



3 in 1 Safety Device-Gas, Alcohol & Smoke Detector

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Abstract:

The "3-in-1 Safety Device" is an innovative, integrated safety solution designed to detect gas leaks, alcohol, and smoke, enhancing personal and public safety. This device combines three essential hazard detection systems into a single compact unit, offering a cost-effective and space-saving product.

The gas detection system monitors the presence of harmful gases such as carbon monoxide (CO), methane (CH₄), and liquefied petroleum gas (LPG), providing early warnings to prevent poisoning, explosions. The alcohol detection component is to identify alcohol concentrations in the body, help to determine driving or workplace safety violations. The smoke detection system detects the presence of smoke particles.

This device features real-time monitoring. The integration of multiple detection capabilities within a single unit reduces maintenance costs and enhances user convenience, making it ideal for both residential and commercial applications. With growing concerns over safety in homes, workplaces, and public spaces, the 3-in-1 Safety Device represents a critical advancement in multi-hazard detection, offering comprehensive protection against three common, yet potentially deadly, environmental threats.

Index Terms: MQ2 sensor, Buzzer, Charging module

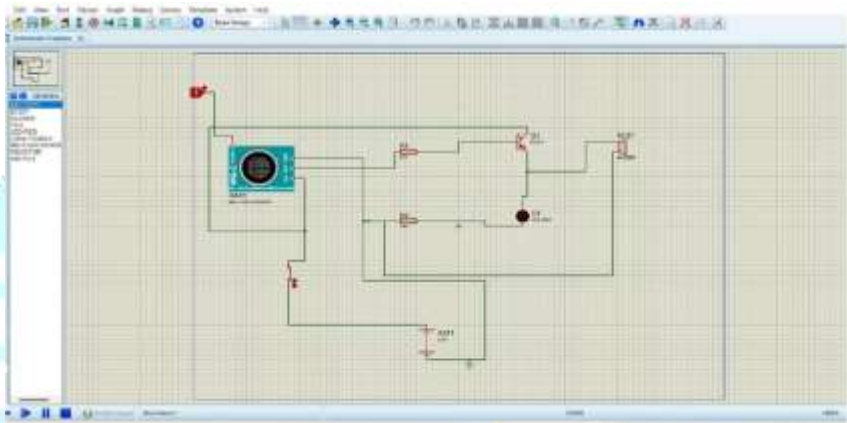
I. Introduction:

As there is more and more industrial growth, this also results in safety problems in various types of industries. This project is related and a solution to this problem introducing a "3 in 1 safety device—gas, alcohol, and smoke detector. Safety issue in industries and residential areas that could lead to a huge amount of financial and health loss. particularly in areas where flammable materials, gases, and alcohol, timely detection of such substances can prevent dangerous events such as fires, explosions potentially saving lives and property.

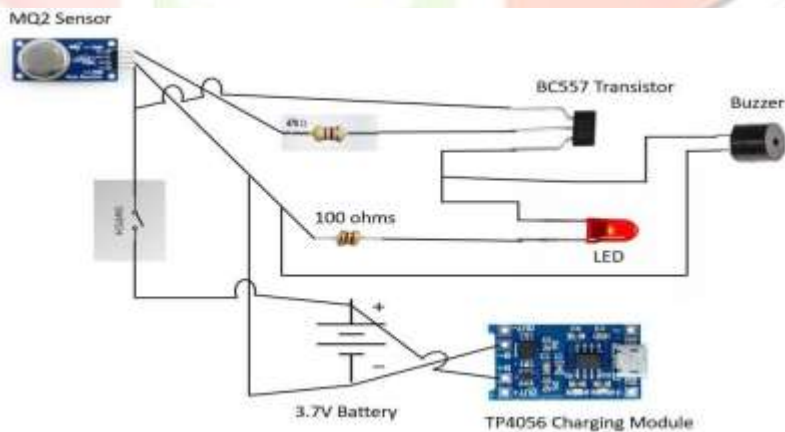
The need for an integrated solution that can detect multiple types of hazards in a single device is clear, especially for settings where different risks coexist. The 3-in-1 Fire, Gas, and Alcohol Detector project aims to address this requirement by combining three essential detection capabilities into one electronic system, combining these functionalities enables faster hazard response times, as users only need to monitor and maintain a single device rather than three separate units. This project aims to revolutionize safety standards by providing a reliable, efficient, and innovative solution for detecting smoke, gas, and alcohol. Its impact will be significant, saving lives, reducing risks, and promoting a safer environment for all.

