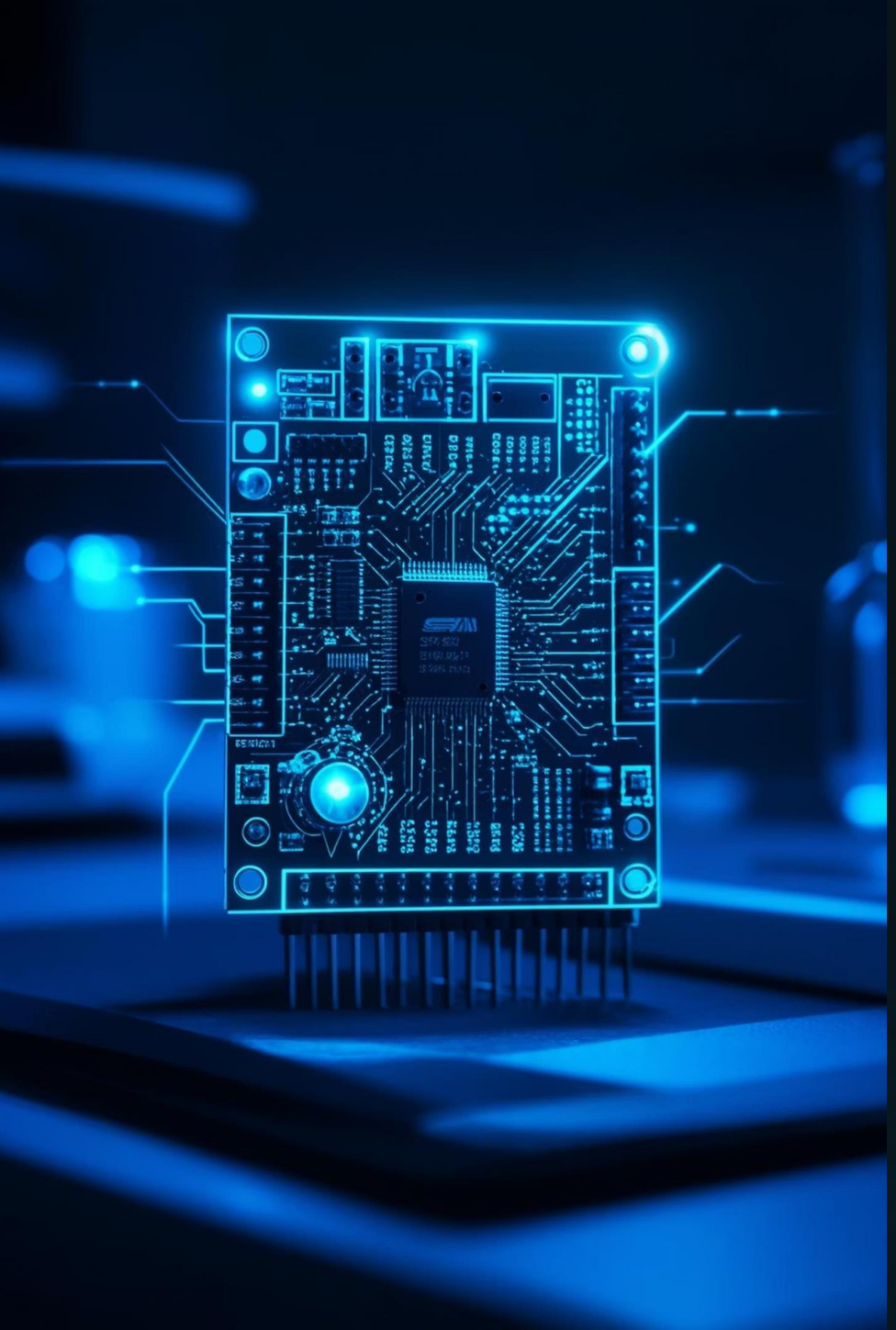

Smart Disaster Management System using STM32F401

Course: Embedded Systems Design - 23CSE304

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Problem Statement

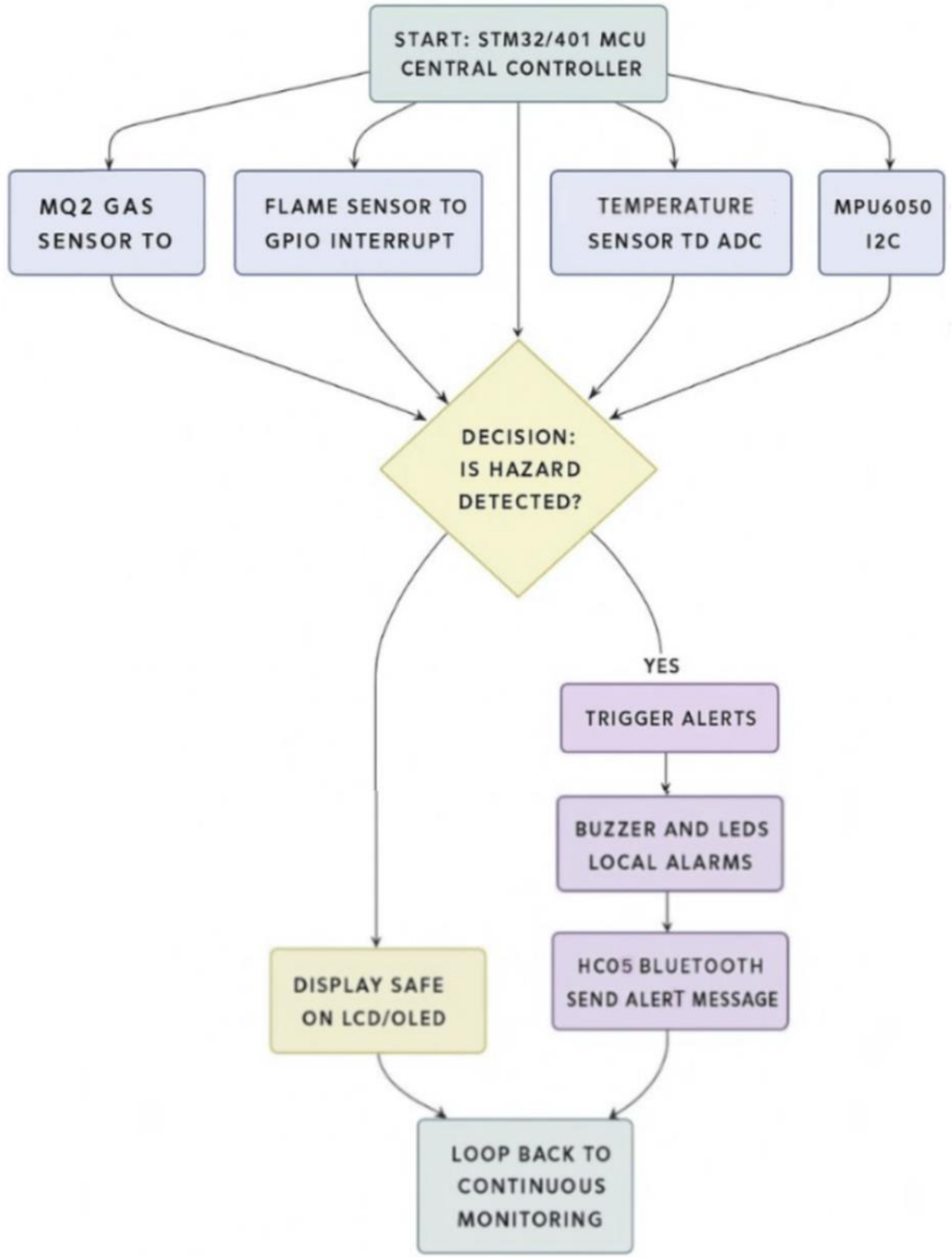
Disasters like gas leaks, fire, and earthquakes cause severe loss of life and property. Existing alarms are single-purpose and cannot handle multiple hazards. Our project uses an **STM32F401** to build an **integrated multi-hazard monitoring system** with ADC, I^2C, UART, interrupts, and display for improved safety and real-world use.

Why did we choose this?

- Disasters like **gas leaks, fire, and earthquakes** demand **early detection**.
- Existing systems are **single-purpose** and cannot handle multiple hazards.(only fire alarm, only gas detector).
- The system should detect **gas leaks, fire and vibrations** simultaneously.
- A **multi-sensor node** improves **safety, reliability, and awareness**.

