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Research Article

SOFT GAS DETECTION ON THE ARDUINO PLATFORM

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ABSTRACT

This article soft gas detection on the Arduino platform is an affordable and accessible approach to monitoring the presence of specific gases in the environment. This article provides a comprehensive guide on implementing soft gas detection using Arduino, covering key aspects such as gas sensor selection, wiring, calibration, data interpretation, and control logic implementation. By leveraging the capabilities of Arduino boards and compatible gas sensors, users can create reliable gas detection systems for various applications. The article highlights the importance of proper sensor calibration, data interpretation, and safety precautions when working with potentially hazardous gases. Soft gas detection on the Arduino platform offers a cost-effective solution for gas monitoring, making it suitable for hobbyists, students, and professionals alike.

KEYWORDS

Soft gas detection, Arduino platform, Gas sensors, Gas monitoring, Gas detection system, Calibration, Data interpretation, Control logic, Affordable, Accessibility and Arduino boards.

INTRODUCTION

Soft gas detection using the Arduino platform offers an accessible and cost-effective solution for monitoring the presence of specific gases in the environment. With the help of gas sensors and the Arduino board, you can create a reliable gas detection system for various applications. In this article, we will explore the steps involved in implementing soft gas detection on the Arduino platform [1].

When selecting a gas sensor for your application, there are several factors to consider. Here are some key points to keep in mind:

▢ Target Gas: Identify the specific gas or gases you need to detect. Different gas sensors are designed to detect different types of gases, so choose a sensor that is suitable for your target gas.

▢ Sensitivity and Selectivity: Consider the sensitivity and selectivity of the gas sensor. Sensitivity refers to the ability of the sensor to detect low concentrations of the target gas, while selectivity refers to its ability to distinguish the target gas from other gases in the environment. Ensure that the sensor has the required sensitivity and selectivity for your application.

▢ Detection Range: Determine the desired detection range for your application. Some gas sensors have a wide detection range, while others are more suitable for specific concentration ranges. Choose a sensor that covers the range you need.

▢ Environmental Conditions: Consider the environmental conditions in which the gas sensor will operate. Factors such as temperature, humidity, and pressure can affect the sensor's performance. Ensure that the sensor is designed to operate effectively in the intended environment.

▢ Power Requirements: Check the power requirements of the gas sensor. Some sensors may require a specific voltage or current, so make sure that your power supply can meet those requirements.

▢ Calibration: Determine whether the gas sensor requires regular calibration. Some sensors need periodic calibration to maintain accuracy. Consider the calibration process and frequency when selecting a sensor.

▢ Interface Compatibility: Check the compatibility of the gas sensor with the Arduino platform. Ensure that the sensor provides an output signal (analog or digital) that can be easily interfaced with the Arduino board.

▢ Cost: Consider the cost of the gas sensor. Prices can vary depending on the type and capabilities of the sensor. Determine your budget and choose a sensor that meets your requirements without exceeding your financial limitations.

▢ Support and Documentation: Look for gas sensors that come with comprehensive documentation, including datasheets, application notes, and technical support. This will help you understand the sensor's specifications and assist in the integration process [2].

By carefully considering these factors, you can select a gas sensor that is suitable for your application and ensures accurate and reliable gas detection on the Arduino platform [3].

Methods.

Methods for selecting the gas sensor:

▢ Research: Conduct thorough research on different gas sensors available in the market. Look for reputable manufacturers and suppliers that offer a wide range of gas sensors suitable for your application. Read product specifications, datasheets, and customer reviews to gather information about the sensors' performance and reliability.

▢ Identify Gas Requirements: Clearly define the specific gas or gases you need to detect. Determine the gas concentration range and any specific environmental conditions under which the sensor will operate. This will help narrow down the selection to sensors that are designed to detect the target gas and operate effectively in the desired conditions [4].

⬜ Consult Experts: Seek advice from experts in the field of gas detection or consult with professionals who have experience in using gas sensors. They can provide valuable insights and recommendations based on their expertise and knowledge of different sensor technologies.

Consider the desired sensitivity and selectivity of the gas sensor. The sensitivity determines the minimum gas concentration the sensor can detect, while selectivity refers to its ability to distinguish the target gas from other gases. Choose a sensor that offers the required sensitivity and selectivity for your application [5].

Determine if the gas sensor requires regular calibration. Some sensors may need periodic calibration to maintain accuracy. Evaluate the calibration process and the associated costs and consider if it aligns with your requirements and budget.

Verify that the gas sensor is compatible with the Arduino platform. Check if the sensor provides an output signal (analog or digital) that can be easily interfaced with the Arduino board. Look for Arduino libraries or example codes available for the sensor to ensure smooth integration [6].

Consider the cost of the gas sensor, including the initial purchase cost and any additional expenses like calibration, maintenance, and replacement. Compare the prices of different sensors while considering their features, performance, and long-term costs to make an informed decision based on your budget.

Take into account any specific requirements of your application, such as size, power consumption, response time, and operating temperature range. Ensure that the selected gas sensor meets these requirements [7].