II. Construction and Working:

Simulation on Proteus Simulation Software



Circuit Diagram



A **3-in-1 detection sensor** combines multiple functions into a single device, often used in security systems, environmental monitoring, or home automation. It detects and respond to various types of events or conditions by integrating multiple sensors into one compact unit. This detector helps user to find the gas leakages, smoke and also help the police authorities to find the alcohol level in the person's body.

3 in 1 Detector has Mainly two working

Industrial

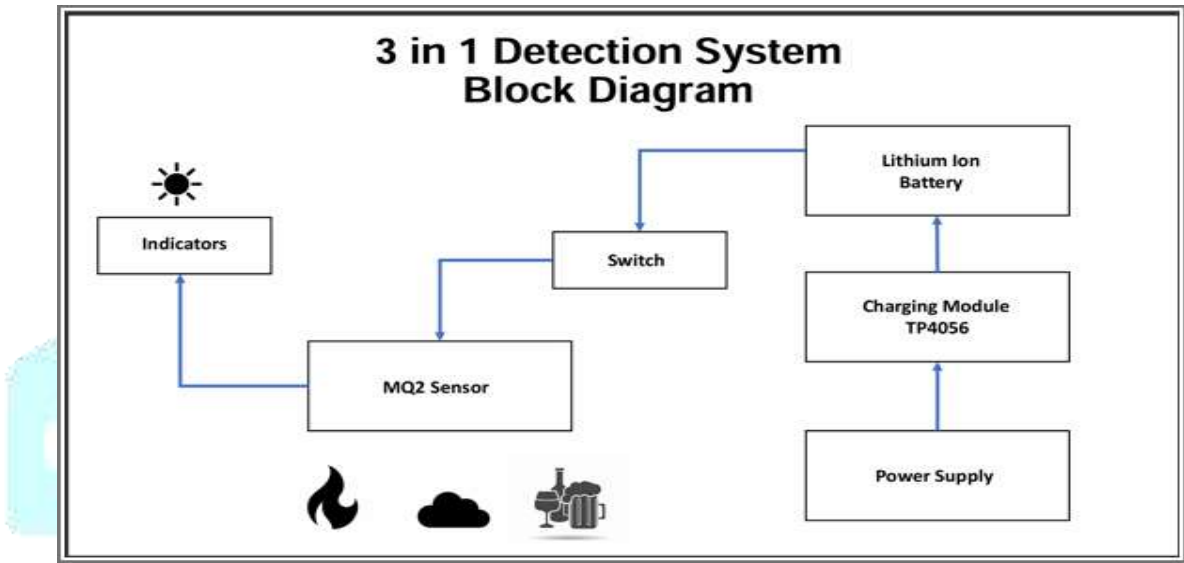
Residential

The 3-in-1 detection sensor integrates all these functions into a single device, providing controlled monitoring for various hazards.

The main Sensor used in this device is MQ2 Sensor which is used for detecting the harmful gasses such as smoke, alcohol, methane.

When sensor senses the required input, it generates the output in analog form after detection of this LED and Buzzer starts indicating that favorable input is detected

III. Block Diagram:



Details of Block Diagram 3 in-1 Detection System Block Diagram consists of three main Parts

Power Supply: In the Power Supply Comes 2 main Components are 3,7 V lithium Ion Battery and Charging Module TP4056

Detection/Sensors: In Detection Part, the main component is MQ2 Sensor, Used for sensation of Smoke, Gas and Alcohol

Indicators:3 in 1 Detection Product consists of 2 Indicators Light Emitting Diode (LED) & 3V Passive Buzzer that makes Sound After Detection

IV. Simulation Results:

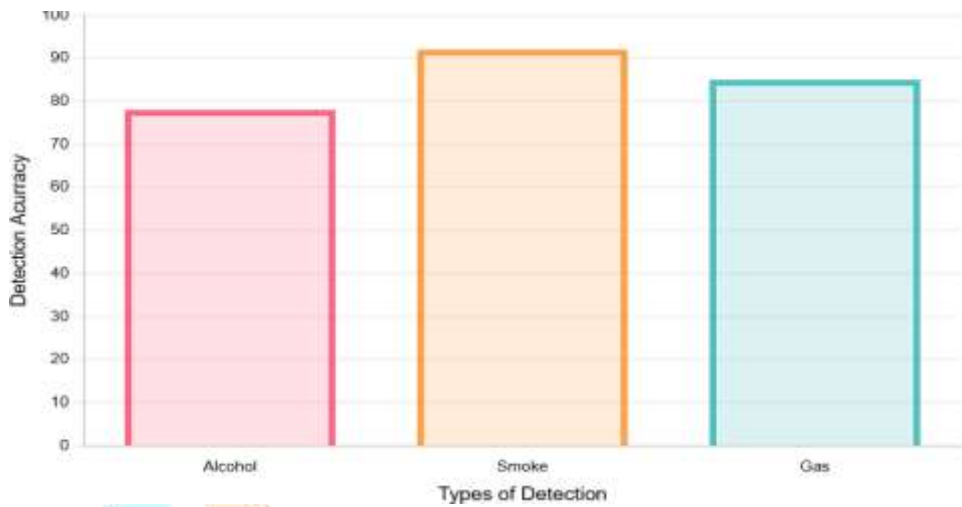
Detection Accuracy Breakdown

Description: A Bar Graph can show the accuracy percentages for each type of detection (gas, smoke, alcohol) based on the detector’s performance in various tests. This will allow readers to see, at a glance, which type of detection was most reliable.

