YOLO-Based License Plate Recognition for Parking Management

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***Abstract*—This thesis studies YOLO object detection and applies it to license plate recognition for parking management. The report reviews the detection model and describes a Python implementation combining YOLO, PaddleOCR, image handling, and an SQLite record store. Its appendix includes source code for those components. The author says the system can support vehicle identification but also acknowledges that recognition performance needs improvement. Locating a vehicle inside the lot and counting available spaces are proposed future functions. The source does not provide a verified general accuracy rate, a large independent test set, or a production parking-facility trial. The contribution is a documented student prototype and an explicit statement of its present recognition and workflow limits.**

***Index Terms*—YOLO, license plate recognition, PaddleOCR, parking, SQLite**

I. Introduction

Parking facilities need a reliable way to associate a vehicle with an entry and exit record. This thesis explores license plate recognition using a YOLO detector. It introduces object detection and the intended parking workflow before describing the application. The objective is to build a prototype that can identify plates and store related data. The report does not establish an operational baseline for a real parking facility [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 studies YOLO and prepares a Python application for vehicle-image processing. The source code uses an Ultralytics YOLO model, PaddleOCR for text reading, OpenCV for image handling, and SQLite for data storage. The report describes development and training tools and illustrates the interface and detection flow. The source does not document a blinded accuracy study, a comprehensive lighting test, or long-term camera operation [1].

III. Results

The manuscript presents an implemented detection and recognition workflow and associated code. The author reports that the system can contribute to parking management, while explicitly noting that recognition performance remains in need of improvement. No independently verified accuracy percentage or production processing-time reduction is provided. The documented result is a student prototype with selected examples, not a validated automated parking service [1].

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IV. Discussion

Plate recognition is sensitive to image quality, camera position, lighting, and variations in plate appearance. The author states that performance should be improved and proposes later functions for vehicle location and empty-space counts. Those features are not part of the demonstrated result. A meaningful operational evaluation would need a labeled plate set and tests across realistic conditions, with error handling for unreadable images [1].

V. Conclusion

The thesis documents a YOLO and OCR based prototype for license plate recognition in a parking context. The source includes implementation code and discussion of the intended workflow. The author recognizes unresolved recognition performance and proposes additional parking-management functions. The work is a student demonstration; accuracy and practical value require further measured testing across lighting, camera placement, and plate variations before field use [1].

References

[1] Lê Mạnh Quân, ”YOLO-Based License Plate Recognition for Parking Management,” internal undergraduate thesis (original in Vietnamese), Thai Nguyen University of Information and Communication Technology, 2024.
[2] Ngô Thị Bích, ”Design of a Parking System Control and Monitoring for Autonomous Parking,” internal undergraduate thesis, Thai Nguyen University of Information and Communication Technology, 2023.
[3] Hoàng Anh Tuấn, ”Construction of an Automated Parking System Model Using Mitsubishi PLC,” internal undergraduate thesis, Thai Nguyen University of Information and Communication Technology, 2021.
[4] ICTU Student 203, ”Construction of a Character Recognition Program,” internal undergraduate thesis, Thai Nguyen University of Information and Communication Technology, 2010.
[5] Kenneth Christoper Nugraha et al., ”VEHICLE LICENSE PLATE DETECTION USING YOLO ALGORITHM,” Jurnal Algoritma, Logika dan Komputasi, 2023. doi:10.30813/j-alu.v6i2.4739.
[6] Rayson Laroca et al., ”An efficient and layout□independent automatic license plate recognition system based on the YOLO detector,” IET Intelligent Transport Systems, 2021. doi:10.1049/itr2.12030.

[7] Reda Al-batat et al., ”An End-to-End Automated License Plate Recognition System Using YOLO Based Vehicle and License Plate Detection with Vehicle Classification,” Sensors, 2022. doi:10.3390/s22239477.
[8] Arjan Chakravarthy, ”A Comparison of YOLO Models for License Plate Detection,” Indian Journal of Computer Science, 2021. doi:10.17010/ijcs/2021/v6/i6/167643.
[9] Jae-Jung Kim et al., ”Implementation of Robust License Plate Recognition System using YOLO and CNN,” The Journal of Korean Institute of Information Technology, 2021. doi:10.14801/jkiit.2021.19.4.1.
[10] Chuan Pratama et al., ”Vehicle License Plate Detection for Parking Offenders Using Automatic License-Plate Recognition,” Journal of Southwest Jiaotong University, 2020. doi:10.35741/issn.0258-2724.55.4.32.