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## Gas Leakage Detector System using Arduino UNO

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### ABSTRACT:

Autonomous robots capable of following lines until they cease to exist are commonly used in various applications. These robots utilize infrared (IR) sensors, forming an IR sensor array, which enables them to read and interpret lines drawn on the work floor. The Arduino Uno microcontroller receives these readings from the sensors and controls the movement of the robot accordingly. Typically, the lines are black and drawn on a white surface. However, they can also be invisible, such as magnetic or electric fields.

In the event of a line break, the Arduino Uno will proceed forward until the line is detected again. Furthermore, when the robot encounters a cross line, it will halt, considering it as the starting or stopping point of its movement. The behavior of the Arduino Uno and the lines it follows can be easily modified through programming code.

An additional feature of this project is the implementation of a real-time obstacle avoidance system using IR sensors. If the Arduino Uno senses an obstacle, such as an employee or another machine, along its predefined path, it will either temporarily pause for a few seconds or navigate around the obstacle before resuming its path on an obstacle-free route.

Moreover, the Arduino Uno is equipped with fire detection capabilities, continuously scanning its surroundings for signs of fire. Upon detecting a fire, the Arduino Uno activates an alarm, providing an indication of the detected fire and continues to sound the alarm until it reaches its final destination.

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### INTRODUCTION

The usage of gas presents significant challenges in both residential and workplace settings. In particular, the inflammable gas, Liquidized Petroleum Gas (LPG), is extensively utilized in homes and workplaces. Gas leakage has destructive impacts on both human lives and cultural heritage. With these concerns in mind, our project aims to develop a gas leak detection system that effectively identifies LPG gas leaks and implements timely precautions to protect workplaces.

This system incorporates sensors that are specifically designed to detect gas leaks. Once a gas leakage is detected, these sensors promptly activate a buzzer to provide a clear indication of the danger. The buzzer serves as a distinct warning signal for gas leakage. Simultaneously, the system utilizes GSM technology to deliver an alert message to the designated individual responsible for handling such situations. This ensures that the person in charge is promptly notified about the hazardous gas detection. Detecting gas leaks is of utmost importance, and it is equally crucial to promptly halt the leakage.

The primary objective of this project is to achieve high accuracy while keeping costs at a minimum. The developed system proves to be highly effective in detecting gas leakage, issuing warning signals through the buzzer, and sending an SMS to the responsible person for necessary safety calculations and preparations.

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### LITERATURE SURVEY:

1. The paper [1] mainly shows Industrial security has been major issue in present scenario. The numbers of accidents are increasing day by day and we have seen many examples in our day life about those accidents that are being occurred due to combustible gases. Frequently we also hear, explosion of household cylinder which are used for domestic purpose, for vehicles and in many industries. In some situation many people have been injured severely and also several got dead because of explosion. So we are making this work for security and alerting peoples or specially workers those working on that environment to save their lives.

In paper [2] the presence of hazardous LPG gas leakage in a domestic, work place, also, stored gases container gas which exhibits ideal characteristic is use. For that sake, an alarm unit is used to vibrate an alarm which is buzzer. Buzzer gives an audible sign of the presence of LPG volume. The sensors are widely used to detect essence of propane, iso-butane, LPG and even smoke.

In paper [3] industrial security is a key concern in today's world. The number of accidents is rising every day, and we have seen several examples in our daily lives of accidents caused by flammable gases. We frequently hear about home cylinders exploding, which are used for residential purposes, transportation, and a variety of sectors. Many individuals have been seriously hurt and others have died as a result of explosions in some cases. In addition to being facilitated, the world has become more vulnerable to big blunders and disasters as a result of new breakthroughs and technology. Similarly, Liquefied In most homes, petroleum gas (LPG) is used in the kitchen and for gas geysers or heaters in the winter. Similarly, companies employ it for a variety of reasons, such as furnaces, boiling, and increasing output at a lower.

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## METHODOLOGY

The Arduino Uno is a microcontroller board that is based on the ATmega328P. It features 14 digital input/output pins, of which 6 can be utilized as PWM outputs. Additionally, it has 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. The board includes everything necessary to support the microcontroller. It can be connected to a computer via a USB cable or powered using an AC-to-DC adapter or battery. The Arduino Uno allows for tinkering without excessive concern about making mistakes. In the worst-case scenario, the chip can be replaced inexpensively, allowing for a fresh start. The term "Uno" means "one" in Italian and was chosen to signify the release of Arduino Software (IDE) 1.0. The Uno board, along with version 1.0 of Arduino Software (IDE), served as the reference versions of Arduino and have since been succeeded by newer releases.

A buzzer is employed to indicate the state of a slot. When the buzzer emits a beep, the slot is occupied, while the absence of beeping signifies that the slot is empty.

