

A 8023

Engineering Design Thinking

# Engineering Design Thinking

Team No. - 04

## Alcohol detection with auto engine cutoff

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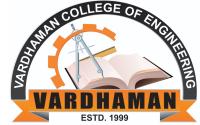
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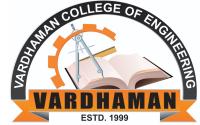
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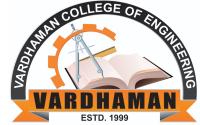
## Outline:

- Objectives
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- Introduction (Bullets with Images/Background knowledge)
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- Construction and working of Product
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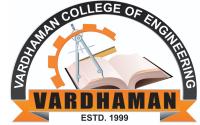
## Objectives:

- To use MQ3 sensor to detect if the driver of a vehicle has consumed alcohol and to turn off the engine if he/she has consumed alcohol.
- To reduce road accidents caused by drunken drivers.



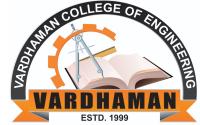
## Motivation:

- Implementing alcohol detection technology in car locking systems aims to reduce the incidence of drunk driving, which remains a significant cause of accidents, injuries, and fatalities on roads worldwide. The motivation behind integrating alcohol detection into car locking systems is multifaceted and includes the following reasons:
  1. Safety Enhancement
  2. Legal Compliance
  3. Public Health Concerns
  4. Insurance and Liability
  5. Ethical Responsibility



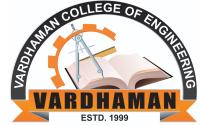
## Introduction:

- Driving is a complex process that involves several perceptual and motor tasks
- All over the world, India bags the top most position in accidental deaths.  
    Nearly 1.2 lakh of people killed every year on Indian roads
- The common causes for vehicle accidents are :
  - 1)Driver distraction or negligence
  - 2)Urban location-heavily populated areas or small areas with insufficient transport facilities.
  - 3)Vehicle handling problem .
  - 4)Weight distribution .
  - 5)Drunk and Driving



## Need Statement and Community Partner details:

- Alcohol detection system with auto engine cut-off: Enhances road safety by detecting alcohol levels in the driver's breath or blood and disabling the engine if the threshold is exceeded. Aims to reduce alcohol-related accidents, promote responsible driving, and create a safer transportation environment for all.



## Components Used :

### 1. Arduino Uno:

Arduino Uno is a user-friendly microcontroller board with digital and analog pins, suitable for prototyping.

### 2. MQ-3 Sensor:

The MQ-3 is a gas sensor that detects alcohol vapor and other gases by operating on the principle of resistance changes.

### 3. Relay Module:

A relay module is an electronic switch controlled by low-voltage microcontrollers.

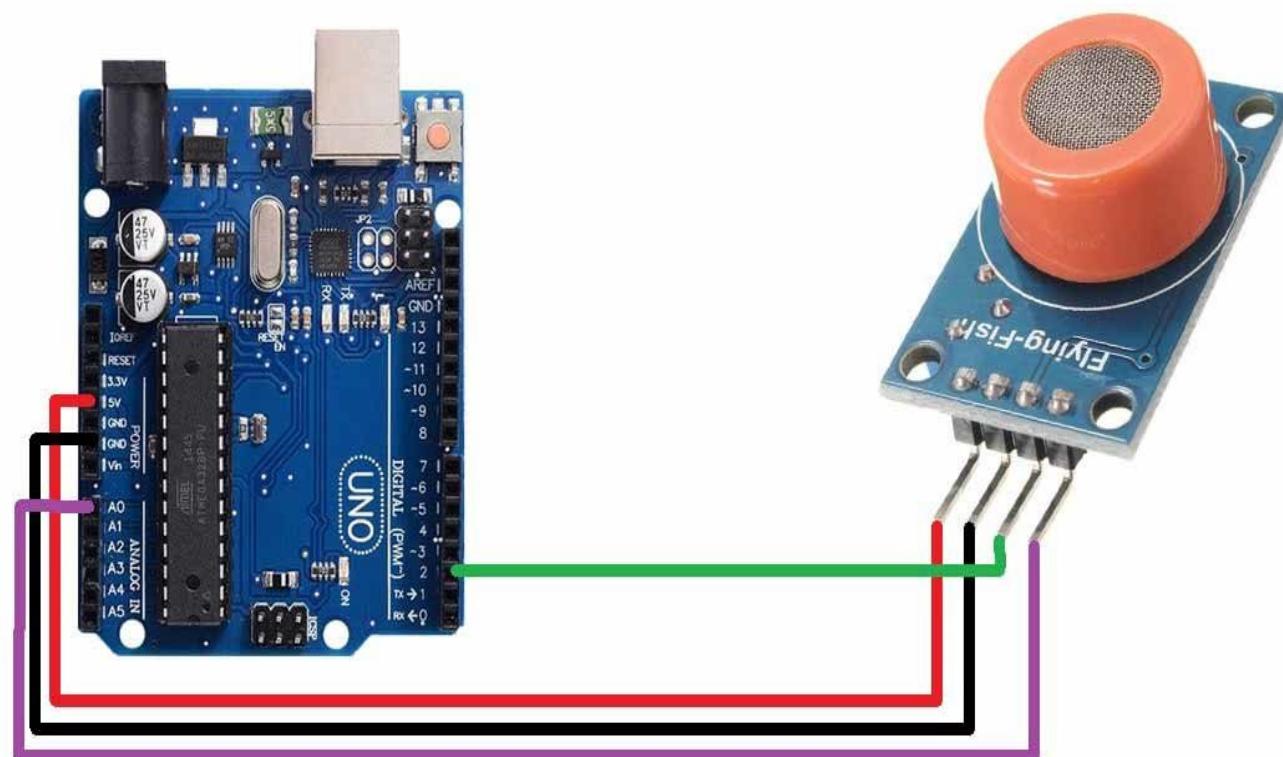
### 4. DC Motor:

