UNIVERSITY PARTNER

UNIVERSITY OF WOLVERHAMPTON

HERALD COLLEGE KATHMANDU

4CS016 – Embedded System Programming

REPORT WRITING

Project Title	: Alcohol Detector
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1. INTRODUCTION:

The mini-project which has been created for the final assessment of the Embedded System Programming Module is a simple but effective Alcohol Detector. With this, we can measure the alcohol level in the air and it can also be used to get the level of alcohol in the human body.

The main factor in traffic deaths is alcohol. A third of all traffic-related fatalities 10,000 deaths annually—are caused by drunk driving incidents. More than 230 kids lost their lives in drunk driving accidents in a recent year. The riskiest age group for drunk driving is young adults, particularly those between 21 and 35.

A person who is operating a vehicle with a blood alcohol content (BAC) of 0.08 or above is deemed legally intoxicated. The number of drinks needed to obtain this BAC varies significantly by gender and weight, however for adults, the average is 2-3 standard pours.

A driver's ability to properly operate a motor vehicle is greatly compromised by alcohol due to its detrimental effects on judgment and reaction time. Operating a vehicle while intoxicated is forbidden everywhere in the world because the consequences could be fatal. (Rivelli, 2022)

2. TOOLS USED:

2.1. Arduino UNO Board:

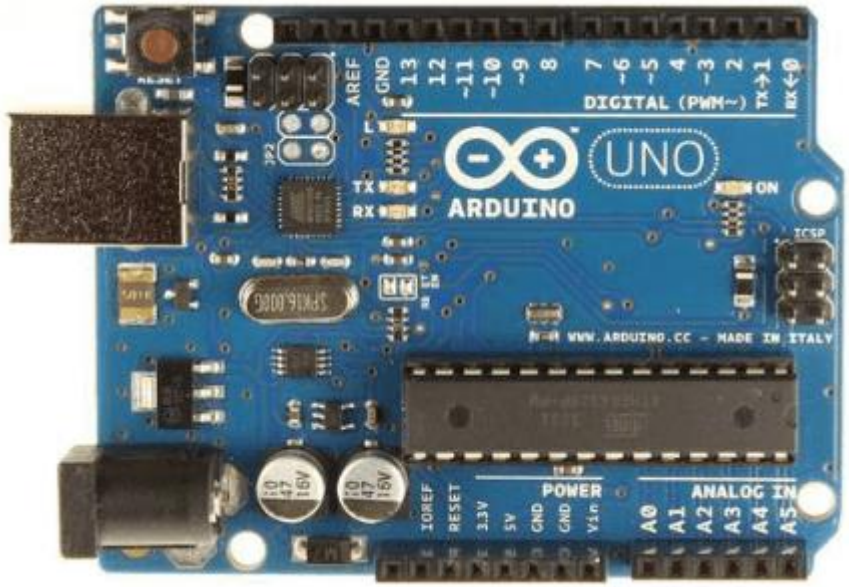

Figure 1. Arduino UNO Board

The Arduino UNO is a standard board of Arduino. It is regarded as a strong board that is employed in many projects. The ATmega328P microprocessor is the foundation of the Arduino UNO. Compared to other boards, it is simple to operate. The board is made up of shields, various circuits, and digital and analog which is Input/Output (I/O) pins being 14 and 6 in number respectively.

(Jaiswal, 2011)

2.2. MQ3 Sensor:

Figure 2. MQ3 Gas Sensor

Alcohol may be detected with the MQ-3 module. SnO2, which has a reduced conductivity in clean air, is the sensitive material used in the MQ-3 gas sensor. Based on alcohol concentration, this sensor outputs an analog resistive signal. When alcohol gas is present, the conductivity of the sensor increases along with an increase in gas concentration. (Sensor, 2018)

2.3. Breadboard

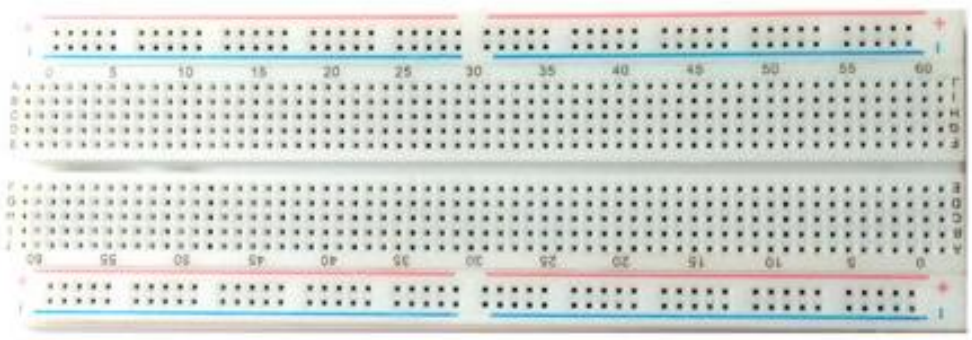

Figure 3. Breadboard

A breadboard is a plastic board with several tiny holes used for circuit construction and testing. They have internal connections between the holes in a certain pattern. The top and bottom 2 sets of dots have horizontal connections while the remaining dots between those two have vertical connections. (Breadboard, 2018)

