED is ON to indicate the alcohol detected, the buzzer is ON, the vehicle motor is stopped, it is not running now. The GSM now sending SMS to the respective mobile number, stating that the alcohol detected with the vehicle number and the corresponding locations longitude, latitude and altitude. The SMS message is also displayed in the virtual terminal during the abnormal mode of simulation. The abnormal mode of operation which is detecting alcohol is shown in figure 4.

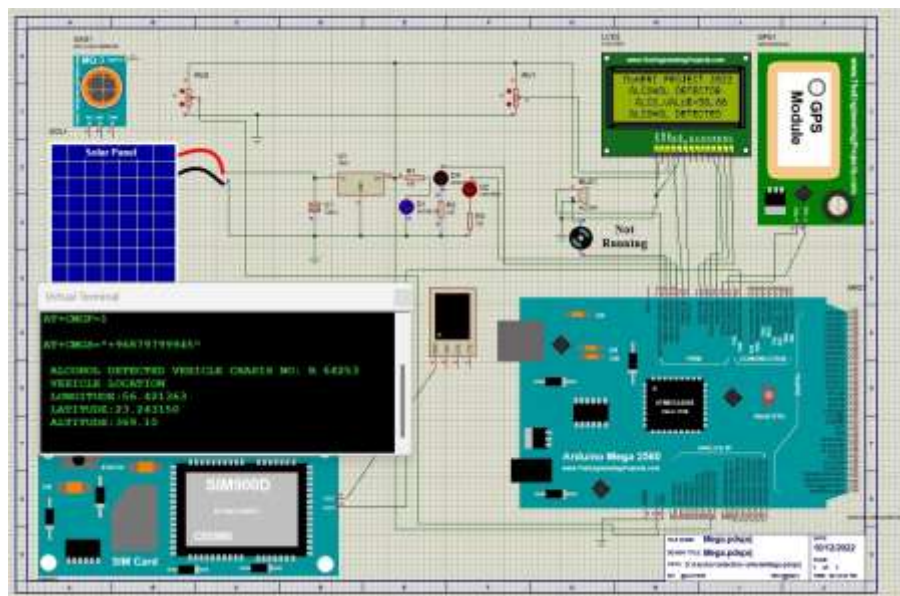


Fig. 4. Circuit diagram when detecting the alcohol

The same simulation circuit is implemented as hardware, during the hardware the PMDC motor is fixed in the wheels of a toy electric vehicle, the white LED is secured in the vehicle front head light and the red LED is secured as a vehicle rear lamp. Hence the red LED will indicate as a hazard indication before stopping the vehicle. The same operation will be performing in the hardware prototype also. The hardware also initially tested with bread board, photograph of the circuit testing is shown in the figure 5. The screenshot of the SMS is shown in Figure 6.

The final assembly of the project photography during OFF state is shown in figure 7. The final assembly of the project photography during ON state is shown in figure 8. The photography of overall view of the proposed system with solar panel is shown in figure 9.