A DC motor converts electrical energy into mechanical motion using the Lorentz force principle.

### 5. Battery:

A battery stores and releases electrical energy in a chemical form.

## Conceptualization (Concept Design of Product with pin to pin connections):





## Construction of Product :

- **Circuit Design:**

Design the circuit layout. Connect the required components using appropriate wiring and make sure to meet voltage and current requirements.

- **Assemble the circuit:**

Physically assemble the circuit on a prototyping board following the circuit design.

- **Write Arduino code:**

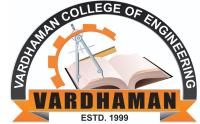
Write the Arduino code to manage the alcohol levels' inputs and the corresponding actions of the relay module.

- **Upload the code to Arduino:**

Connect the Arduino to the computer and upload the code to the microcontroller using Arduino IDE.

- **Debug and optimize:**

Test the prototype and fix if there are any bugs and you can optimize your code to get the best output.



## Working of Product :

The detailed description on how this prototype works is given below

### 1. Alcohol Sensor:

1. The system is equipped with an alcohol sensor, often using a technology like the MQ series, capable of detecting alcohol vapors.
2. The sensor continuously monitors the air within the vehicle for the presence of alcohol.

### 2. Microcontroller:

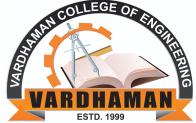
1. A microcontroller, such as an Arduino or similar device, processes the data from the alcohol sensor.
2. The microcontroller runs a program that includes algorithms to interpret the sensor readings and make decisions based on predefined criteria.

### 3. Threshold Setting:

1. The system has a predetermined threshold for alcohol concentration. If the detected alcohol level surpasses this threshold, the system initiates a response.

### 4. Engine Cutoff Mechanism:

1. An engine cutoff mechanism, often controlled by a relay, is connected to the microcontroller.



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- When the alcohol concentration exceeds the set threshold, the microcontroller triggers the relay to cut off power to the vehicle's ignition system or fuel pump, preventing the engine from starting or causing it to shut down.

### 1. User Interface:

- A user interface, such as a keypad or other input method, is integrated into the system.
- Before starting the vehicle, the driver must interact with the user interface to provide necessary information, such as a Personal Identification Number (PIN) or other authentication methods.

### 2. PIN Verification:

- The microcontroller verifies the entered PIN through the user interface.
- If the correct PIN is entered and the alcohol concentration is below the threshold, the system allows the vehicle to start.

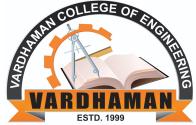
### Operational Steps:

#### 1. Ignition Attempt:

- The driver attempts to start the vehicle by turning the ignition key or pressing a start button.

#### 2. Sensor Monitoring:

- The alcohol sensor continuously monitors the air within the vehicle for alcohol vapors.



### 1. PIN Entry:

1. The driver interacts with the user interface to enter a PIN or provide authentication details.

### 2. Microcontroller Decision:

1. The microcontroller receives input from the alcohol sensor and verifies the entered PIN.
2. If the alcohol concentration is below the threshold and the PIN is correct, the microcontroller allows the engine to start.

