Development Of IoT Based Smoke & Gas Detection

Minor Project Report - II

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In

Information Technology

Submitted By

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UNDER THE SUPERVISION AND GUIDANCE OF

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January-June 2025

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I hereby declare that the work entitled **"Development Of IoT Based Smoke & Gas Detection"** is my work, conducted under the supervision of **Prof. Shubham Sharma, Assistant Professor,** during the session January-June 2025. The report submitted by me is a record of Bonafide work carried out by me.

I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge and belief.

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ABSTRACT

The development of an IoT-based Smoke and Gas Detection system using Blynk IoT involves integrating sensors like the MQ-135 (for smoke and gas detection) with a microcontroller, such as Arduino. The system connects to the Blynk app, which allows real-time monitoring and control via a mobile interface. When smoke or gas is detected, the sensors trigger the microcontroller to send an alert through the Blynk app, notifying the user immediately. Additionally, the system can send emergency alerts through email and SMS, ensuring that the user receives notifications even if they are away from the app. This IoT-based system enhances safety by providing real-time updates and remote monitoring, making it ideal for homes, industries, and other sensitive environments.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to everyone who contributed to the successful **Development of the IoT-based Smoke and Gas Detection** system using Blynk IoT with email and message and voice notifications. First, I extend my heartfelt thanks to my Vice Chancellor "**Dr. R.K Pandit"** and Dean Faculty Of Engineering, **"Dr. Manjaree Pandit"** and project guide **"Prof. Shubham Sharma"** for their valuable insights, continuous guidance, and encouragement throughout the project. Their expertise has been instrumental in shaping this project. I would sincerely like to thank my department, "**Department Of Information Technology**" for allowing me to explore this project. I humbly thank **"Dr. Sanjiv Sharma"**. I also appreciate the support of my peers and colleagues who provided constructive feedback and technical assistance when needed.

I would like to acknowledge the role of various IoT platforms like Blynk for enabling real-time monitoring, email and notification alerts, which made the system more efficient. Last but not least, I am grateful to my family and friends for their unwavering support and motivation throughout the course of this project.

This project would not have been possible without the combined effort and support from all involved. Thank you.

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CONTENT

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ACRONYMS

Iot	Internet Of Things
MQ-135	Metal Oxide Semiconductor Gas Sensor (used for detecting smoke and gases)
Blynk	A platform for building mobile applications for the Internet of Things
SMS	Short Message Service (used for text messaging alerts)
ESP8266	A low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability
DFP Module	Plays MP3 and WAV files from a microSD card (FAT16/FAT32).

NOMENCLATURE

Here's the list of terms and their definitions related to apps along with functionalities:

IoT - Internet of Things: A system of interrelated devices that can collect and exchange data over the internet.

Blynk: A mobile application platform that enables users to create IoT applications and control devices remotely.

MQ-2: A sensor used for detecting smoke, methane, LPG, and other gases in the environment.

Arduino: An open-source electronics platform used to control sensors and other components in IoT-based projects.

SMS - Short Message Service: A method for sending text alerts to mobile phones.

Wi-Fi: A wireless networking technology used to connect the system to the internet for remote monitoring and control.

Sensor: A device used to detect changes in environmental conditions (e.g., smoke or gas levels) and convert these changes into readable data.

Notification: A process where the system sends an alert via Blynk, email, or SMS to notify the user of smoke or gas detection.

Cloud: A remote server used for storing data and allowing users to access real-time information about the system from anywhere.

Alert System: The mechanism that triggers notifications (email, SMS, or Blynk app alert) when a predefined threshold (like smoke or gas level) is detected.

CHAPTER 1: INTRODUCTION

The development of an IoT-based Smoke and Gas Detection System aims to enhance safety by providing real-time monitoring and instant alerts for smoke and gas hazards. Traditional smoke and gas detection systems only provide local warnings, but with the integration of IoT technology, users can receive notifications remotely, ensuring quick responses even if they are not present at the location. This project utilizes **Blynk IoT**, a user-friendly platform for creating mobile applications that interface with IoT devices, to offer real-time data monitoring and alerts. By incorporating sensors such as the **MQ-2**, which detects smoke and various gases, the system is capable of detecting potential dangers early.

When smoke or gas is detected, the system sends notifications through the **Blynk app**, as well as **SMS** and **email alerts** via services like or **SMTP**, keeping users informed at all times. This development ensures that individuals can take preventive actions promptly, significantly reducing the risk of accidents in homes, industries, and other sensitive environments. The system is cost-effective, scalable, and highly reliable, making it ideal for diverse applications.