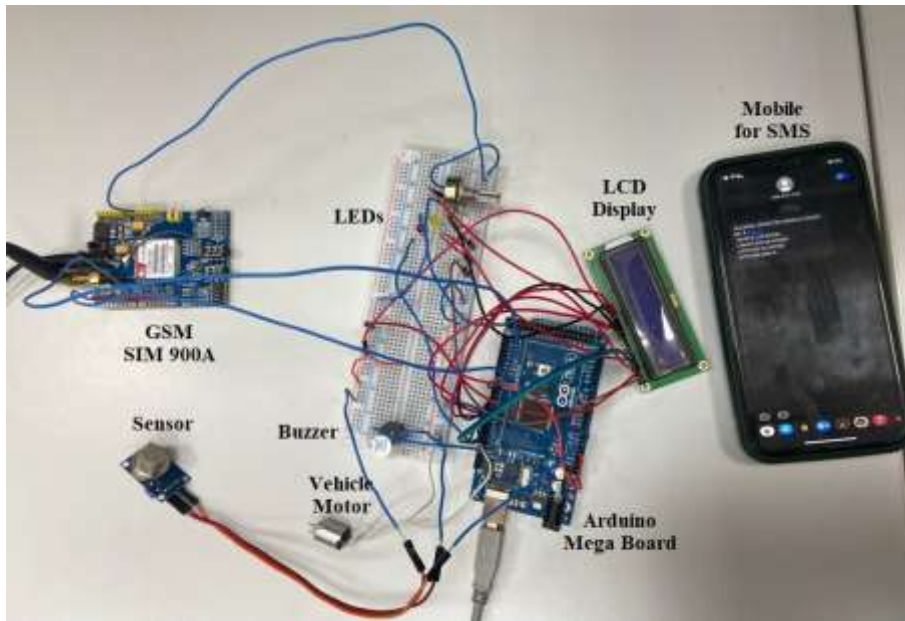


Fig. 5. Testing of the project with Bread board

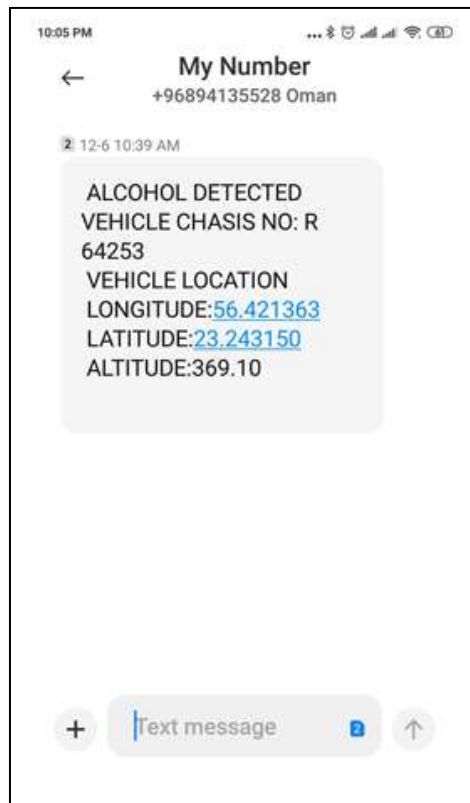


Fig. 6. Screenshot of SMS from Mobile

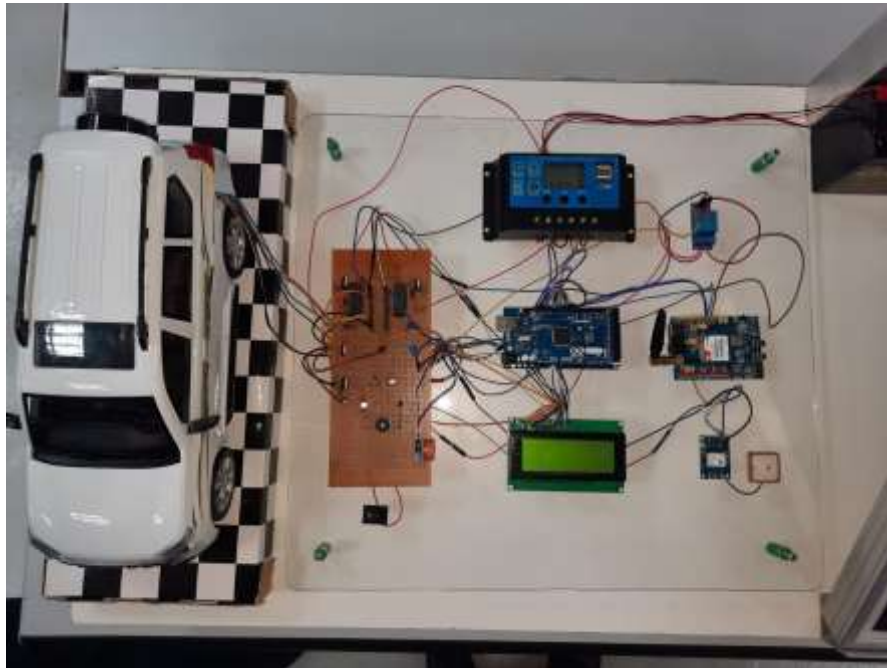


Fig. 7. Photography of Assembled system during OFF position.