2.4. 5V Buzzer

Figure 4. 5V Buzzer

The smallest yet most effective part for adding sound characteristics to our project or system is a buzzer. It has a tiny 2-pin construction and is quite small. Although a buzzer can be powered by a DC power supply ranging from 4V to 9V, it is advised to use a regulated +5V or +6V DC supply. (Buzzer, 2017)

2.5. LED

Figure 5. LED

When an electric current flows through a light-emitting diode (LED), a semiconductor device, it creates visible light. In most LEDs, the light is monochromatic and occurs at a single wavelength, however it is not extremely bright. (Contributor, 2005)

2.6. 180-ohm Resistor

Figure 6. 180-ohm resistor

The resistor is an electrical component that is passive and adds resistance to the flow of current. They are present in practically all electronic circuits and electrical networks. There are various uses for resistors. Among some instances are voltage division and current restriction. They can be distinguished from one another by their colour code. 180 Ohm Resistor Colour Code: Brown, Gray, Brown, Golden. (Resistor, 2012)

2.7. Jumper Wires

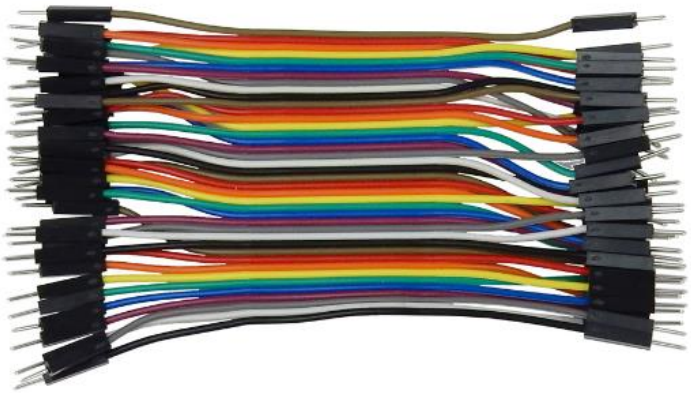

Figure 7. Jumper Wires

A jumper wire is an electrical cable used to link distant electrical circuits. It can be used to short-circuit and short-cut (jump) to another electrical circuit by joining it to the circuit. (Seisen, 2017)

3. WORKING PRINCIPLE:

Before understanding the working mechanic, it is crucial to learn the structure of MQ-3 sensor. These sensors are made of iron mesh on the surface and a plastic cover on the outside. Also, these sensors are designed so that only gaseous elements can travel inside. Skipping the complicated design, it is enough to understand that the sensor has a sensing-element made of ceramic containing aluminum oxide and coated with tin dioxide on the outside and these tin dioxides are very sensitive to alcohol.

When an alcohol mixture is brought close to sensor it reacts with the tin dioxide reducing the surface absorption of oxygen. Then the potential barrier decreases. The electrons are then released into the tin dioxide. Then the current flows freely. So, the output voltage increases. We can get this output voltage in the form of analog input and digital input. That task is performed by the module to which this sensor is connected. (Hobby, 2020)