CHAPTER 2: LITERATURE SURVEY

The integration of IoT technology in smoke and gas detection has significantly enhanced safety and emergency response systems in both domestic and industrial environments. Several studies and projects have explored the application of IoT-based sensors for real-time monitoring and alert systems.

1. **IoT-based Smoke and Gas Detection Systems**
   Numerous IoT-based smoke and gas detection systems have been developed using microcontrollers such as **Arduino** and **ESP8266**, with sensors like the **MQ series** (MQ-2, MQ-7, etc.). These sensors are capable of detecting gases like methane, carbon monoxide, LPG, and smoke. In one such study by **B. Kumar et al. (2019)**, a wireless gas detection system was implemented using an Arduino and MQ-2 sensor, where data was sent to a cloud platform. Users could monitor gas levels through a mobile application. This approach provides an early warning system, which is crucial for preventing accidents due to gas leakage or fire.

2. **Blynk IoT for Remote Monitoring**
   The **Blynk IoT platform** is widely used for building mobile applications to monitor and control IoT devices remotely. According to **V. S. Yadav et al. (2020)**, Blynk allows seamless integration with microcontrollers like **ESP8266** and **Arduino**, providing an intuitive interface for users to access sensor data. Blynk's easy setup and real-time monitoring features make it ideal for integrating with smoke and gas detection systems, enabling users to receive immediate alerts and status updates.

3. **Integration with Email and SMS Notifications**
   Traditional smoke and gas detection systems typically only sound an alarm locally. However, modern IoT-based systems integrate **email** and **SMS notifications** to inform users about hazardous conditions even if they are far from the affected area. According to **S. R. Gupta et al. (2018)**, the use of **IFTTT** (If This Then That) and **SMTP** protocols has made it possible to send real-time notifications to mobile devices or email addresses when sensors detect dangerous gas levels. This ensures that users can take quick action even from remote locations.

4. **Cloud Integration for Data Logging and Analysis**
   Cloud platforms provide a scalable solution for storing data from sensors, enabling users to access historical data and analyze trends over time. Research by **S. A. Patil et al. (2021)** highlighted the benefits of cloud storage in IoT-based systems, where sensor data is uploaded to the cloud for later analysis. This is particularly useful in smoke and gas detection systems, where ongoing monitoring is crucial for predictive maintenance and safety.

5. **System Reliability and Efficiency**
   Reliability and efficiency are key factors in the success of IoT-based smoke and gas detection systems. A study by **A. R. Nayak et al. (2022)** demonstrated that using Wi-Fi-based microcontrollers like **ESP8266** provides a stable and efficient communication link for transmitting sensor data to the cloud and mobile devices. Additionally, the use of **low-power sensors** like the MQ series ensures that the system is energy-efficient and cost-effective, which is vital for long-term deployment.

Conclusion from the Literature Survey

The literature shows that IoT-based smoke and gas detection systems have seen significant advancements with the integration of sensors, microcontrollers, and mobile applications. The use of platforms like **Blynk IoT** has simplified remote monitoring and control, while email and SMS notifications enhance the responsiveness of the system. The combination of real-time monitoring, data logging, and remote alerts makes IoT-based detection systems more efficient, reliable, and safe compared to traditional methods. This literature survey confirms that IoT-based smoke and gas detection systems have great potential for deployment in both residential and industrial applications, significantly improving safety and emergency response.

CHAPTER 3: REQUIREMENTS

1. Hardware Requirements

- **Microcontroller**:
  - **ESP8266**: These Wi-Fi-enabled microcontrollers allow seamless connection to the internet and Blynk IoT for real-time data monitoring and control.
  - **Arduino Uno** (optional): If using an external Wi-Fi module like the ESP8266, Arduino can act as the microcontroller.
- **Gas Sensor**:
  - **MQ-135**: A versatile gas sensor capable of detecting a variety of gases, including ammonia, benzene, carbon dioxide, and smoke. It will serve as the main sensor for gas and smoke detection.
- 🔊 **TF MP3 Receiver**:
  - A compact audio module that plays MP3 files from a **TF (microSD) card** and may include **Bluetooth** for wireless audio streaming.
- **Other Components**:
  - **Power Supply**: A stable **12V power supply** (for Arduino) or **3.3V/5V** (for ESP8266/ESP32).
- **Cables and Connectors**:
  - **Jumper wires**, **Breadboard**, and **Resistors** for setting up the circuit.