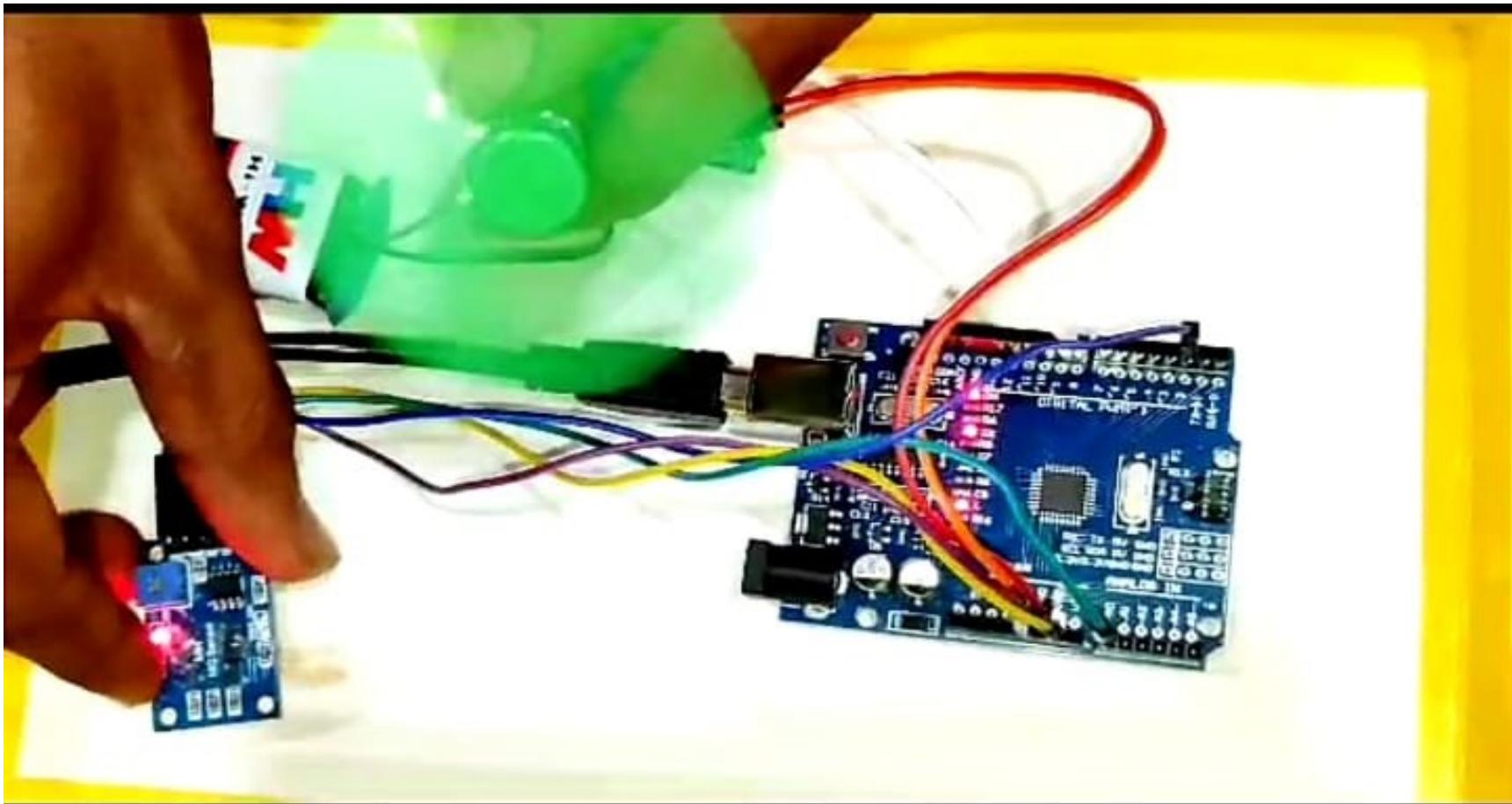
### 3. Engine Operation:

