Air Quality Monitoring System

Abstract

Air quality monitoring is crucial for assessing environmental conditions and ensuring public health. In this project, we develop an air quality monitoring system using an Arduino Uno, MQ135 gas sensor, BMP280 pressure sensor, and an LCD display. The system measures various air quality parameters such as carbon dioxide (CO_2), temperature, humidity, and atmospheric pressure. Data collected from the sensors are displayed in real-time on the LCD screen, allowing users to monitor air quality levels. The system provides a cost-effective and accessible solution for individuals and communities to track air pollution levels and take appropriate actions to mitigate health risks.
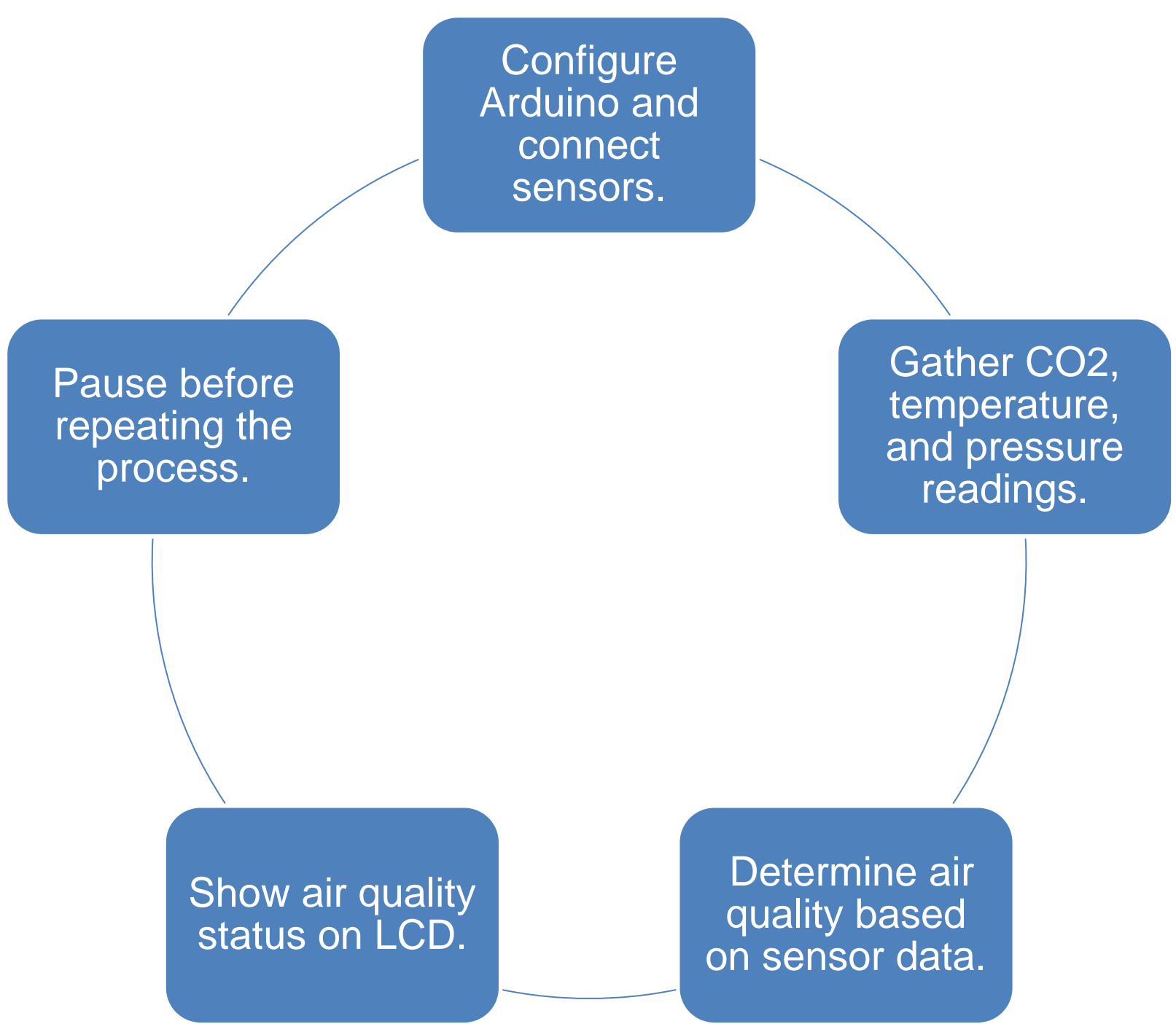
Introduction