Data:

- Gas Detection Accuracy: 85%
- Smoke Detection Accuracy: 92%
- Alcohol Detection Accuracy: 78%

This chart illustrates that while all three sensors perform adequately, the smoke detection sensor achieved the highest accuracy, identifying an area for potential improvement in the alcohol detection component.



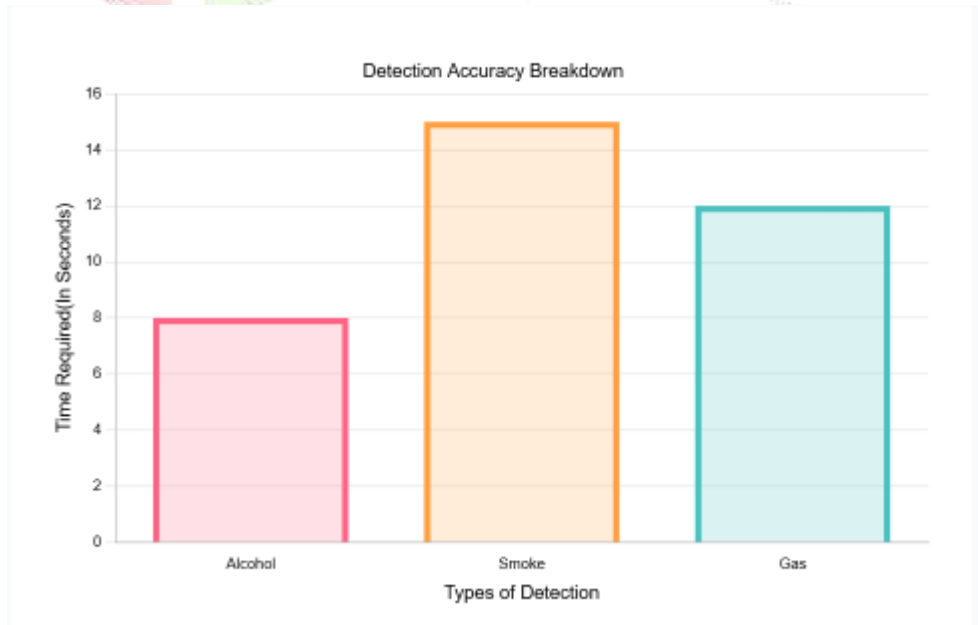
Response Time Comparison

Description: A bar chart can be used to compare the average response times for detecting gas, smoke, and alcohol. This is especially useful if different types of sensors respond at different rates, which could be critical for high-risk environments.

Example Data:

- Gas Response Time: 12 seconds
- Smoke Response Time: 15 seconds
- Alcohol Response Time: 8 seconds

This bar chart highlights that while smoke detection was the fastest, the alcohol sensor had a slower response time, which could impact emergency response strategies.



V. Conclusion:

A 3-in-1 detector that can simultaneously sense gas, smoke, and alcohol has great potential as a comprehensive safety device. Such a product would be valuable for residential, commercial, and industrial applications where multiple types of air pollutants and hazards material need to be monitored efficiently. Integrating these sensors into one unit .Provides a more cost-effective solution for end-users. Here are some potential benefits:

- **Versatile Safety Solution:** This 3-in-1 device detects smoke, alcohol and various types of harmful gases in environments, ensuring greater safety monitoring. Gas leaks, smoke from fire hazards, and alcohol detection in breath (for vehicle or workplace safety) can all be managed with one device, reducing the risk of undetected hazards.
- **Cost and Convenience:** Combining three sensors into a single device reduces the total cost of ownership compared to purchasing separate detectors for each hazard. It also simplifies installation and maintenance, which is advantageous for homes, businesses, and institutions looking to prioritize safety without incurring excessive expenses
- **Limitations and Challenges:** Potential challenges for this device include sensor accuracy for each type of detection, the risk of false detection. Ensuring that one sensor's detection does not interfere with the others, as well as optimizing battery life or power consumption, are also crucial for sustained device performance

VI. References:

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