Vehicle search using license plate images extracted from CCTVs

Nguyễn Trần Việt Anh (21520006), Huỳnh Đặng Vĩnh Hiền (21520029),
Lê Thanh Minh (21520063), Huỳnh Phạm Đức Lâm (21521050), Trần Hoàng Bảo Ly (21521109)

University of Information Technology, Vietnam National University – Ho Chi Minh City

Introduction

Finding a specific vehicle in large parking areas can be a daunting task. To address this challenge, a solution utilizing license plate recognition technology has been developed. By inputting their plate number, users can quickly locate their parked cars using advanced computer vision algorithms. This innovative approach simplifies the process, eliminates manual searching, and saves time, providing a mean of finding cars in busy parking environments convenient.

Problem definition

Implement a software that could recognize the actual location of vehicles with information collected from CCTVs.

Input:

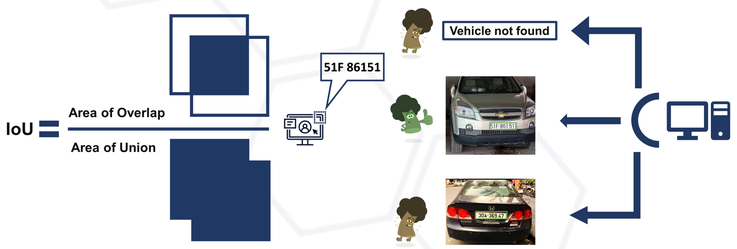
- A collection of high-resolution CCTV images in .jpg format, capturing up to 5 vehicles per image (motorbikes and cars with less than 9 seats). Images are noise-free with clearly visible license plates (no object obstructs any part of the plate) each having a bounding box of at least 50 x 150 pixels.
- The detail of vehicle plates are given by the user.

Output:

- One image with a bounding box of the plate that has the match with the plate detail given from the input.
- The location of where the image was taken.

Evaluation metric

Plate detection: IOU (similarity between bounding boxes).
Plate details: Accuracy

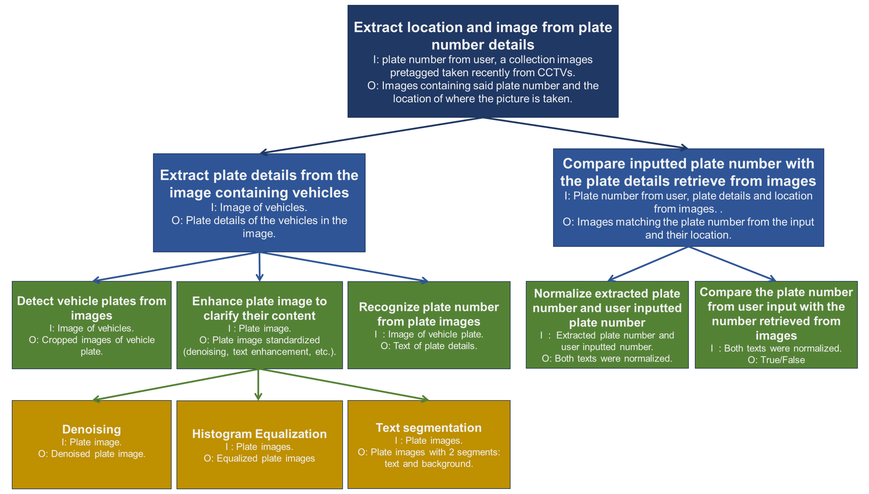


Computational thinking

Abstraction

Relevant information: license plates, location of vehicles.
Less relevant information that can be ignored: background, brand, type, color of vehicle.
The vehicle plates: an object in the image → Object detection.
Recognizing the detail of a plate → Optical character recognition problem.
Search the plate in a list of images → Linear search.
Compare the detail after OCR with the input detail → String matching.

Decomposition



Pattern recognition

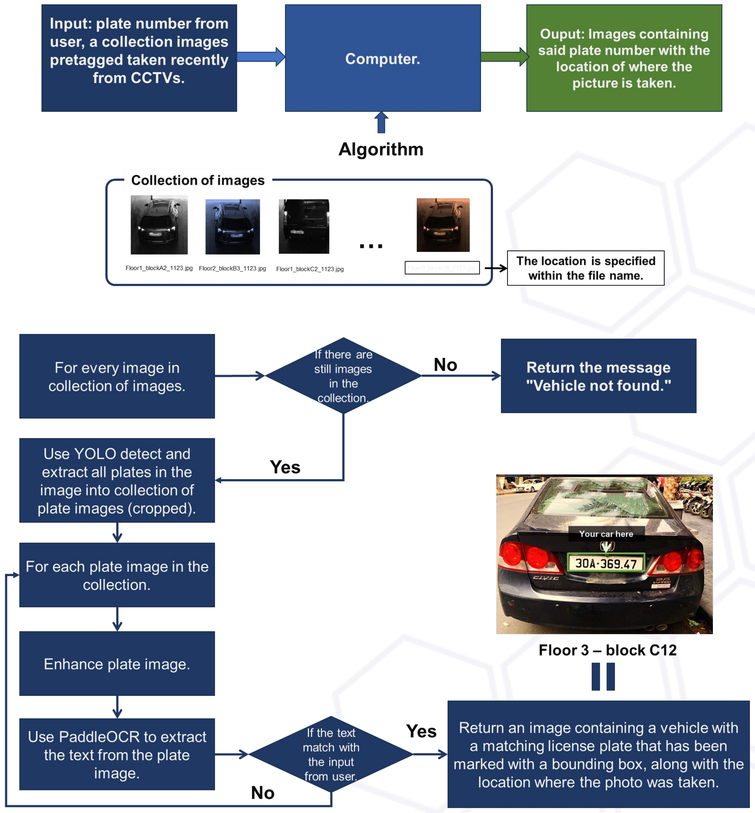
Object detection : is a computer vision task that involves identifying and locating multiple objects within an image or a video. The goal is to classify the present in the input data and determine their precise spatial coordination, usually represented by bounding boxes.

Image preprocessing: is the application of techniques to enhance or modify an image before using it in a computer vision algorithm. It improves image quality, removes noise, normalizes colors, and extracts important features.

Optical character recognition (OCR): is the process that converts an image of text into a machine-readable text format.

String matching: is the step of checking similarity between two strings.

Algorithm



Conclusion

This method could work properly which the constraints mentioned in the input. However, it has not been evaluated on difficult cases like low illumination, image with obstacles, etc. so, the accuracy might reduce moderately.

This research may have further applications like detecting traffic violent or parking toll charging.

In the future, we will try to implement this solution on larger data, like increasing the number of photos taken, or detect multi plates at a same time.

This poster is prepared as a part of the final project of the Computational Thinking course (CS117) in June 2023.

Tool used: ChatGPT, Bailbot, Google