2. Software Requirements

- **Programming Environment**:
  - **Arduino IDE**: The development environment used for writing and uploading code to the microcontroller. Libraries for Blynk and the MQ-135 sensor are required.
- **Libraries**:
  - **Blynk Library**: To connect the microcontroller to the Blynk app and enable communication with mobile devices.

- **ESP8266WiFi** (for ESP8266 or ESP32): For managing Wi-Fi connectivity.

3. Blynk IoT Setup

- **Blynk App**:
  - Install the **Blynk App** on your mobile device (Android or iOS).
  - Create a new project in the Blynk app and configure it for real-time monitoring of the gas sensor.
- **Blynk Widgets**:
  - Use widgets like **Value Display** (to show the gas levels in real-time) and **Notification** (to send alerts when the sensor exceeds a threshold).

4. Communication Protocols

- **Wi-Fi**:
  - Use the **ESP8266/ESP32 Wi-Fi module** to connect the system to the internet and enable communication with the Blynk app for real-time monitoring.
- **SMTP**:
  - Configure an **SMTP** server (such as Gmail) to send email notifications when the gas or smoke levels exceed a specified threshold.

5. Gas Sensor Calibration

- **MQ-135 Calibration**:
  - Calibrate the **MQ-135** sensor for accurate readings of gases like CO2, ammonia, and smoke. The sensor needs a warm-up time, typically 24-48 hours, for best accuracy.
  - Implement an initial calibration process in your code to adjust for environmental factors like temperature and humidity, which can influence the sensor's readings.

6. Alerts and Notifications

- **Blynk Notifications**:

- Set up the **Blynk Notification widget** to send push notifications directly to the user's phone when gas or smoke levels are dangerous.

- **Email Alerts**:
  - Use **SMTP** for sending email notifications to users, allowing them to receive alerts even if they are away from the Blynk app.

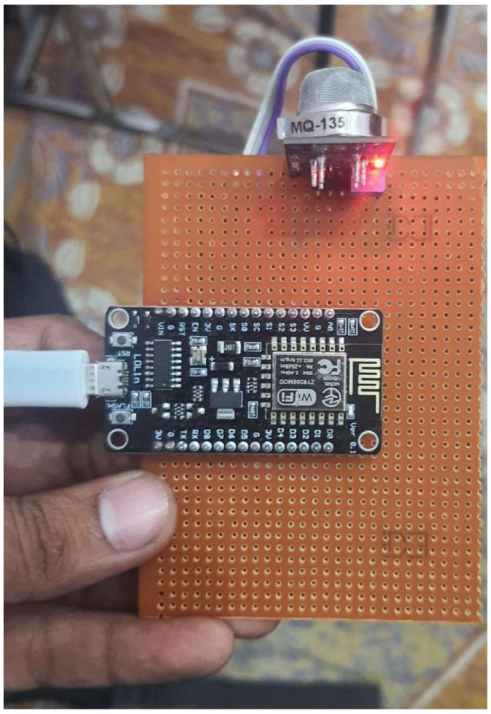
7. Power Management

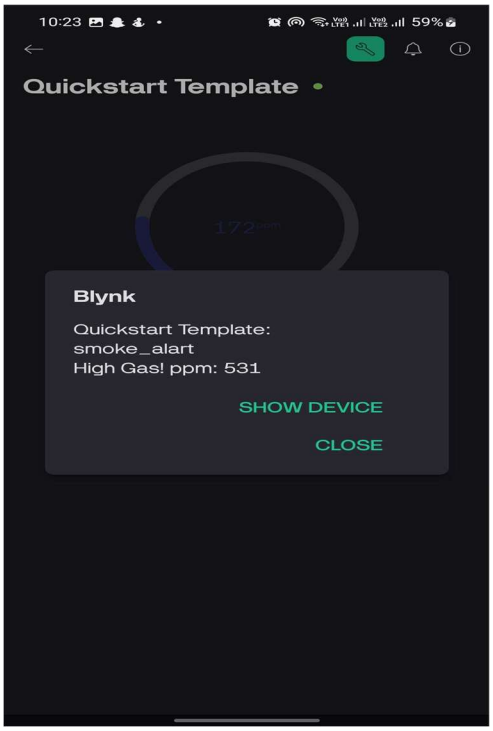
- **Power Source**:
  - Use a reliable **power adapter** long-term operation. The ESP8266/ESP32 can run on 3.3V, while Arduino requires 5V.