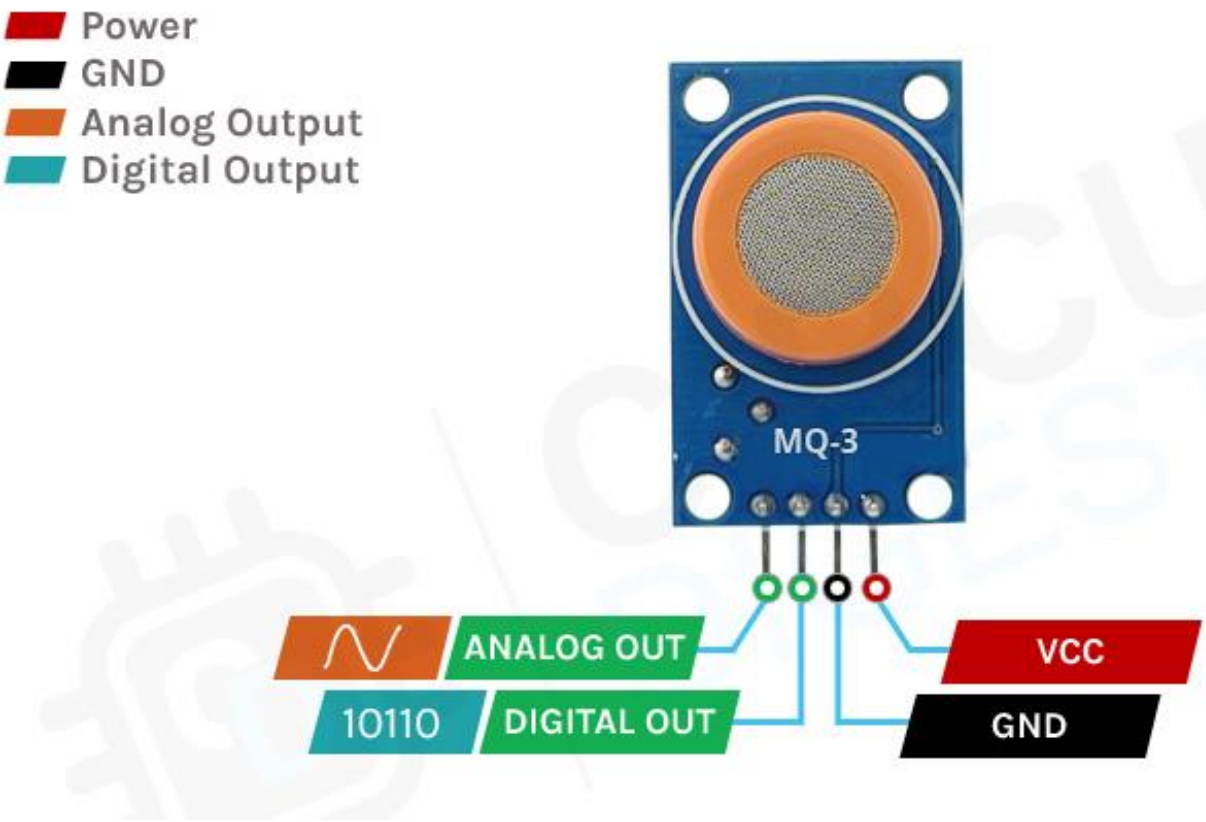

Figure 8. MQ-3 Alcohol Sensor Pinout

VCC is the Gas Detection Sensor's power supply pin, which can be linked to a 5V source.

GND is the board's ground pin, which should be linked to the Arduino's ground pin.

DOUT is the board's digital output pin; a low output indicates that no alcohol is present in the environment, while a high output indicates that Alcohol is present.

AOUT is the board's Analog output pin, which will provide us with an analog signal that varies between VCC and ground depending on the alcohol level detected.

Now that the basic structure and working of the sensor has been explained along with all the complicated parts after that this project is very simple to understand.

Once the current is set to flow freely, it provides electricity to activate the buzzer which in return outputs a sharp but annoying ‘beeping’ noise. The current also provides enough electricity to the LED which makes it glow. Thus, completing the whole circuit.

And this is how traces of alcohol can be detected with the help of this mini-project.