By following these methods, you can systematically evaluate and select the most suitable gas sensor for your soft gas detection application on the Arduino platform.
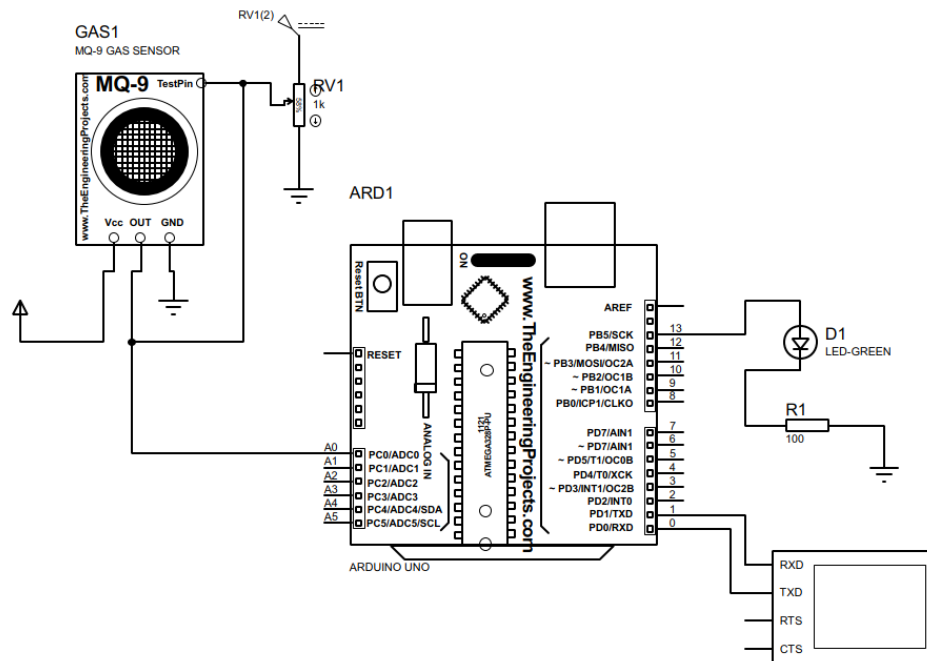
Figure-1. Electrical schematic of mq-9 gas sensor element in proteus software.

Here:

The MQ-9 gas sensing element is programmed through Arduino, and then the electrical circuit is created in Proteus software. We can see this scheme above. For this we need the following items:

- Arduino Uno.
- MQ-9 Gas sensitive element.
- Jumper wires.
- Green led
- Resistance
- Power.
- GND.
- Potentiometer.
- Virtual Terminal [8].

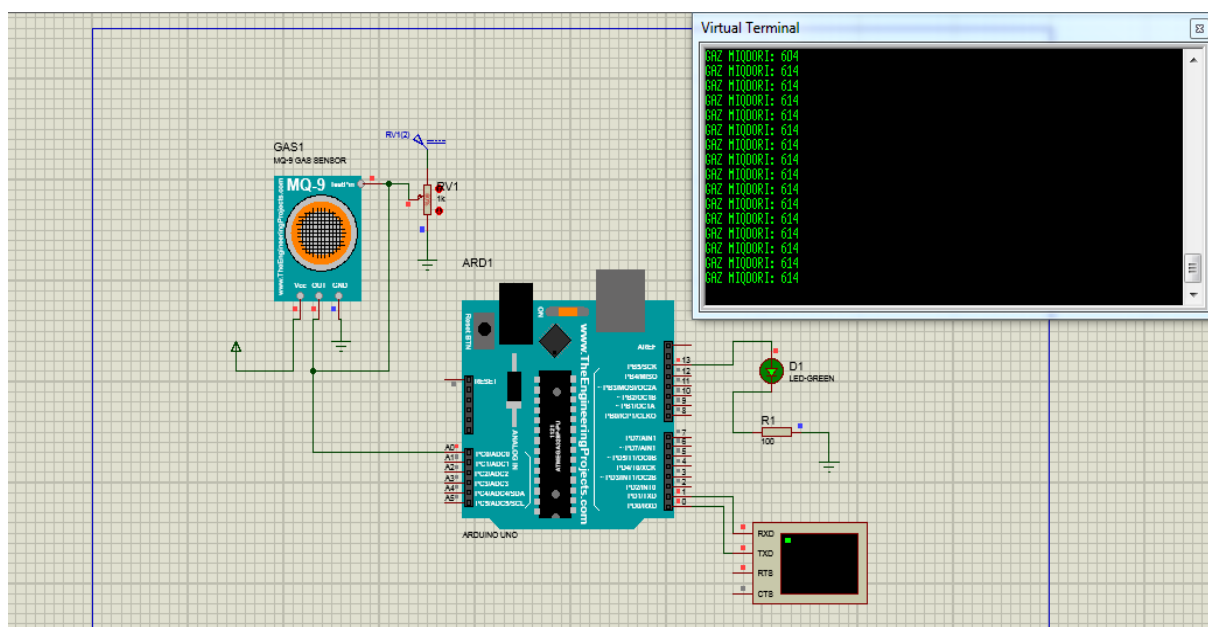The workflow through proteus will look like this.

Figure-1. MQ-9 gas sensing element operation process in Proteus software.

In this process, based on the function we wrote, we control the MQ-gas sensitive element through a potentiometer. We can see that when the gas content exceeds 600, the green led lights up automatically when we control it through the potentiometer. In this case, we have considered control through one green led, and instead of this green led, you can connect a motor or other type of element through a relay [9].

Conclusion:

In conclusion, I can say that it is possible to determine the amount of gas in the room and prevent it from harming people through the MQ-9 gas sensing element. In this article, I reviewed the principles of operation of the MQ-9 gas sensing element and achieved good results.

Soft gas detection on the Arduino platform provides a flexible and accessible approach to monitor the presence of gases in the environment. By selecting an appropriate gas sensor, wiring it to the Arduino board, and leveraging the power of Arduino programming, you can create a reliable gas detection system for various applications. Remember to follow the guidelines provided by the sensor manufacturer and prioritize safety when working with potentially hazardous gases.

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