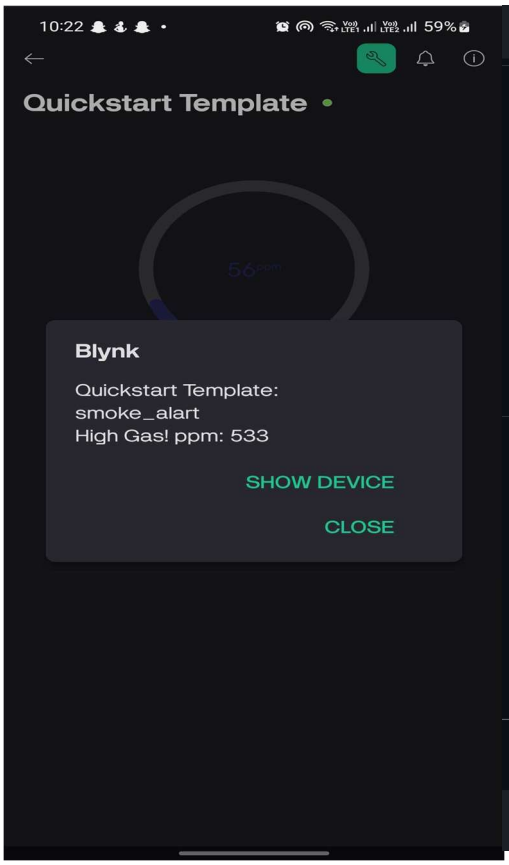
Conclusion

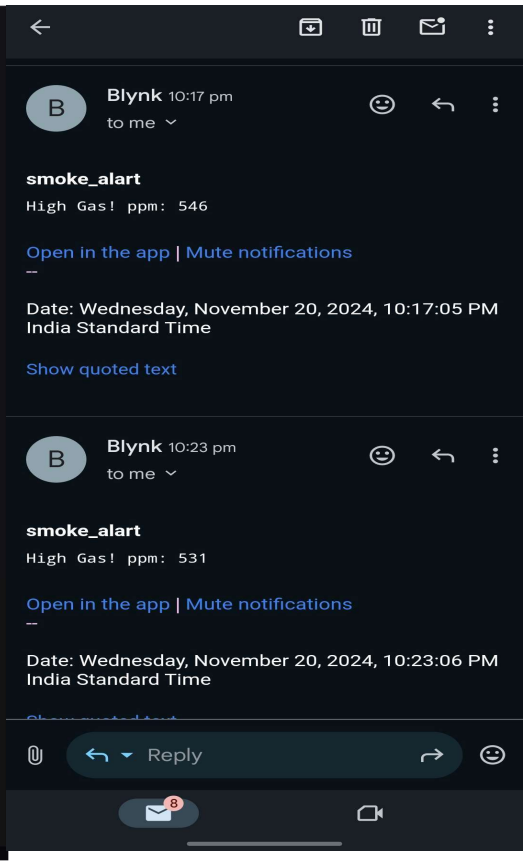
The IoT-based **Smoke and Gas Detection System** using **MQ-135**, **Blynk IoT**, and **Mail/Notification** (without the need for an LED) relies on several key hardware components like the **ESP8266** microcontroller and the **MQ-135** sensor, combined with powerful software tools such as the **Blynk app** for monitoring and **SMTP** voice notificaation for sending alerts. The absence of an LED in this setup reduces the need for local visual indicators, while still ensuring safety through real-time mobile and remote notifications.

