An Embedded Fire Detection Prototype with Raspberry Pi and YOLOv5

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***Abstract*—This undergraduate thesis investigates an embedded fire and smoke detection prototype. Early visual warning may help identify signs of fire in a monitored area. The student combines image processing and YOLOv5 with a Raspberry Pi and documents a prototype workflow for detecting fire-related visual objects. The thesis reports that the embedded demonstration detects fire-related signs and discusses trials. It does not provide a reproducible quantitative accuracy or false-alarm result in the conclusion. The source does not validate performance across lighting, camera positions, outdoor scenes, or sustained operation, and it does not establish suitability as a certified safety system. The contribution is a documented student study or prototype whose stated scope can guide further testing.**

***Index Terms*—Raspberry Pi, YOLOv5, fire detection, embedded system**

I. Introduction

Early visual warning may help identify signs of fire in a monitored area. This thesis investigates an embedded fire and smoke detection prototype. 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]. Related published studies provide context for the subject and methods [4], [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 student combines image processing and YOLOv5 with a Raspberry Pi and documents a prototype workflow for detecting fire-related visual objects. 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 reports that the embedded demonstration detects fire-related signs and discusses trials. It does not provide a reproducible quantitative accuracy or false-alarm result in the conclusion. 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 validate performance across lighting, camera positions, outdoor scenes, or sustained operation, and it does not establish suitability as a certified safety system. Further work could build a labelled test set, report sensitivity and false alarms, and evaluate alert delivery and hardware reliability under controlled 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 an embedded fire and smoke detection prototype. The thesis reports that the embedded demonstration detects fire-related signs and discusses trials. It does not provide a reproducible quantitative accuracy or false-alarm result in the conclusion. The source does not validate performance across lighting, camera positions, outdoor scenes, or sustained operation, and it does not establish suitability as a certified safety system. Further work could build a labelled test set, report sensitivity and false alarms, and evaluate alert delivery and hardware reliability under controlled 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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