An Embedded IoT Lighting and Security System

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***Abstract*—This undergraduate thesis investigates embedded lighting control and motion-triggered security alerts. A small home or facility may need local lighting control and a way to receive notice when movement is detected. The author combines a Raspberry Pi controller, a passive infrared motion sensor, a buzzer, Python control logic, Firebase data exchange, and an Android application. The report documents sensor input, local outputs, and a mobile interface for observing and controlling the system. The prototype reports motion status and activates local light or sound responses while sending data or alerts to a mobile device. The source presents these functions through its implementation and demonstration. Scheduled alarms and contacting a security authority are proposed extensions rather than completed features. The source does not report a long-term installation, independent intrusion-detection accuracy, or a measured reduction in security incidents. Network availability and sensor placement would matter in a real setting. The contribution is a documented student study or prototype whose stated scope can guide further testing.**

***Index Terms*—embedded systems, IoT, Raspberry Pi, motion detection, Android**

I. Introduction

A small home or facility may need local lighting control and a way to receive notice when movement is detected. This thesis investigates embedded lighting control and motion-triggered security alerts. It begins from a practical engineering need and explains the technologies and workflow chosen for the case. The objective is to document a student implementation or comparative investigation, together with the evidence available in the manuscript. Broader operational or economic effects require separate measurements and are not assumed from the existence of a prototype [1]. Earlier ICTU student work on related designs is included here for context [2], [3], [4]. Related published studies provide context for the subject and methods [5], [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 combines a Raspberry Pi controller, a passive infrared motion sensor, a buzzer, Python control logic, Firebase data exchange, and an Android application. The report documents sensor input, local outputs, and a mobile interface for observing and controlling the system. The source is summarized through its stated design, implementation material, examples, and conclusion. Features shown in the manuscript are distinguished from proposals for later development. This review does not add a new experiment, fill missing measurements with estimates, or treat a planned capability as an observed result. The source thesis remains the provenance for the reported work [1].

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III. Results

The prototype reports motion status and activates local light or sound responses while sending data or alerts to a mobile device. The source presents these functions through its implementation and demonstration. Scheduled alarms and contacting a security authority are proposed extensions rather than completed features. The report's screens, configurations, examples, or measurements constitute the evidence for this summary. A capability described only as a design intention is not counted as a validated operational outcome. No additional performance, adoption, financial, or safety figure has been introduced here. The result is interpreted within the scope of the student's documented setup [1].

IV. Discussion

The source does not report a long-term installation, independent intrusion-detection accuracy, or a measured reduction in security incidents. Network availability and sensor placement would matter in a real setting. A field evaluation could log missed and false detections, notification delay, power failures, and access-control behavior across different rooms and lighting conditions. These limitations affect how the evidence should be read. The current manuscript can support understanding of the design and reported demonstration, while independent tests would be needed for stronger claims. Any later deployment should document its environment and separate observed outcomes from intended benefits [1].

V. Conclusion

The thesis documents embedded lighting control and motion-triggered security alerts. The prototype reports motion status and activates local light or sound responses while sending data or alerts to a mobile device. The source presents these functions through its implementation and demonstration. Scheduled alarms and contacting a security authority are proposed extensions rather than completed features. The source does not report a long-term installation, independent intrusion-detection accuracy, or a measured reduction in security incidents. Network availability and sensor placement would matter in a real setting. A field evaluation could

log missed and false detections, notification delay, power failures, and access-control behavior across different rooms and lighting conditions. Accordingly, the present contribution is a source-grounded account of the student work and its tested or illustrated scope. Claims about broader effectiveness should be assessed in later work using explicit evaluation conditions [1].

References

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