CHAPTER 4: POSSIBLE SNAPSHOT

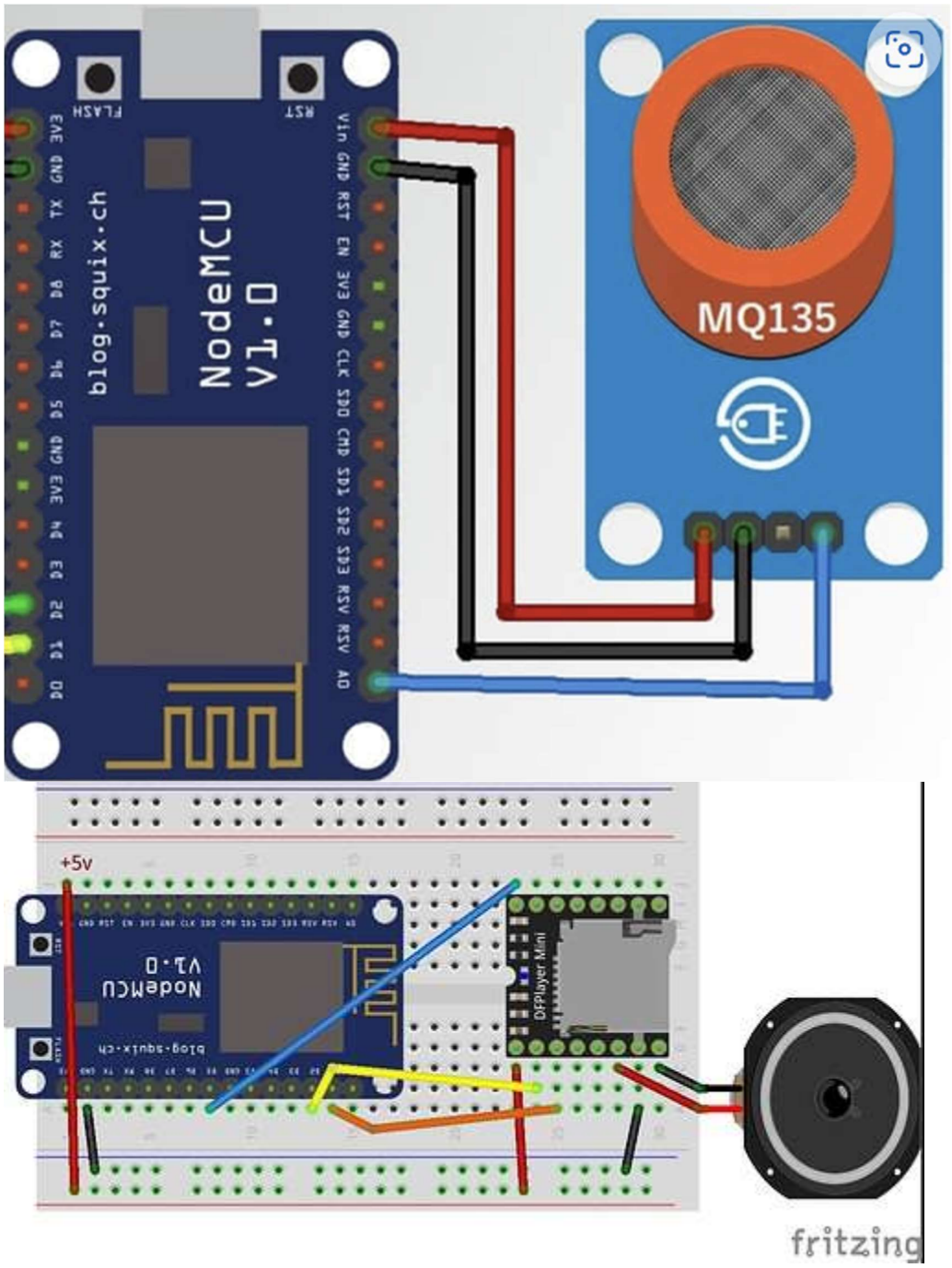








CHAPTER 5: CIRCUIT DIAGRAM



REFERENCE

"Internet of Things with Arduino: Build IoT Projects Using Arduino and the Blynk App" by Raj, J., & Raju, P. (2018).
This book provides insights into using the Blynk app with Arduino for creating various IoT-based projects, including smoke and gas detection systems.

"IoT Projects with Blynk: Build Projects Using Blynk IoT" by B. Anand, & K. Radhakrishnan (2020).
This book explores IoT projects, including smoke and gas detection, while using the Blynk app to create mobile interfaces for controlling and monitoring sensors.

Websites and Tutorials:

1. **Blynk Documentation - "Creating IoT Projects with Blynk"**
   Website: https://docs.blynk.io/
   The official documentation of the Blynk platform provides detailed steps on creating IoT-based projects, including connecting sensors like MQ-135 to the Blynk app, and sending notifications.

2. **"How to Build an IoT Smoke and Gas Detector using MQ-135 and Blynk" - Instructables**
   Website: https://www.instructables.com/
   This tutorial on Instructables explains the process of connecting the **MQ-135 sensor** to an **ESP8266** and using **Blynk IoT** for smoke and gas detection, with step-by-step instructions for setting up notifications.

3. **"IoT-Based Smoke and Gas Detection System Using Blynk and Arduino" - Hackster.io**
   Website: https://www.hackster.io/
   This tutorial on Hackster.io provides a comprehensive guide on how to build an IoT smoke and gas detection system using **Arduino**, **MQ-135**, and the **Blynk app** to send alerts via mobile notifications.

TURNITIN PLAGIARISM REPORT

Please Insert a Scanned Copy of the Front pages duly signed by the Candidate, Supervisor, Departmental Turnitrin Coordinator, and HoD with Seal

MPRs (If Applicable)

ESP8266	320/-
MQ-135	299/-
Jumper Wires	99/-
SD-Card 4-GB	300/-
DFP-MP3 Module	300/-
Speaker	50/-