Project Report

Title

Alcohol Detection System

Description

Developing a microcontroller-based prototype that detects and helps prevent drink-and-drive scenarios by measuring the alcohol concentration of the driver.

Problem Statement

Driving under the influence of alcohol remains a major cause of road accidents worldwide. Existing systems to control drunk driving are either manual or require police intervention, which is not always effective. There is a need for an automated, low-cost, real-time system that can detect alcohol consumption by the driver and take preventive measures.

Scope of the Solution

- Detect alcohol consumption by the driver using an alcohol sensor.
- Alert or disable vehicle ignition if alcohol concentration exceeds a predefined threshold.
- Compact and cost-effective system suitable for integration into existing vehicles.
- Prototype demonstration with simulated alcohol input and visual/audible alerts.

Required Components to Develop the Solution

Hardware:

- Arduino Uno
- MQ-3 alcohol sensor
- Buzzer
- LED (Red)
- Jumper wires
- Breadboard

Software:

- Arduino IDE (for code development and uploading)
- Optional: Tinkercad Circuits (for online simulation)

Working Principle:

1. MQ-3 sensor detects alcohol vapors in the driver's breath.
2. It gives:
   - Analog output (AO): variable voltage based on concentration (read by Arduino pin A1).
   - Digital output (DO): changes to LOW when alcohol concentration exceeds preset threshold (read by Arduino pin D2).
3. Arduino continuously reads:
   - Analog value: shows actual alcohol concentration.
   - Digital value: tells if alcohol has crossed the threshold.
4. When alcohol is detected (DO → LOW):
   - Arduino turns ON LED (pin D3).
   - Arduino turns ON buzzer (pin D4).
5. Otherwise:
   - LED and buzzer remain OFF.

Connections

MQ-3 Pin	Connects To	Why
VCC	Arduino **+5V**	Powers the sensor
GND	Arduino **GND**	Common ground
AO (Analog Out)	Arduino **A1**	Gives a continuous value (0–1023) showing alcohol concentration
DO (Digital Out)	Arduino **D2**	Outputs HIGH (1) or LOW (0) if alcohol exceeds preset threshold

- The MQ-3 sensor has three main pins used in this setup: VCC, GND, and OUT.
- Connect the VCC pin of the MQ-3 sensor to the +5V pin of the Arduino UNO.
- Connect the GND pin of the MQ-3 sensor to the GND pin of the Arduino UNO.
- Connect the OUT pin of the MQ-3 sensor to the D3 digital pin of the Arduino UNO.

Resistor connection with ardunio

• Arduino UNO Pin	• LED/Resistor	• Terminal
• D3	• Anode	• Terminal 1
• GND	• Cathode	• Terminal 2

- Connect the D3 digital pin of the Arduino UNO to one end of a 220Ω resistor.
- Connect the other end of the resistor to the Anode (longer leg) of the LED.

- Connect the Cathode (shorter leg) of the LED to the GND pin of the Arduino UNO.