4. CIRCUIT DIAGRAM & FRITZING SCHEMATIC:

4.1. CIRCUIT DIAGRAM

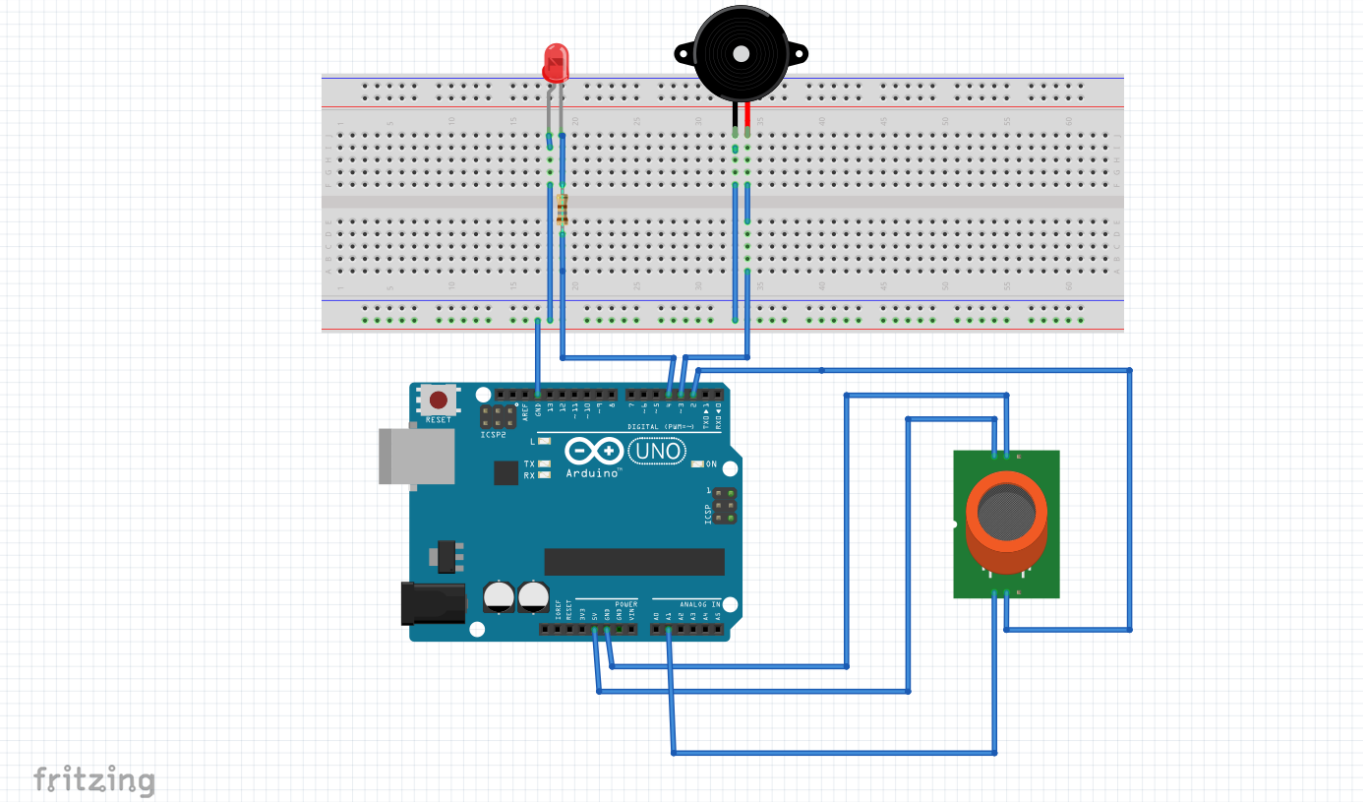

Figure 9. Alcohol Detector Circuit

4.2. FRITZING

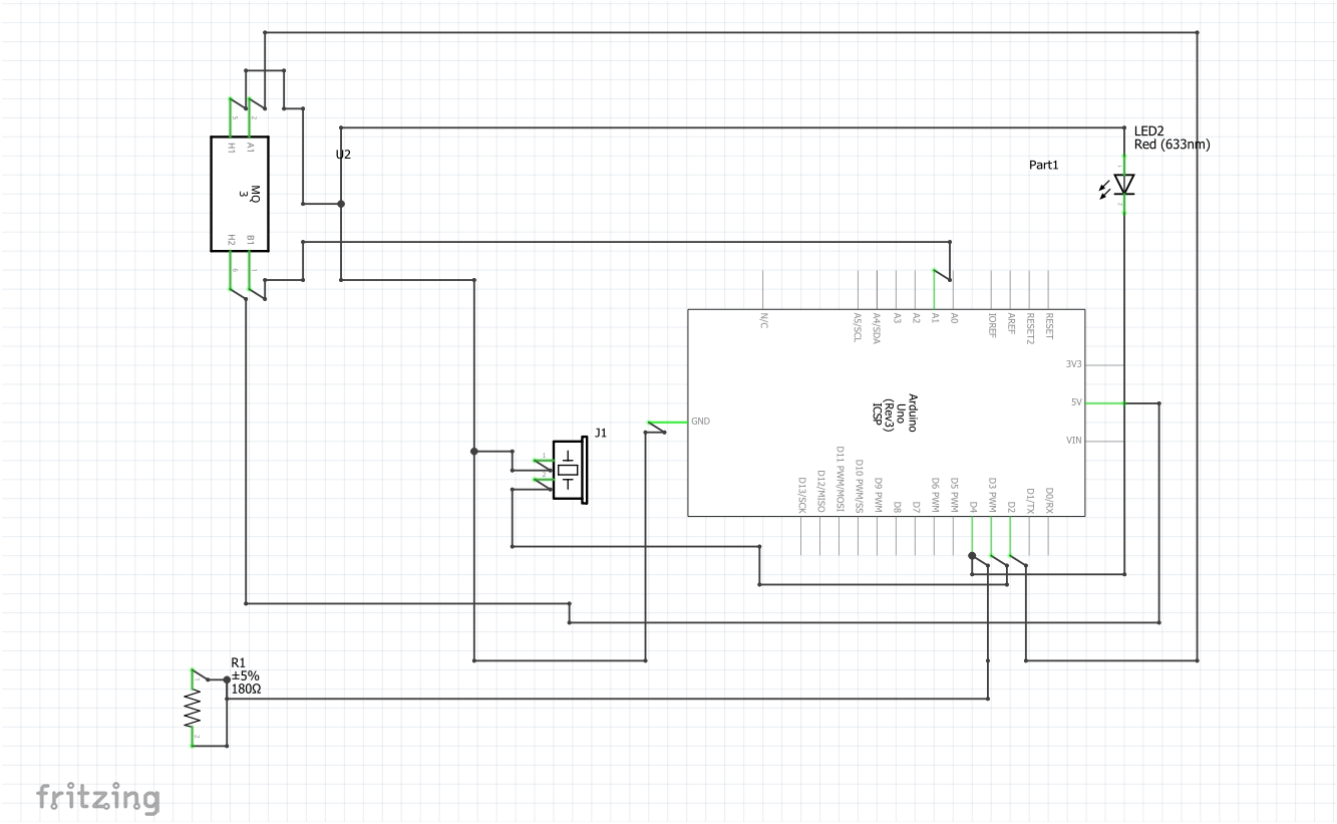

Figure 10. Alcohol Detector Fritzing

3. PROGRAM:

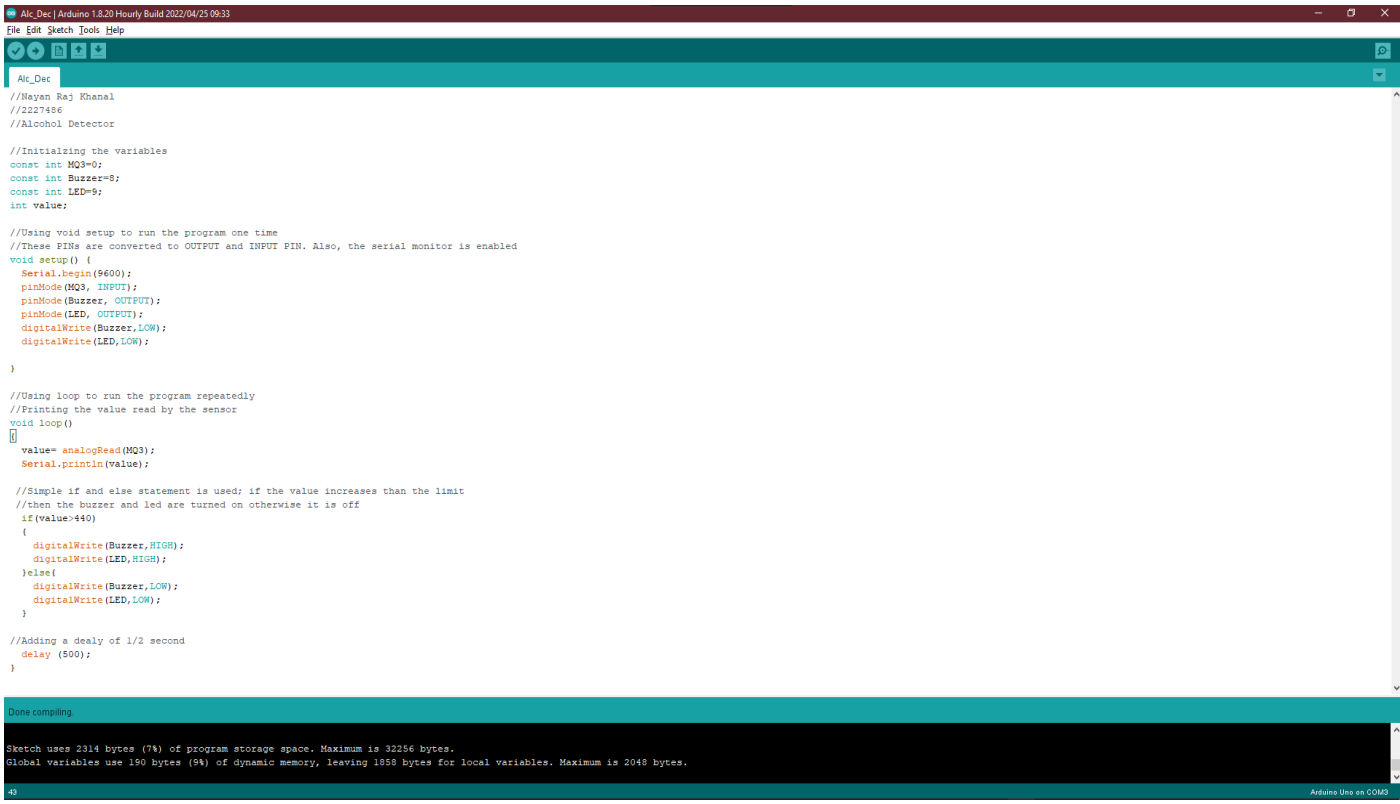

Figure 11. Code

4. TESTING:

4.1. OFF STATE:

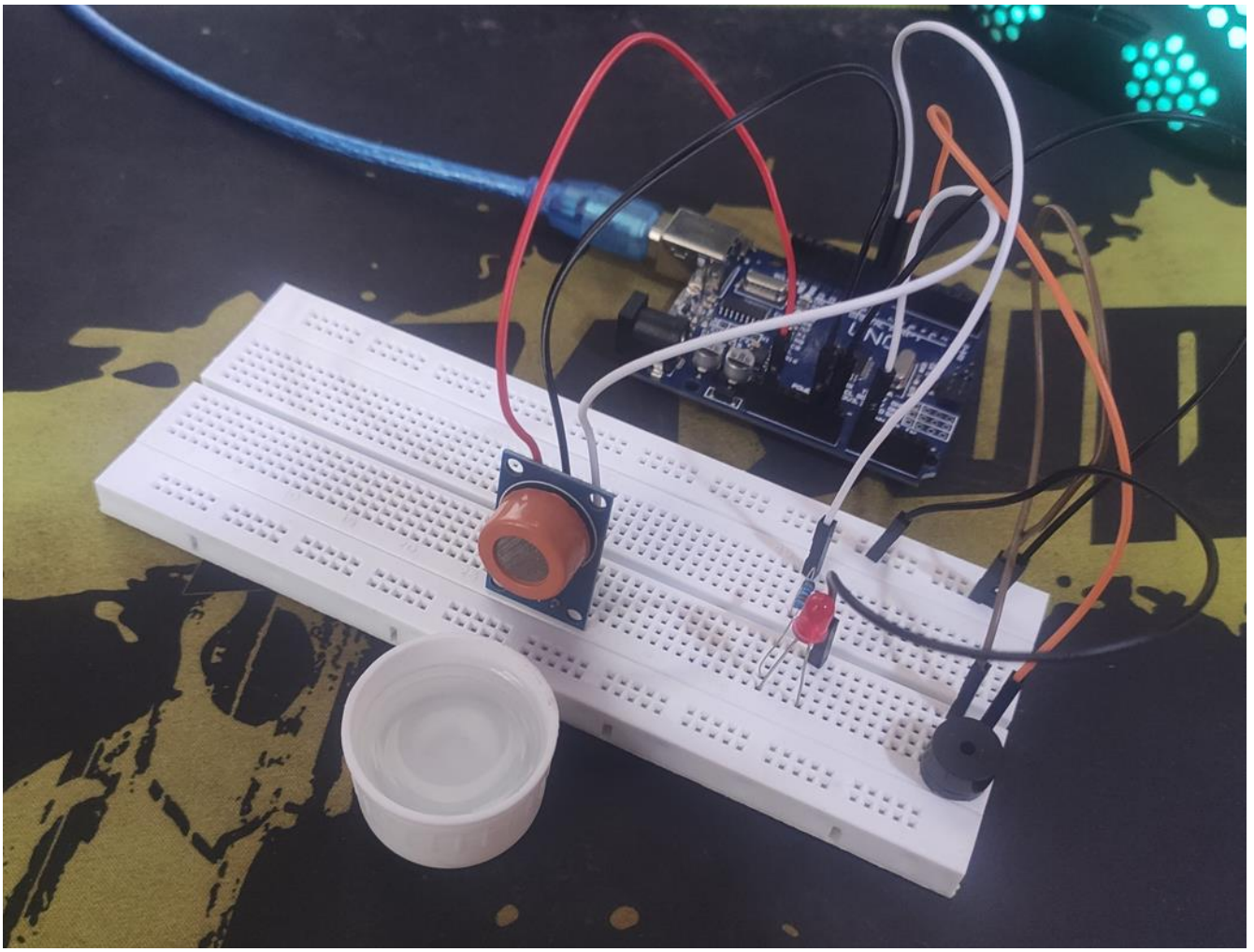

Figure 12. Off State

4.2. IDLE STATE:

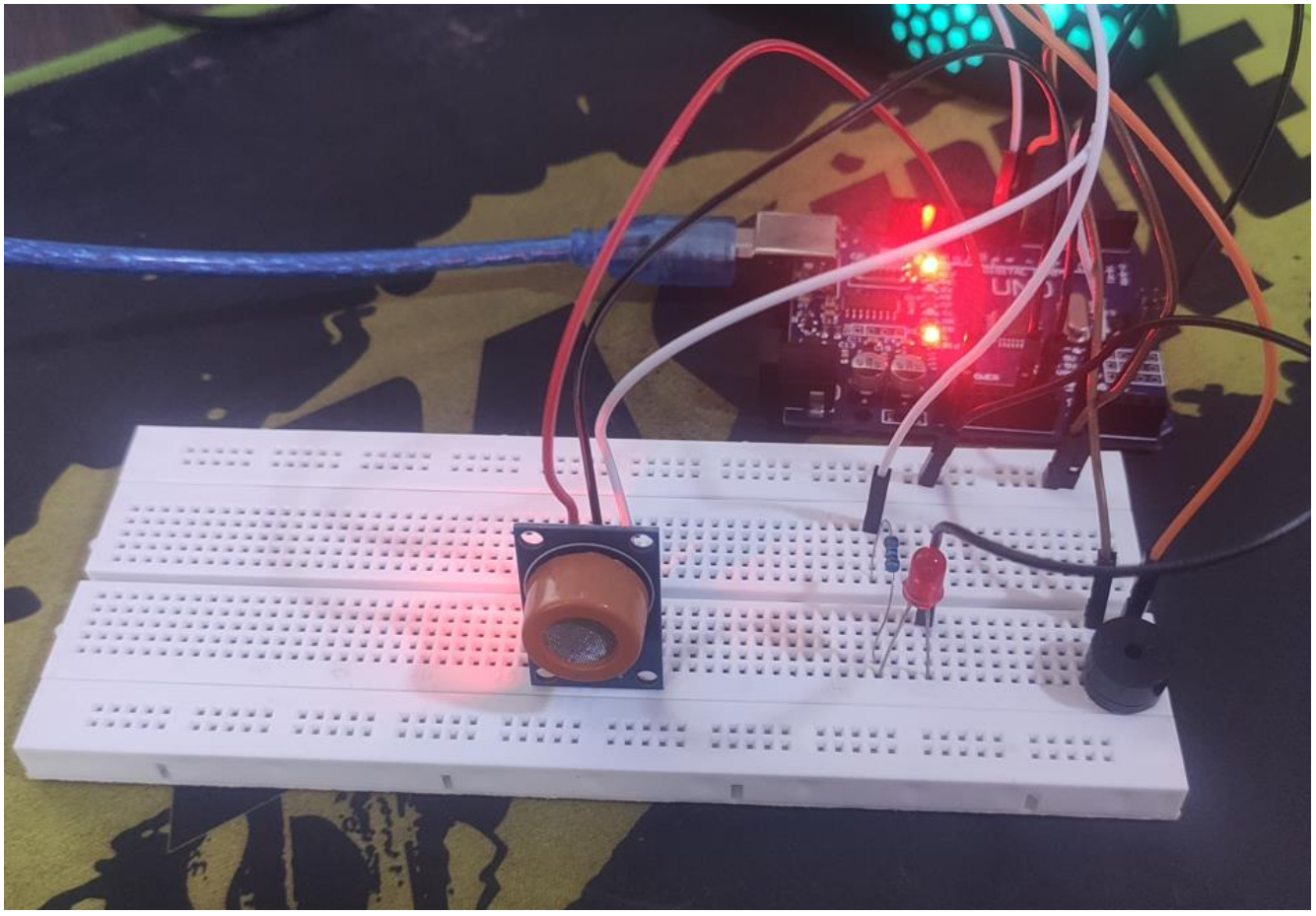

