Raspberry Pi Applications for Embedded Computing

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***Abstract*—This undergraduate thesis investigates educational embedded-computing applications on a Raspberry Pi. A low-cost single-board computer provides a practical platform for learning hardware interfaces and control programs. The author reviews Raspberry Pi hardware and operating-system configuration, then documents experiments with LED control, a traffic-light sequence, and a mobile control interface using Blynk. The report includes circuits, flowcharts, and screen examples. The thesis illustrates basic control programs and a phone interface for switching an LED. Its conclusion focuses on learning outcomes and does not provide a quantitative reliability, energy, or industrial performance assessment. These are teaching demonstrations, not evidence of an industrial control system. Hardware timing, electrical protection, and remote-access security would need additional tests before broader use. The contribution is a documented student study or prototype whose stated scope can guide further testing.**

***Index Terms*—Raspberry Pi, embedded computing, LED control, Blynk**

I. Introduction

A low-cost single-board computer provides a practical platform for learning hardware interfaces and control programs. This thesis investigates educational embedded-computing applications on a Raspberry Pi. 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 reviews Raspberry Pi hardware and operating-system configuration, then documents experiments with LED control, a traffic-light sequence, and a mobile control interface using Blynk. The report includes circuits, flowcharts, and screen examples. 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 thesis illustrates basic control programs and a phone interface for switching an LED. Its conclusion focuses on learning outcomes and does not provide a quantitative reliability, energy, or industrial performance assessment. 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

These are teaching demonstrations, not evidence of an industrial control system. Hardware timing, electrical protection, and remote-access security would need additional tests before broader use. Further work could instrument timing and failure behavior, extend the tested peripherals, and document repeatable classroom or field scenarios. 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 educational embedded-computing applications on a Raspberry Pi. The thesis illustrates basic control programs and a phone interface for switching an LED. Its conclusion focuses on learning outcomes and does not provide a quantitative reliability, energy, or industrial performance assessment. These are teaching demonstrations, not evidence of an industrial control system. Hardware timing, electrical protection, and remote-access security would need additional tests before broader use. Further work could instrument timing and failure behavior, extend the tested peripherals, and document repeatable classroom or field scenarios. 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].

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