Project Title: An IoT-based system to detect fire and gas leaks in real-time, triggering alerts and safety actions to prevent disasters.

Abstract

The MK Sentinel project is an open-source, next-gen IoT fire and gas safety system designed specifically for Indian homes, combining the MQ-2 and MQ-6 combustible gas sensors for accurate LPG leakage detection, the YG1006 flame sensor for direct flame detection, the DHT11 digital temperature sensor for ambient heat detection, and the MQ-2-based smoke sensor for early particulate and smoke detection all controlled by an Arduino Uno with Wi-Fi, ESP8266 CH340 for real-time streaming of data. Compared to static commercial offerings with only loud buzzers at pre-set thresholds, MK Sentinel examines real-time measurements via a lightweight decision tree machine learning model to forward-looking classify and predict risk, suppressing false alarms by detecting gradual or contextual anomalies, and disseminating actionable, color-coded alerts via a React-powered web dashboard accessible anywhere in the home. On demonstration, the system is presented in a miniature house setup that precisely models a Chennai kitchen: the MQ-2 & MQ-6 sensors detect controlled releases of LPG, the YG1006 detects test flames, the DHT11 detects temperature fluctuations, and the MQ-2 smoke sensor detects artificial smoke with all data presented immediately on the dashboard and alerts delivered via notification as an alert message in Web UI. The real world impact of the project is further emphasized by its forward-ready design: while the initial deployment focuses on intelligent monitoring and alerting, the system is designed to be future proofed with a relay or servo driven gas valve mechanism (for instance, via a standard 2-wire solenoid valve or smart gas valve compatible with Arduino outputs), facilitating fully automatic, physical gas supply cutoff in confirmed emergencies an upgrade path that differentiates MK Sentinel from conventional, single function detectors. With integration of robust, multi-modal sensing, predictive analytics, user-centric design, and an open roadmap for proactive mitigation, MK Sentinel offers a configurable, scalable, and transparently intelligent safety platform for Indian homes, raising the bar for student-driven IoT innovation and community-scale hazard prevention.

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