**📌 Project Overview**

This project is part of a **smart community safety system** that integrates **AI**, **IoT**, and **real-time communication** to respond to home hazards like **gas leaks**, **fire**, **theft**, and **medical emergencies**. The system monitors environmental parameters and emergency buttons, and sends immediate alerts via **MQTT**, **OLED display**, **Buzzer**, and the **Blynk IoT app**. It is also tested in **Proteus** simulation and deployed with **Arduino Uno + ESP8266** hardware.

**🧠 Key Features**

* 🔥 **Flame and Gas Detection** using sensors
* 🚨 **Emergency Buttons** for:
  + Theft Alert
  + Medical Emergency
  + Manual Acknowledgement
* 🖥️ **OLED Display** for real-time status
* 📢 **Buzzer & LED Alerts** for local notifications
* 🌐 **MQTT-based Messaging** between devices (via HiveMQ Cloud)
* 📱 **Blynk IoT App Integration** for:
  + Alerts
  + Live sensor readings
  + Remote triggering
* 🧪 Tested in **Proteus** and deployed on real hardware

**🧰 Hardware Components**

* ESP8266 (NodeMCU)
* Arduino Uno
* Flame Sensor (Digital)
* Gas Sensor (MQ-2 or similar)
* Push Buttons (Theft, Medical, Acknowledge)
* OLED Display (128x64, I2C SSD1306)
* Buzzer
* LED or Alert Indicator
* Resistors, Breadboard, Jumper Wires

**📡 Software & Libraries**

* **Arduino IDE**
* **Proteus 8 Professional** (for simulation)
* **Blynk IoT Platform**
* **Libraries Used:**
  + Adafruit\_SSD1306
  + Adafruit\_GFX
  + BlynkSimpleEsp8266
  + ESP8266WiFi
  + PubSubClient
  + WiFiClientSecure

**🔄 Functional Flow**

1. **Startup**: Connects to WiFi and MQTT broker.
2. **Monitoring**: Continuously checks flame and gas sensors.
3. **Emergency Detection**:
   * If gas level exceeds threshold or flame is detected, an alert is triggered.
   * Button press also triggers respective alerts.
4. **Alert System**:
   * Sends MQTT message to community network
   * Displays message on OLED
   * Activates buzzer and LED
   * Pushes notification through Blynk App
5. **Acknowledgment**:
   * Manual or remote acknowledgment deactivates alert and sends "false alert" message.

**🔧 How to Run**

1. Upload the provided Arduino sketch to your ESP8266.
2. Connect the sensors and modules as per your circuit.
3. Install all required libraries in Arduino IDE.
4. Configure your **WiFi SSID/Password**, **MQTT Broker**, and **Blynk Auth Token** in the code.
5. Use the Blynk Web Dashboard or mobile app to monitor alerts and test remote control.

**🔒 MQTT Configuration (HiveMQ Cloud)**

* **Broker**: 7730fe61f8d9449c92d9e149f031efcd.s1.eu.hivemq.cloud
* **Port**: 8883
* **Username**: nodemcu
* **Password**: Pass@123
* **Topic**: alert

**📱 Blynk Virtual Pins**

| **Virtual Pin** | **Function** |
| --- | --- |
| V1 | Theft Alert Button (Web/App) |
| V2 | Medical Alert Button |
| V3 | Acknowledge Alert Button |
| V4 | Gas Sensor Reading |
| V5 | Flame Sensor Status |
| V6 | Main Alert Notification |
| V7 | Alert History List |

**📊 Use Cases**

* Smart home fire and gas detection
* Elderly or medical emergency alert system
* Real-time theft detection in communities
* Inter-house communication using MQTT

**🎯 Project Goals**

* Improve real-time community safety
* Integrate affordable IoT devices for home security
* Align with **SDG 11** (Sustainable Cities) and **SDG 9** (Innovation)