Hardware Components

- STM32F401 Black Pill → Core microcontroller
- MQ-2 Gas Sensor → Detects gas leaks (ADC)
- Flame Sensor → Detects fire (digital interrupt)
- MPU6050 → Vibration/earthquake detection (I^2C)
- HC-05 Bluetooth→ Mobile alerts (UART)
- Buzzer + LEDs → Local alerts



Implementation

1

sensor Data Acquisition

STM32F401 continuously reads values from Gas, Flame, and Vibration sensors.

2

Normal Operation

If readings are safe, The system will give us an indication.

3

Hazard Detection

When thresholds are crossed or interrupts trigger, the system identifies abnormal conditions.

4

Alert Activation

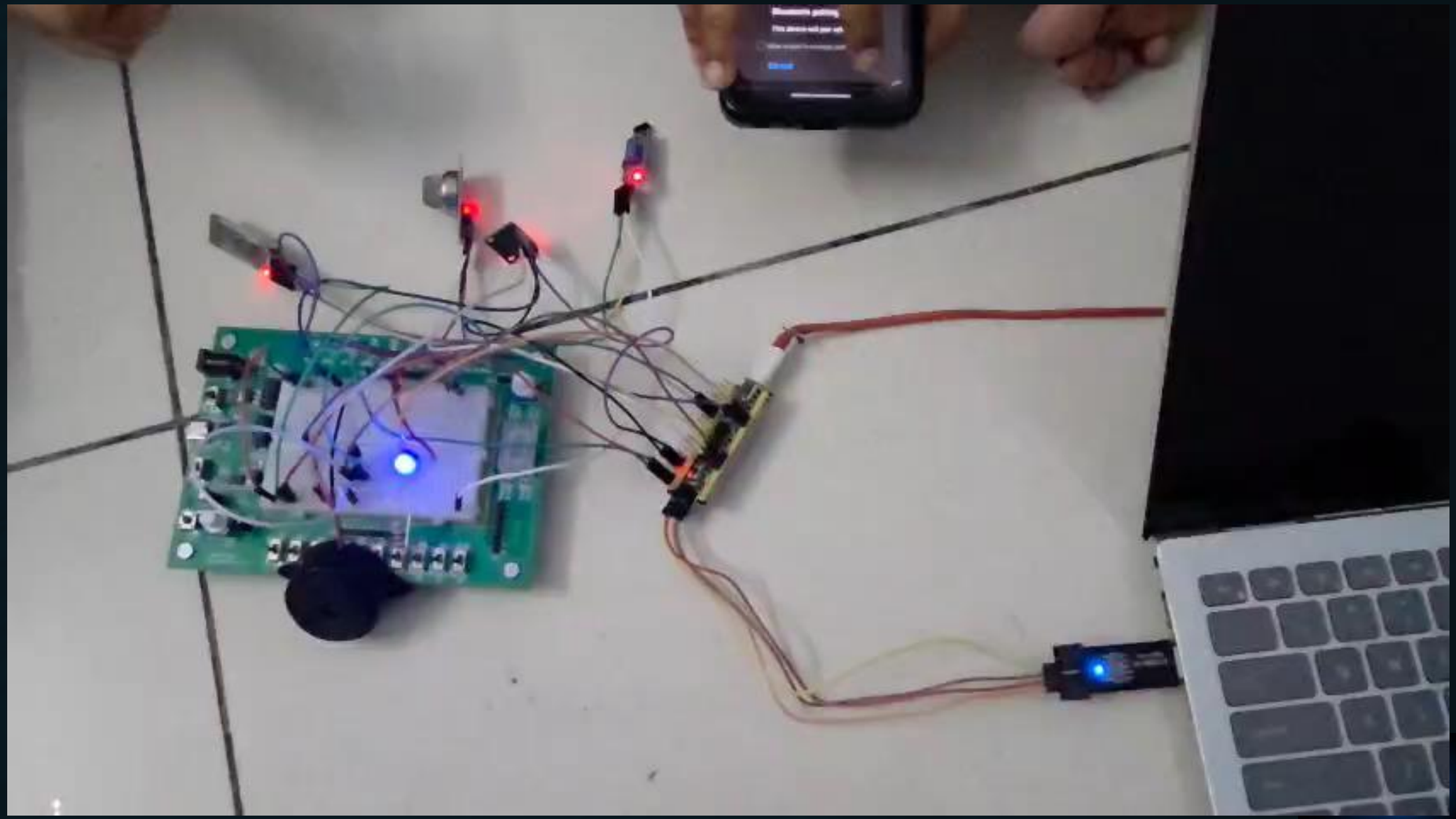
IBuzzer and LEDs provide immediate local alert, and warnings appear on the phone using Bluetooth module.