Figure 13. Idle State

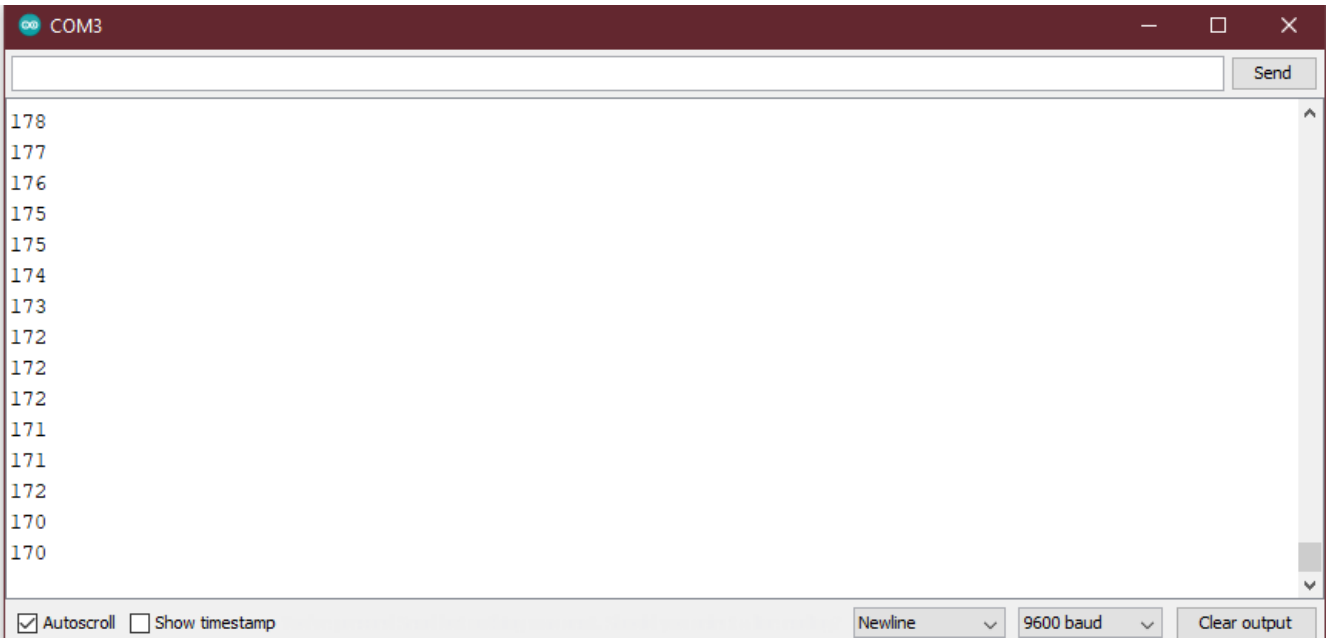

Figure 14. Idle State Readings

4.3. ON STATE:

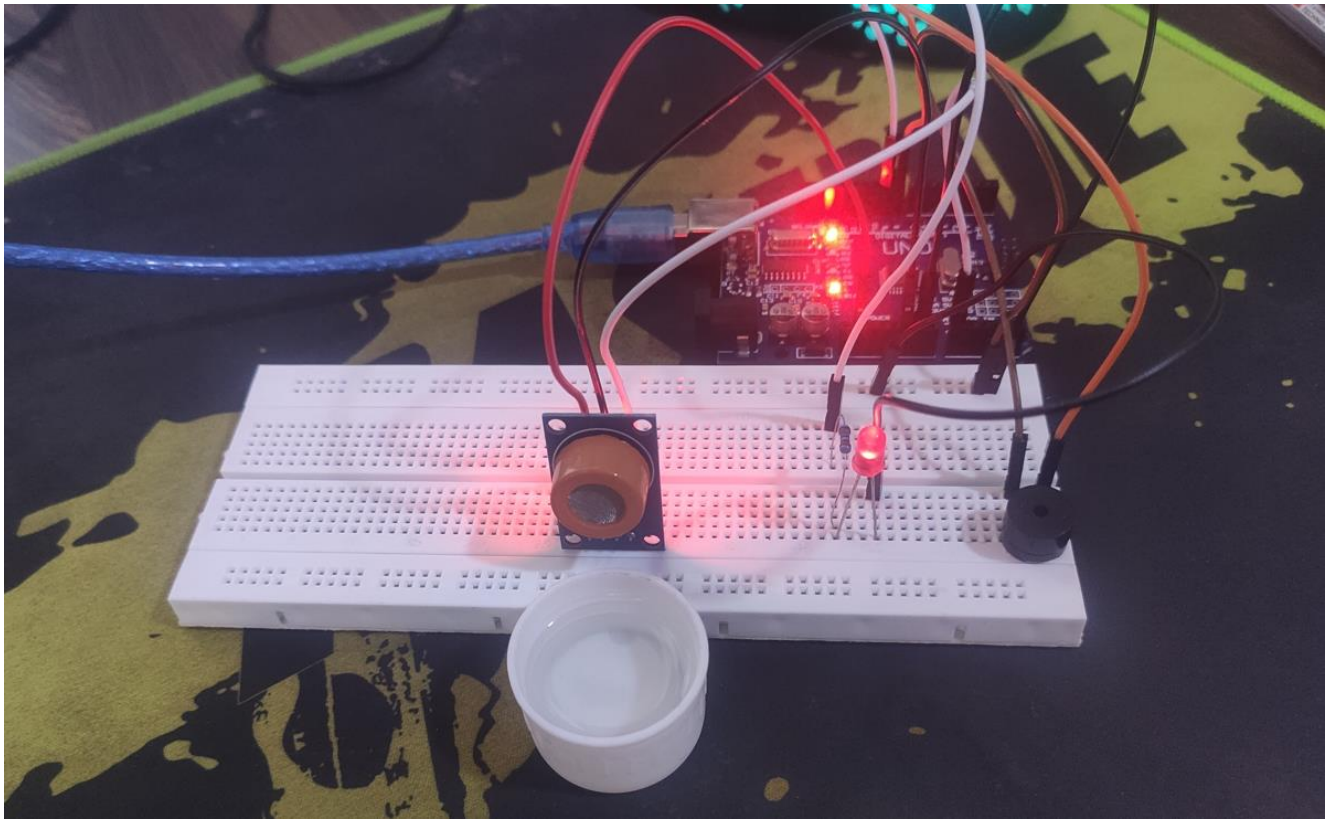

Figure 15. On State

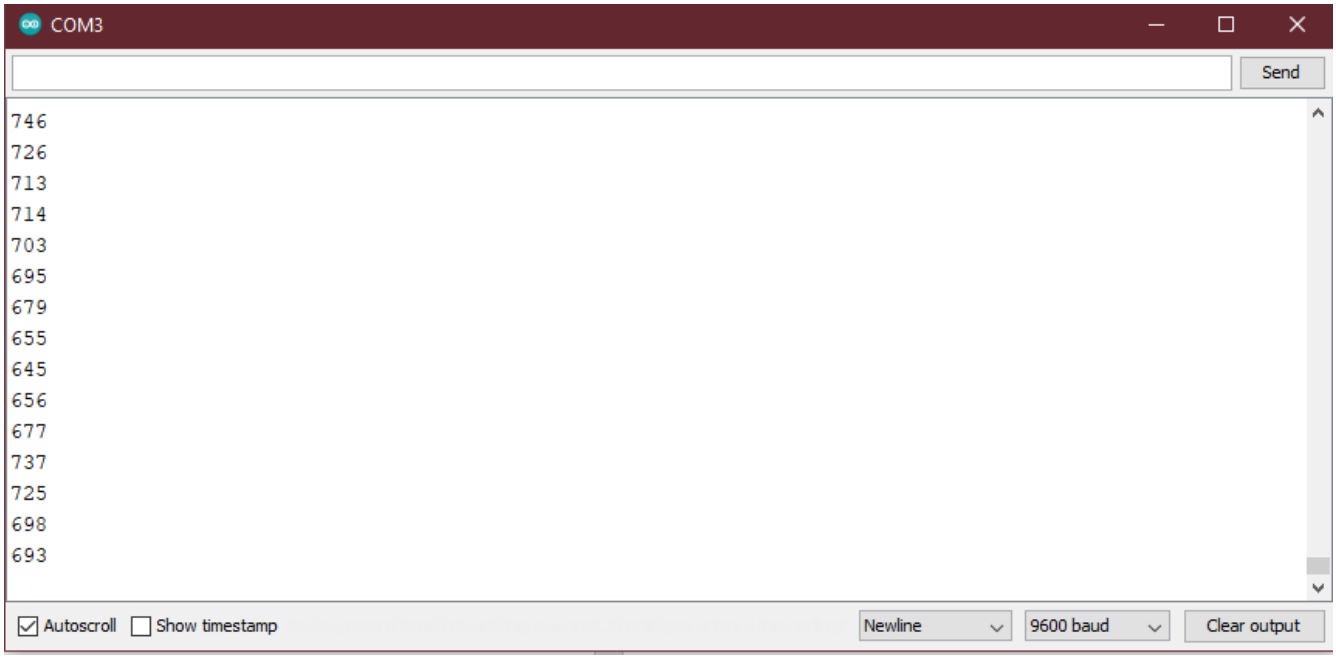

Figure 16. On State Readings

5. CONCLUSION

The "ALCOHOL DETECTOR" project has been successfully developed and tested. It was created by combining features from all of the hardware components used. Every module's presence has been thoughtfully considered and arranged, which helps the unit function as best it can.

The main inspiration for this project came from my real-life experience. One time me and my friend were pulled over late at night. We were returning home after attending another friend’s party. The police asked us to blow into this unknown device, which at that time we had no idea what it was but still we reluctantly did so. In my turn the device was silent but once my friend blew, it started making noise. Luckily, I was the one driving and not him so the police just asked us some questions and let us go. Once, I returned home I researched about the device and was fascinated by it and hoped to make it myself one day. Luckily, this module provided me with such opportunity and here I am completing a report on it. Thankfully, I had access to the internet which played a vital role in helping me complete this project and also my professors whose knowledge and hints kept me in the right track,

Finally, I would like to conclude this report by stating that **EMBEDDED SYSTEM** is an emerging field and there is a huge scope for research and development. So, let your imagination run wild and start working on something as it is very productive and fun.

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