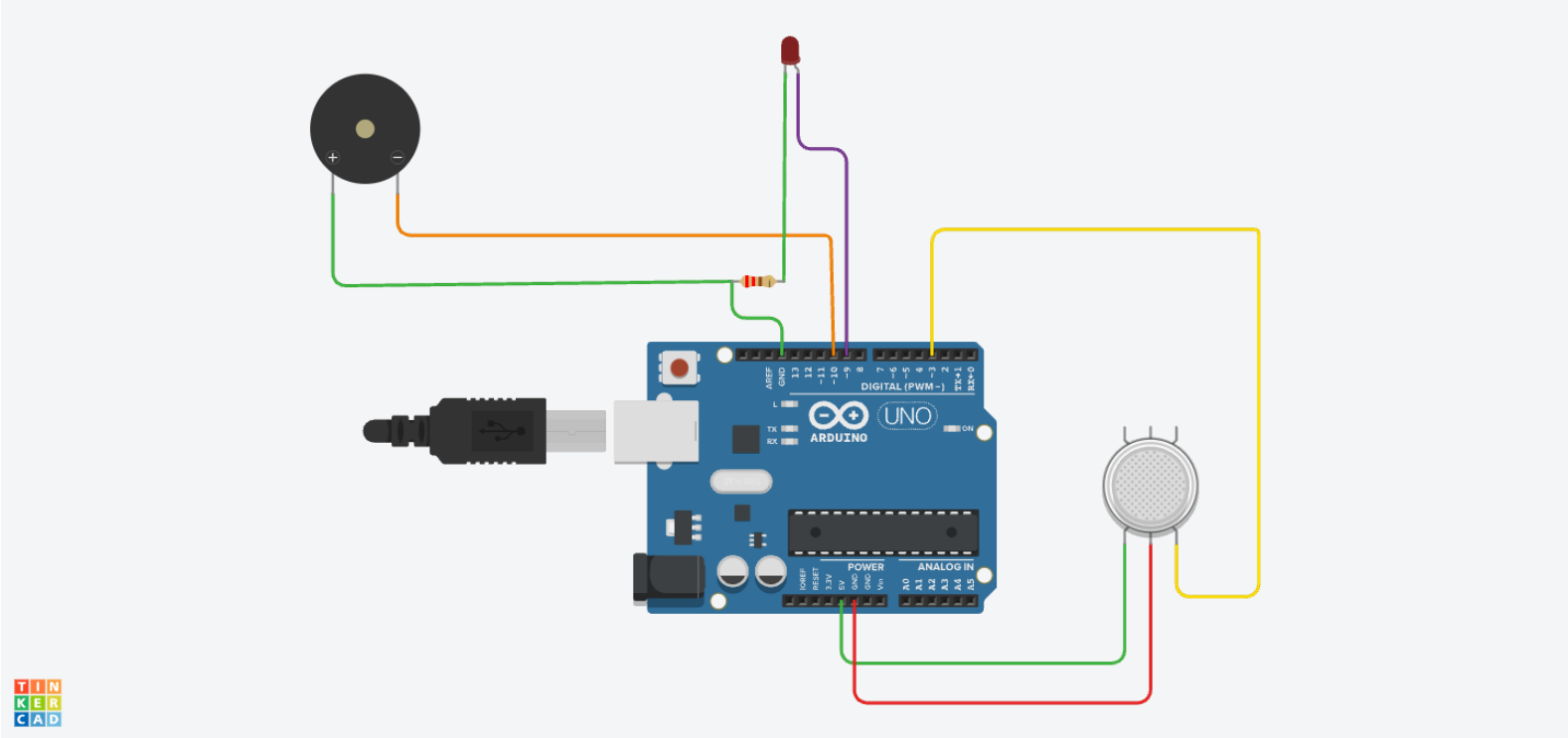
Connection with led

LED Pin	Arduino Connection
Anode (+)	D3 via 220Ω resistor
Cathode (-)	GND

Connection with buzzer

Buzzer Pin	Arduino Connection
+	D4
-	GND

Ciruit Diagram



Ardunio code

```
#define sensorDigital 2

#define LED 3

#define buzzer 4

#define sensorAnalog A1  // Make sure your board supports analog pin A1


void setup() {

  pinMode(sensorDigital, INPUT);

  pinMode(LED, OUTPUT);

  pinMode(buzzer, OUTPUT);

  Serial.begin(9600);

}


void loop() {

  bool digital = digitalRead(sensorDigital);

  int analogValue = analogRead(sensorAnalog);


  Serial.print("Analog value : ");

  Serial.print(analogValue);

  Serial.print("\t"); // tab for nicer formatting

  Serial.print("Digital value : ");

  Serial.println(digital);
```

```
  if (digital == 0) {
    digitalWrite(LED, HIGH);
    digitalWrite(buzzer, HIGH);
  } else {
    digitalWrite(LED, LOW);
    digitalWrite(buzzer, LOW);
  }

  delay(500); // optional: slow down serial output
}
```

Result and observation:

Test Scenario	Observed Analog Value	Digital Value	LED	Buzzer
No alcohol near sensor	Low (e.g., 100–200)	HIGH (1)	OFF	OFF
Alcohol vapors introduced	High (e.g., 400–600)	LOW (0)	ON	ON

When the driver breathes out alcohol vapors and concentration exceeds preset level:

- LED lights up
- Buzzer sounds an alert
- Analog value on Serial Monitor increases
- Digital value changes from HIGH (1) to LOW (0)

When no alcohol is present:

- LED and buzzer remain OFF
- Digital value remains HIGH (1)

Conclusion:

The designed system successfully detects alcohol consumption by the driver in real time.
When alcohol concentration exceeds the set threshold:

- It activates a visual alert (LED)
- And an audio alert (buzzer)