Group III

REPORT

Indoor Environment Monitoring System using STM32F103

# **Introduction:** The quality of the indoor environment is crucial for human health and well-being. Factors such as light intensity, temperature, humidity, and CO gas concentration can significantly impact occupants’ comfort and safety. The report addresses the challenge of creating a comprehensive monitoring system that not only displays but also alarms users when certain thresholds are exceeded**.**

# **System design:** The core of the system is an STM32 microcontroller, which manages various sensors for data collection and controls the display and alarm mechanisms. The software is programmed in C language for efficiency and logical flow. The main program initializes the system and calls subroutines for data collection, display, and transmission to the OneNET platform.

The STM32 microcontroller, specifically the STM32F103 series, is the core component of the indoor environment monitoring system described in the document. The system comprises several key components that work in conjunction with the STM32 microcontroller to monitor and display various environmental parameters:

STM32F103 Microcontroller: This is the central processing unit (MCU) that controls the system's operations, processes data from sensors, and manages the display and communication with the cloud platform.

**Modules/Software:**

* **DHT11 Sensor:** Measures temperature and humidity.
* **Photoresistor Sensor Module:** Detects light intensity.
* **CO Gas Sensor MQ-7:** Senses CO gas concentration and is also suitable for smoke and hazardous gas detection.
* **Display:** 3.5-inch Resistive Screen TFT-LCD: Displays the current parameter values of the indoor environment.
* **Communication Module**: WIFI Module ATK-ESP8266: Enables the microcontroller to connect to the OneNET cloud platform for data transmission.
* **Alarm and Control**: Buzzer: Sounds an alarm when certain thresholds are exceeded.
* **Relay Module**: Can be used to control external devices based on the sensor data.
* **Power Supply**: Provides the necessary voltage to all components, including 3.3V and 5V supplies.
* **Programming and Debugging Tools:** Keil 5
* **Programming Software**: Used for developing and running the program on the STM32 microcontroller.

These components are essential for the system to function correctly, with the STM32 microcontroller acting as the central hub that integrates and manages all aspects of the monitoring system.

# **Results:** The system was tested in an indoor environment, and the results showed that it could accurately measure and display temperature, humidity, and light intensity. The CO gas concentration was tested using a lighter, which successfully triggered an increase in the measured concentration. The system's display and alarm functions were verified to be working correctly.

# **Conclusion:** The designed system has been proven to effectively monitor indoor environmental conditions and can contribute to intelligent living space management. The system's design process and methods are documented to aid students and enthusiasts in developing similar applications, enhancing practical skills, and fostering innovation.

# **Future scope:**

* Integration with Smart Home Systems
* Advanced Data Analytics
* Energy Efficiency