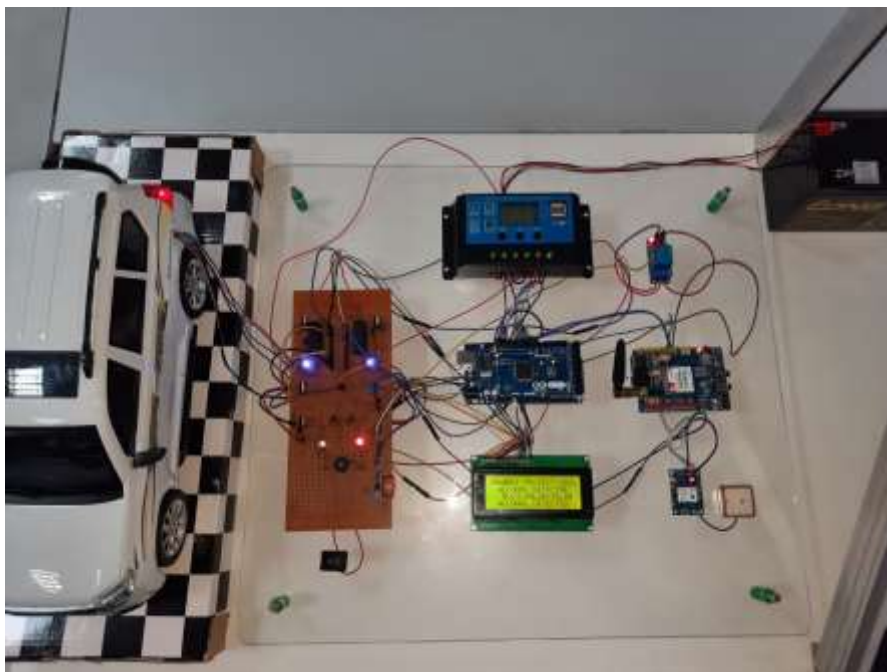


Fig. 8. Photography of system during working.

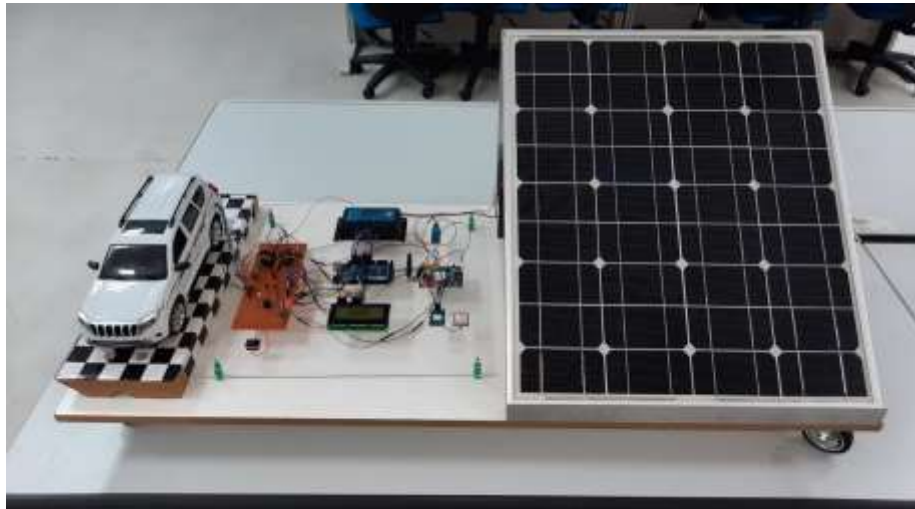


Fig. 9. Photography of overall view of the system with solar panel

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CONCLUSION

In this project, we have developed a project that aims to know the percentage of alcohol in a person consumed, the alcohol sensor (MQ3) that will sense the percentage of alcohol in a person's breath. This project aims to avoid accidents that occur because of the driver drinks alcohol, and it is an assistant to the police in facilitating the process of catching alcoholics. Depends on the sensor value, it will sense the alcohol and send the information to the Arduino Mega board in the form of input information to the analog pin, the Arduino will control the vehicle motor, LED, LCD and buzzer. If alcohol is present, the device will emit a warning sound and the red color will light up by LED, alcohol detected will appear on the LCD and the vehicle will stop working automatically. Also it will send the SMS using GSM module along with the Vehicle location using the GPS. The total power for operating the system is taken from the solar panel which will be mounted on the top of the vehicle. It is expected that this device will have an important function in the future, because it will avoid people from falling into accidents and will contribute to saving many lives.

Scope for future work

In the proposed work only focused on the alcohol detection. Further we may go for other parameters like detecting the drowsiness of the driver, by detecting the eye blink of the driving person we may detect the driver's drowsiness. Also we may go for detecting the speed and giving information to the traffic representatives. Even we can go with image processing technique, in such a way that we may use the face detection technique to detect the driver's drowsiness. The image processing, we may go with the raspberry pi controllers.

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