Air pollution is a significant environmental concern worldwide, with adverse effects on human health, ecosystems, and climate. Monitoring air quality is essential for understanding pollution levels and implementing measures to reduce emissions and protect public health. Traditional air quality monitoring systems are often expensive and require specialized equipment, limiting their accessibility to the general population. In this project, we propose an affordable and user-friendly air quality monitoring system using readily available components and Arduino-based microcontrollers. The system integrates MQ135 and BMP280 sensors to measure key air quality parameters and provides real-time data visualization through an LCD display. By empowering individuals and communities with the ability to monitor air quality, our system aims to raise awareness about environmental pollution and promote sustainable practices for cleaner air.

SDGs Mapped

- SDG 3: Good Health and Well-being: Monitoring air quality helps prevent respiratory diseases and other health issues associated with air pollution, contributing to improved public health and well-being.
- SDG 11: Sustainable Cities and Communities: Accessible air quality monitoring supports the development of sustainable urban environments by informing policymakers and citizens about pollution levels and promoting initiatives to reduce emissions.
- SDG 13: Climate Action: Tracking air pollution levels helps identify sources of greenhouse gas emissions, supporting efforts to mitigate climate change and achieve climate resilience.
- SDG 17: Partnerships for the Goals: Collaborative efforts between government agencies, communities, and stakeholders are essential for implementing effective air quality monitoring systems and addressing environmental challenges collectively.

Methodology

The methodology for the air quality monitoring system using Arduino Uno, MQ135, BMP280, and LCD entails several steps. Firstly, the sensors, including the MQ135 for CO_2 detection and BMP280 for temperature and pressure, are connected to the Arduino Uno board. Upon initialization, the sensors and the LCD display are configured. Subsequently, data acquisition involves reading CO_2, temperature, and pressure values from the sensors. The air quality is then calculated based on the CO_2 concentration, using predefined thresholds for classification. The determined air quality status is displayed on the LCD screen for user visibility. This process iterates continuously, ensuring real-time monitoring of air quality conditions.

Configure Arduino and connect sensors. → Gather CO2, temperature, and pressure readings. → Determine air quality based on sensor data. → Show air quality status on LCD. → Pause before repeating the process.

Results

The air quality monitoring system successfully measures and displays key parameters including VOCs, CO_2, temperature, humidity, and atmospheric pressure in real-time. Users can easily interpret the data shown on the LCD display and take appropriate actions based on air quality levels. The system provides a cost-effective solution for individuals and communities to monitor air pollution levels and make informed decisions to protect public health and the environment.

Conclusion

The development of an affordable and accessible air quality monitoring system offers significant benefits for environmental monitoring and public health. By empowering individuals and communities with the tools to monitor air quality, raise awareness about pollution levels, and implement measures to reduce emissions, our system contributes to promoting cleaner and healthier environments.