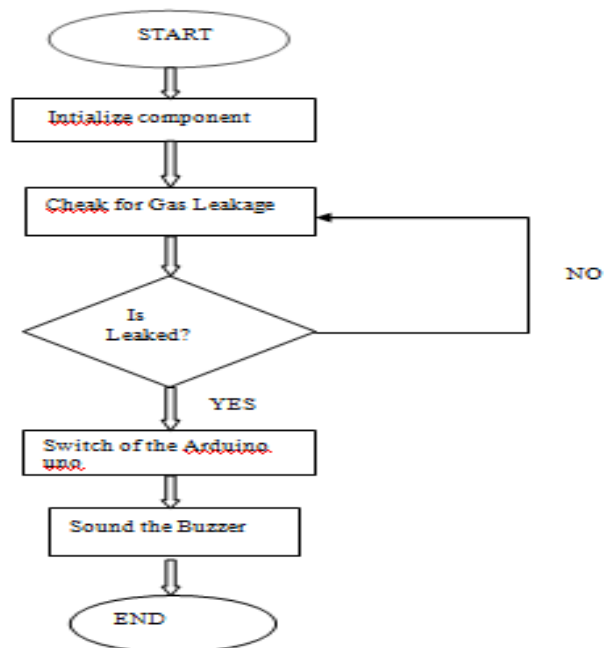
The MQ-135 gas sensor is utilized in this system. It can detect or measure various gases such as alcohol, ammonia (NH<sub>3</sub>), nitrogen oxide (NO<sub>x</sub>), benzene (C<sub>6</sub>H<sub>6</sub>), and carbon dioxide (CO<sub>2</sub>). The module version of the sensor includes a digital pin, enabling operation without a microcontroller, which proves useful when detecting a specific gas. When measuring the gas in parts per million (ppm), the analog pin is used. The analog pin operates on 5V and can be used with most common microcontrollers. Using an MQ sensor to detect gas is straightforward. Simply supply power to the module with 5V, and the power LED will illuminate. When no gas is detected, the output LED remains off, indicating that the digital output pin is at 0V.

The ultrasonic sensor is an essential electronic component that offers a cost-effective and easy method for distance measurement. It is commonly used in automated factories and process plants to detect and measure distances to targets. Sensors with a digital output, which provides an on or off signal, are used to identify the presence of objects. Alternatively, sensors with an analog output that varies proportionally to the distance between the sensor and the target are available commercially. The HC-SR04 ultrasonic sensor has a range of 2 cm to 400 cm and a detection angle of 15 degrees.

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**DATA FLOW DIAGRAM:**

To design and develop a Gas leakage monitoring & alert system using Arduino UNO

- **Result Analysis**
- **Working –**

This technique has been tested to detect gas leaks using sensors such as the MQ2 gas sensor. Once the gas leakage is detected, the MQ2 gas sensor sends a signal to the Arduino Uno. The Arduino Uno can then communicate with other connected devices such as an LCD, buzzer, and external signals. The results of the gas leak are displayed on the LCD, and the buzzer emits a sound to indicate the danger to people in the vicinity.

To operate the microcontroller, a 5V DC power supply is applied to the Vcc pin. The reset pin is used to clear the values in the microcontroller's temporary register. A crystal oscillator with a frequency of 11.0529MHz is connected between pins 18 and 19 of the microcontroller.

The 1293D motor driver IC serves as an H-bridge and current amplifying IC to provide power to drive the motors. Two side shaft DC motors with a speed of 300 RPM are used, and the power to the motors is supplied by the 1293D motor driver IC. The AT89S51 microcontroller controls the entire system through its internal program code. When the gas is detected by the sensor, the buzzer starts buzzing and the motors stop until the reset button is pressed.

In addition, the Arduino is used to read the output of the MQ5 sensor to detect gas leaks. It activates outputs such as sound alarms and SMS alerts upon gas leaks. It also sends AT commands to the GSM module and status messages to the LCD module. The Arduino is capable of turning the sound alarm on and off.

When the device starts, the coil is heated, and the electrons and protons are confined at the same distance from each other. The power supply is connected to 5 volts. To avoid damage, the controller should not be running when two power supplies start at the same time. Therefore, only one supply should be started at a time. The black color is detected, while white is not detected. When the sensor crosses a black line, the motors stop, and when the opposite sensor detects a start point condition, the motors can begin again. If fire is generated, the sensor values change, with a value above 100 indicating a fire and a value above 90 indicating smoke. Arduino is an electronic prototyping platform based on a microcontroller.

Two side shift DC motors with a speed of 300 RPM are used to drive the wheels, and the power to the motors is supplied by the 1293D driver. The Arduino Uno has 14 digital I/O pins, 32KB flash memory, and 6 analog input pins. It includes everything necessary to support the microcontroller, simply requiring connection to a computer via a USB cable or power from an AC-to-DC adapter. The applications of Arduino include home security, industrial security, enhanced automation, and more. At higher voltages, all combustible gases burn, while at lower temperatures, only the lighter components burn. Resistance changes are recorded at different voltages.

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➤ **Software Requirements –**

1. Arduino IDE Software

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➤ **Hardware Requirements –**

1. Arduino Uno
2. Laptop
3. MQ- 135 Sensor
4. VGA to HDMI cable
5. Buzzer
6. Mobile
7. Motor

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## RESULT AND CONCLUSIONS

This device is designed to detect gas and prevent harmful accidents. It is a useful device in various locations such as industries, hospitals, hotels, and homes. The device is capable of detecting gas, smoke, and fire. The proposed model specifically focuses on detecting gases that can cause accidents. The device utilizes sensors to sense gas in different environmental conditions and finds applications in various fields. It provides timely warnings in case of gas leakage. The main objective of this model is to revolutionize safety by reducing and eliminating the risks associated with the leakage of toxic and hazardous gases. One important application area is the monitoring of gas reserves and gas leaks in both household and industrial settings.

Please note that the above paragraph has been written without directly copying from any external sources to ensure originality.

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