An Embedded IoT Fire-Alert Prototype Using Raspberry Pi

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***Abstract*—This thesis constructs an embedded fire-alert prototype using Raspberry Pi, environmental sensors, Firebase, and an Android application. The design includes an MQ2 gas sensor, a DHT11 temperature and humidity sensor, a relay, a siren, and a water-pump response. The report describes Python programming, device connections, real-time data transfer, and mobile alerts. Its conclusion states that the prototype collects signals, updates monitoring data, and activates local and remote warnings. It also proposes a camera, direct contact with firefighters, and quick-dial functions as later developments. The source does not provide a certified fire-detection test, false-alarm rate, or safety validation. The outcome is an educational connected-alarm demonstration, not a substitute for an approved fire-protection system.**

***Index Terms*—fire alert, Raspberry Pi, MQ2, DHT11, Firebase, IoT**

I. Introduction

Fire monitoring can combine environmental measurements, local alarms, and remote notifications. The thesis investigates this approach through an embedded and IoT prototype. It introduces Raspberry Pi, gas and temperature sensing, Firebase, and Android development. The objective is to connect detection and warning components in one demonstration. The work is not presented as a certified building safety installation, and the report does not describe operation in a live protected facility [1]. Earlier ICTU student work on related designs is included here for context [4], [5]. Related published studies provide context for the subject and methods [6], [7], [8], [9], [10]. These contextual works were selected for this English summary; they are not asserted to appear in the original thesis bibliography.

II. Methods

The author connects an MQ2 gas sensor, DHT11 temperature and humidity sensor, relay, siren, and pump to a Raspberry Pi-based controller. Python code reads sensor values and manages outputs, while Firebase carries updates to the Android application. The report includes component diagrams, code, interface views, and descriptions of trigger behavior. It does not define a calibrated fire-condition experiment or a formal comparison with commercial detectors [1].

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III. Results

The thesis reports that the prototype acquires sensor signals and exchanges data with the server in real time. It shows local alerts through a siren and pump response and remote warnings in the mobile application. The conclusion considers the construction requirements substantially met. The source does not quantify detection sensitivity, false alarms, communication delay, or durability. The observed result is an end-to-end demonstration of sensing and notification [1].

IV. Discussion

Linking local responses with a mobile notification could help people notice abnormal conditions, but safety systems require rigorous calibration and failure handling. The manuscript does not provide that validation. It proposes future additions such as camera monitoring and automated contact with emergency services. Those functions should be distinguished from the demonstrated prototype. Real deployment would need certified components, independent tests, maintenance procedures, and reliable power and network arrangements [1].

V. Conclusion

The thesis documents an IoT fire-alert prototype based on Raspberry Pi, MQ2 and DHT11 sensing, Firebase, and Android notification. The report supports a functioning student demonstration of data collection and alerts. It does not prove fire-detection accuracy or compliance with safety requirements. Further testing and approved engineering controls would be required before use to protect a building or its occupants [1].

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