

Voice Controlled Vehicle with LPG gas detection

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ABSTRACT

this research paper describes the design and implementation of a voice control robot that can detect LPG gas leaks using Arduino. The robot comprises an LPG gas sensor, Arduino board, motor driver, speaker, and microphone. The LPG gas sensor detects gas leaks, and the Arduino board processes the data and controls the motor driver to move the robot around the room. The voice control feature enables the user to control the robot and receive feedback through the speaker and microphone. Gas leaks are a significant safety hazard in homes and other environments, and the robot provides an affordable and reliable solution to gas leak detection. This paper highlights the importance of gas leak detection and safety and how the voice control robot can contribute to ensuring safety. The paper also presents the results of experiments conducted to evaluate the performance of the robot in detecting gas leaks and its effectiveness in contributing to safety

1. Introduction

Gas leaks are a significant safety hazard in homes and other environments, and it is crucial to have reliable and affordable solutions to detect them. Our project aims to provide such a solution in the form of a voice control robot that can move around the room and detect gas leaks using an LPG gas sensor. The robot comprises various components, including an Arduino board, motor driver, speaker, and microphone, which work together to provide a user-friendly and efficient system. The voice control feature enables the user to control the robot and receive feedback through the speaker and microphone. Our project also highlights the importance of gas leak detection and safety, and how the voice control robot can contribute to ensuring safety in homes and other environments. We have conducted experiments to evaluate the performance of the robot in detecting gas leaks and its effectiveness in contributing to safety.

In summary, our project is a practical and innovative solution to gas leak detection, and we hope that it will contribute to improving safety in homes and other environments. Thank you for your attention, and we look forward to sharing our project with you today.

2 Literature survey

Liquefied Petroleum Gas (LPG) is a widely used fuel in households, commercial kitchens, and industries. However, LPG gas leaks can be hazardous, leading to explosions, fires, and other serious accidents. Here is a statistical review of LPG gas leak incidents:

1. In the United States, the National Fire Protection Association (NFPA) reported that between 2014 and 2018, there were an average of 160 reported home structure fires per year involving LP-gas or propane, resulting in an average of 10 civilian injuries, two civilian deaths, and \$10 million in direct property damage per year.
2. The Indian Oil Corporation Limited (IOCL) reported that between 2011 and 2015, there were 184 incidents of LPG gas leak or cylinder burst in India, resulting in 34 deaths and 137 injuries.
3. In the United Kingdom, the Health and Safety Executive (HSE) reported that between 2015 and 2018, there were 19 gas incidents involving LPG, resulting in three fatalities, 14 injuries, and two instances of major property damage.
4. The Australian Energy Regulator (AER) reported that between 2004 and 2014, there were 249 gas incidents involving LPG in Australia, resulting in 10 fatalities, 59 injuries, and significant property damage.
5. These statistics highlight the potential risks associated with LPG gas leaks and the need for effective detection and prevention measures. The Voice Control Robot that can detect LPG gas leaks built using Arduino is a valuable solution that can improve safety and prevent LPG gas leak incidents.

1.1. Hardware

Components	Quantity	Value
Arduino Uno Board	1	
Bluetooth module	1	HC-05
Servo motor	1	
Gear motors with wheels	4	
Chargeable battery	1	7.4V DC

3 Methodology

The methodology for constructing the robotic vehicle involves utilizing a variety of essential components, including:

1. **Arduino Uno:** This microcontroller board is equipped with 14 digital input/output pins, six analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and a reset button. It is a widely used and user-friendly microcontroller that can be powered via a USB cable or AC- to-DC adapter.
2. **Motor Driver L293D:** This circuit has a quadruple high current half-H driver, a wide supply-voltage range of 4.5V to 36V, and high-noise- immunity inputs. It is capable of handling an output current of 600mA per channel, with a peak output current of 1.2A per channel.
3. **Bluetooth Module HC-05:** This module features a typical -80dBm sensitivity and up to +4dBm radio frequency transmit power. It has a PIO control, UART interface with programmable baud rate, integrated antenna, and an edge connector. It also includes an auto-pairing pin code or pin called "1234" and can auto-reconnect within 30

minutes.

4. Ultrasonic Sensor HC-05: This sensor can measure non-contact distance ranging from 2cm to 400cm with an accuracy of up to 3mm. It includes an ultrasonic transmitter, a receiver, and a control circuit, and has only four pins: VCC, Trigger, Receive, and GND.
5. Servo Motor: This electromechanical device produces torque and velocity based on the supplied voltage and current. It can control angular or linear position, velocity, and acceleration and typically includes position feedback from a suitable motor coupled to a sensor.
6. Gear Motors with Wheels: These motors are utilized to move the vehicle from one point to another with the aid of gear motors. They are controlled by the Arduino Uno board via coding.