1. If conditions are met, the engine operates normally, and the vehicle can be driven.

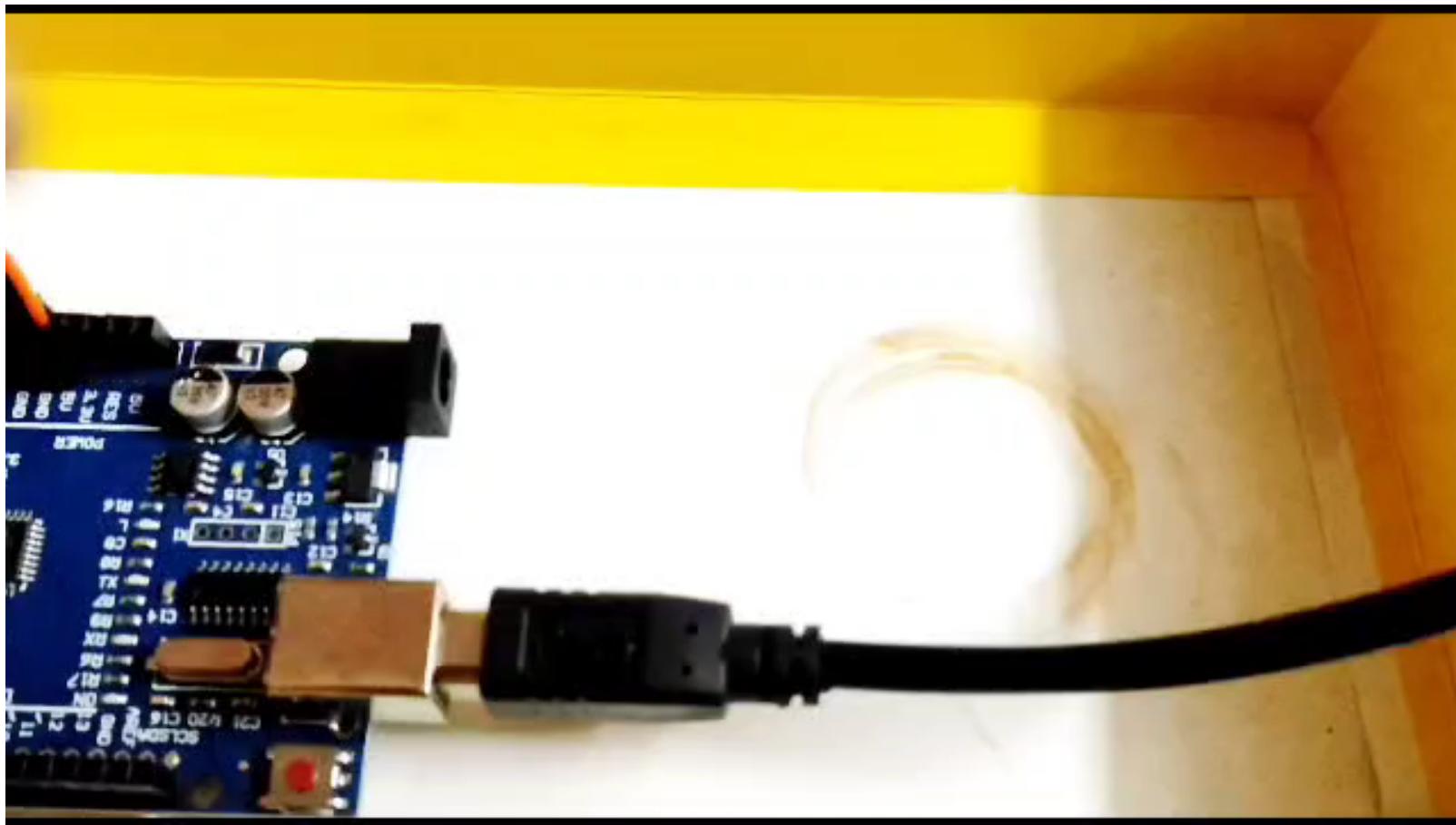
### 4. Alcohol Detection During Operation:

1. While the vehicle is in operation, the alcohol sensor continues to monitor the air.
2. If alcohol concentration rises above the threshold during operation, the microcontroller triggers the engine cutoff mechanism, bringing the vehicle to a stop.

## Picture of the Product:

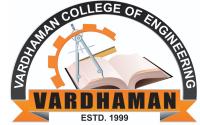


## Working model:



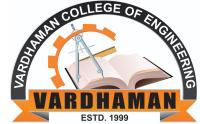
# Prototype testing(4 square model ):

<b>What worked?</b> The motor is stopped when high level of alcohol is detected.	<b>What could be improved?</b> The prototype can be improved to detect the alcohol level faster.
<b>New ideas</b> A GPS module can be integrated to send the location of the vehicle if the driver tries driving it despite the warnings.	<b>Questions</b> What are the components used in this prototype? How can this be integrated in a vehicle?



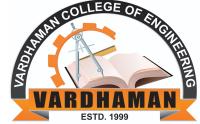
## Conclusion :

In conclusion, implementing “alcohol detection with auto engine cutoff” using Arduino can help us in visualizing our idea in a minimalistic and a feasible way. It helps us in understanding if it actually be embedded into a system or not.

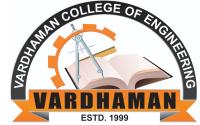


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- [3] "Arduino - ArduinoBoardUno". Available: [Getting Started with Arduino UNO | Arduino](#)
- [4] [MQ-3.doc \(sparkfun.com\)](#)



Any  
Questions/Discussions ???



Thank You  
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