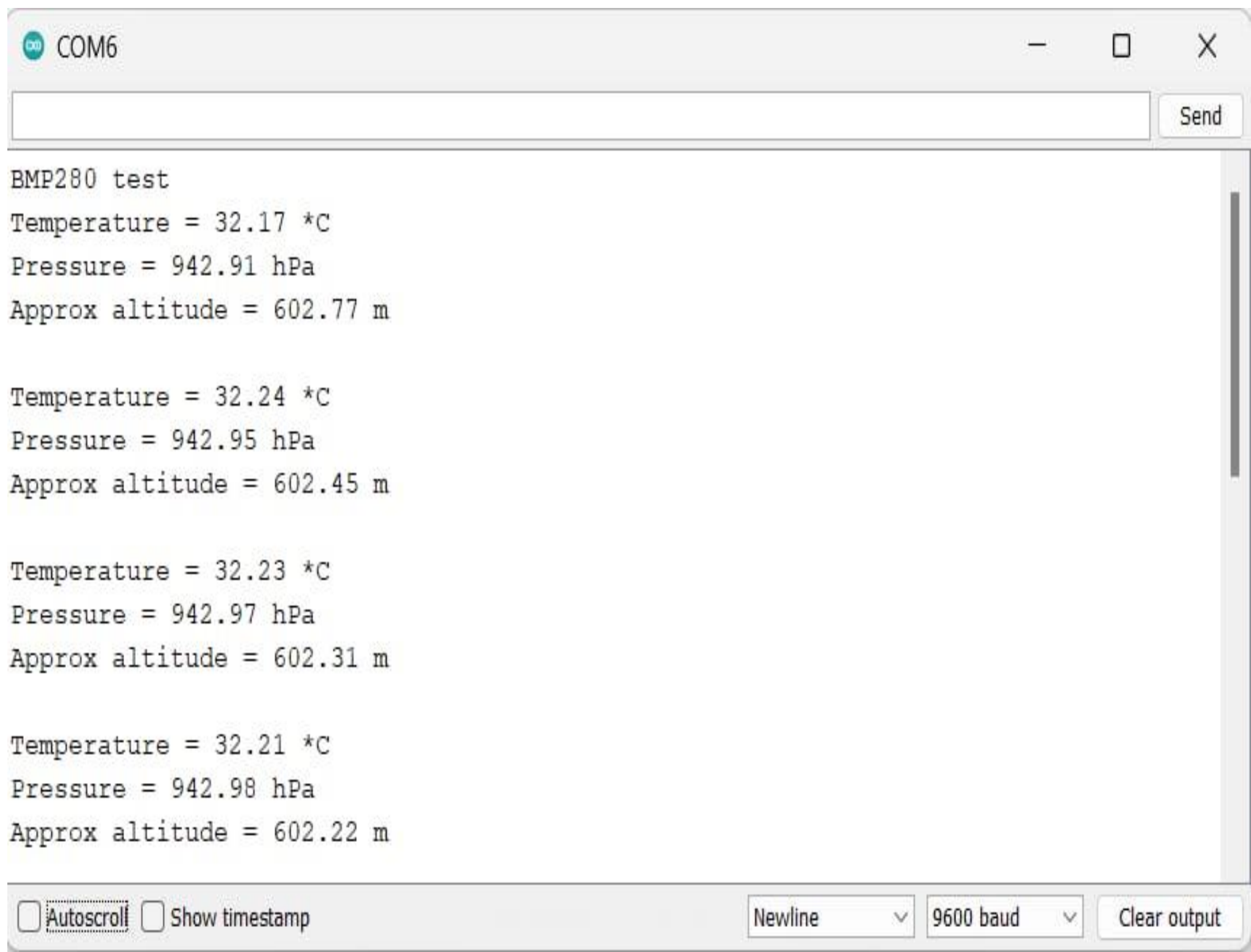**Figure 1.** Results displayed on LCD module

Figure 4. Serial monitor output for BMP280

Future Work

Future work on the air quality monitoring system could include:

- Calibration and validation of sensor data to improve accuracy and reliability.
- Integration of wireless communication modules for remote data monitoring and analysis.
- Development of mobile applications for data visualization and user interaction.
- Installing these devices in government hospitals, schools, work places so that work environment can be monitored