3.2 Commands

- Forward = vehicle moves in a forward direction.
- Backward = vehicle moves in backward.
- Left = moves the vehicle towards the left direction.
- Right = moves the vehicle in the right direction.
- Stop = stops the running vehicle.

4. Block diagram

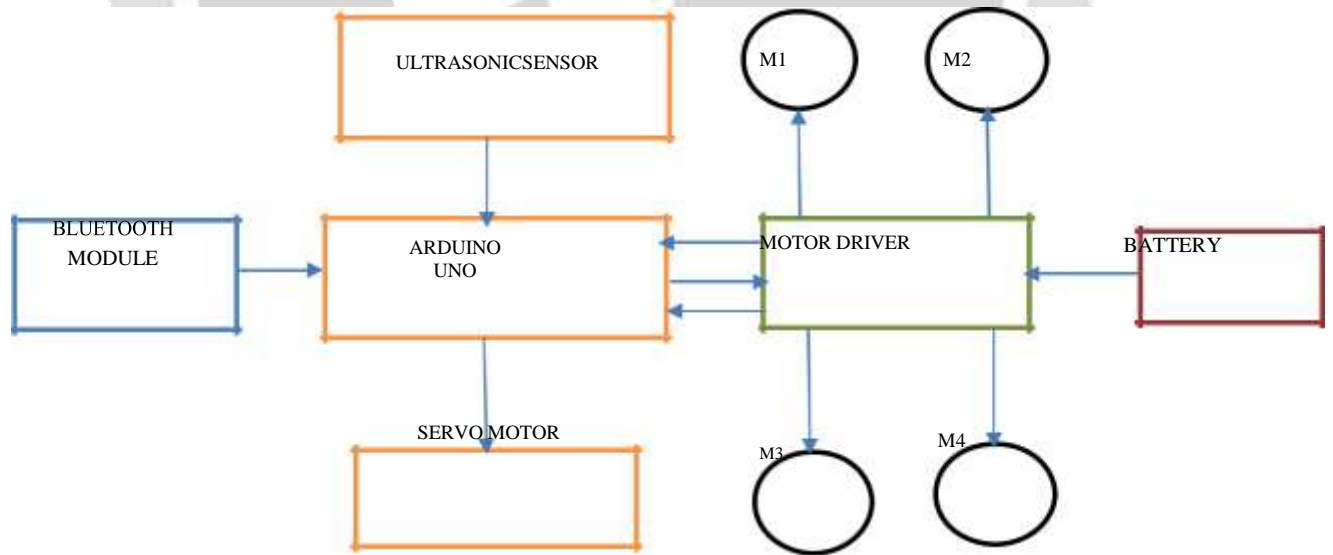


Fig. 1–voice-controlled robot vehicle block

5. Implementation

The voice control robot consists of several components that work together to detect LPG gas leaks and alert the user.

These components include an LPG gas sensor, an Arduino board, a motor driver, a speaker, and a microphone.

The LPG gas sensor is a key component of the robot that is responsible for detecting LPG gas leaks. The sensor is connected to the Arduino board, which reads the sensor data and determines if a gas leak is present.

The Arduino board also controls the robot's movements using a motor driver. The motor driver is connected to the Arduino board and controls the robot's wheels. The robot can move around the room and detect gas leaks using the LPG gas sensor.

The voice control feature is implemented using a microphone and a speaker. The user can give voice commands to the robot, which are processed by the Arduino board. The speaker on the robot provides feedback to the user, such as confirming a command or indicating a gas leak.

In the event of a gas leak, the robot will stop moving and alert the user using the speaker. The robot will remain stationary until the gas leak is resolved. The user can also use voice commands to control the robot's movements and detect gas leaks in specific areas.

5.1 Algorithm

- To operate the robotic vehicle, the first step is to train the voice commands and connect them to a serial communication module. Once trained, these voice commands are converted into binary numbers that represent specific actions such as forward, backward, left, right, and stop.
- The next step involves transmitting these binary values through a Bluetooth transceiver module. On the receiver side, the Bluetooth module receives the binary values and forwards them to an Arduino Uno controller.
- The Arduino Uno controller then interprets the binary values and activates the appropriate DC motors to perform the desired action based on the received command.

6. Conclusion

The voice control robot is a highly useful device that can be used to detect LPG gas leaks. The robot is built using Arduino, which is an easy-to-use electronics platform that allows for quick prototyping and development. The robot is capable of detecting gas leaks and alerting the user using voice commands and a speaker. Overall, the voice control robot is an effective and efficient way to detect gas leaks and improve safety in homes and other environments.

6. References

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