5

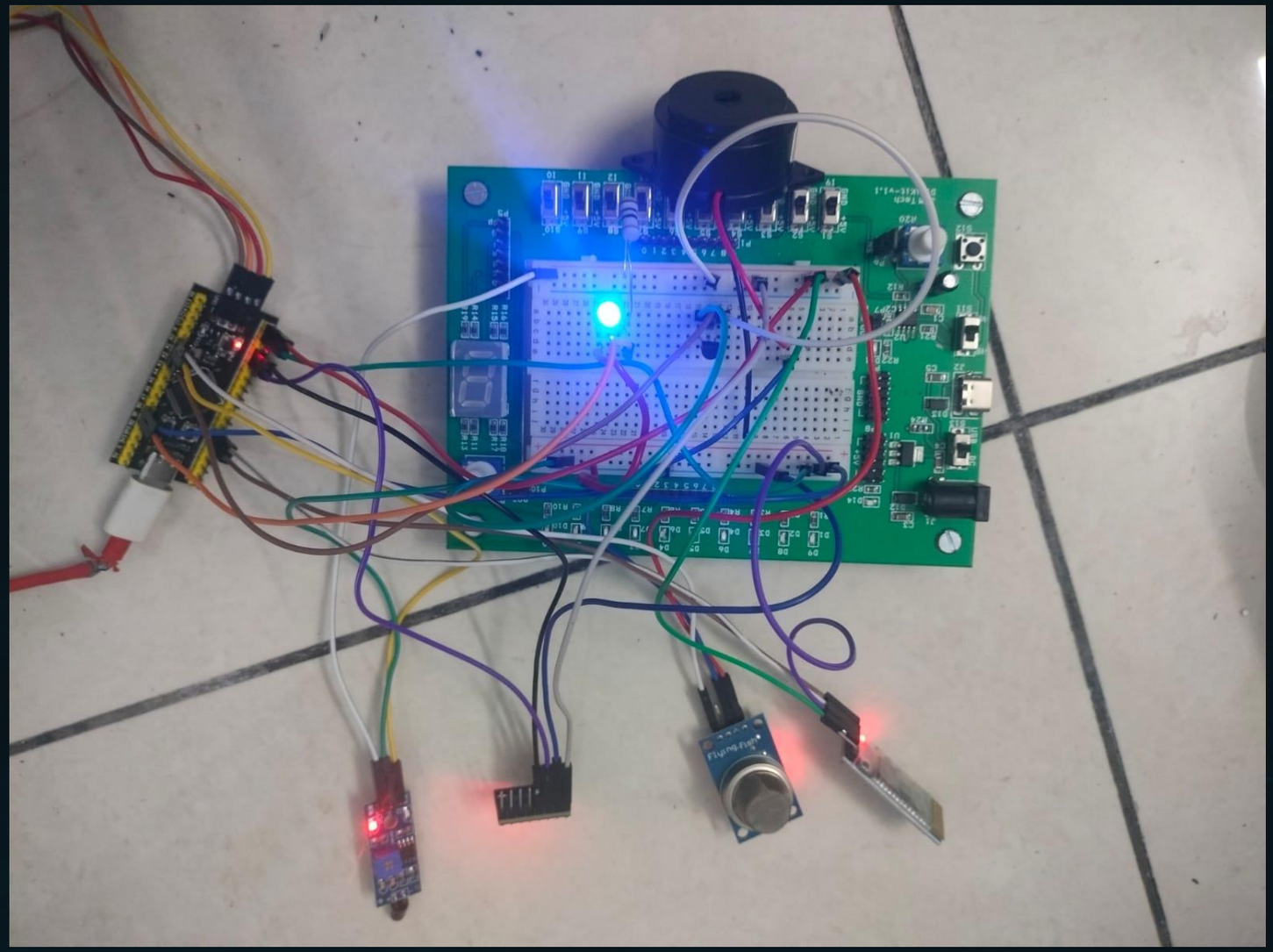
Remote Notification

Alert messages are sent to mobile/PC via Bluetooth (UART) for remote monitoring.

Prototype



Our Prototype



Bluetooth module output