CHAPTER I. INTRODUCTION

1.1 BACKGROUND OF THE PROJECT

Edge detection is a fundamental technique in image analysis, particularly in object recognition and segmentation (Muthukrishnan et al., 2011). It involves finding boundaries between regions of an image that have distinct intensity values. One common approach to edge detection is thresholding, which converts a grayscale image into a binary image by selecting a threshold value that separates the foreground (object of interest) from the background (Al-Amri et al., 2010). Contour detection is a subsequent process that involves identifying and extracting the boundaries of objects in the binary image.

License Plate Recognition (LPR) is a technology that automates the process of identifying and tracking vehicles by detecting their license plates. LPR is widely used in security and traffic applications, and relies on edge detection techniques to accurately identify license plates (Anagnostopoulos et al., 2006). While there are several edge detection techniques available, thresholding and contour detection is a simple yet effective approach that can be used to detect the edges of license plates in certain types of images.

To improve the accuracy of LPR systems, researchers have developed more updated edge detection techniques such as Canny edge detection, which uses a multi-stage algorithm to detect edges with high accuracy (Mahalakshmi, S., & Karani, P. M. (2017). However, thresholding and contour detection remains a popular choice due to its simplicity and ease of implementation.

1.2 PROBLEM STATEMENT

With the increasing number of cars on the roads and highways, we are confronted with a slew of issues such as car smuggling, car use in terrorist acts, and illicit operations (Adithya et al., 2021). However, recognizing license plates with high accuracy in real-time can be challenging, especially when dealing with multiple license plates captured at close condition. This project aims to develop a license plate recognition system that leverages the power of edge detection and contour detection techniques to accurately identify and recognize multiple license plates in real-time.

These are some challenging issues, this research project focused on :

1. Inaccurate and Unreliable License Plate Edge Detection:

   This issue poses a challenge in accurately identifying the boundaries of license plates in real-time, especially when dealing with multiple license plates captured under varying conditions.

2. Challenging Real-Time License Plate Number Recognition:

   Recognizing license plate numbers in real-time is a complex task, especially when faced with multiple license plates simultaneously.

3. Lack Of A User-Friendly Interface:

   The lack of a user-friendly interface makes it difficult for users to manage various components and functionalities of the license plate recognition system. Not having a user-friendly interface where all the necessary features are conveniently accessible creates inconvenience and makes it harder to operate the system efficiently.

1.3 OBJECTIVES

1) Develop and implement an image preprocessing techniques, such as gray scaling, Gaussian blur, and adaptive thresholding, to enhance the accuracy of license plate edge detection.
2) Implement an efficient optical character recognition (OCR) algorithm, such as Tesseract OCR, to accurately recognize license plate numbers in real-time.
3) To design and implement a consolidated user interface that integrates all the necessary features, including live camera feed management, edge detection, and license plate number recognition, into a single page for enhanced user convenience and streamlined operation.

1.4 SCOPE

1.4.1 User Scope

- Users will be able to access and review the license plate recognition data through a user-friendly interface, allowing for easy data management.
- Users will be able to receive real-time alerts when a recognized license plate matches a specific criteria, such as a vehicle on a blacklist.

1.4.2 System Scope

- The system will be able to process multiple images simultaneously in real-time, allowing for efficient recognition of license plates from cameras.
- The system will provide a user-friendly interface for managing the recognition process and viewing the captured license plate data.
- The system will include an option for manual verification of license plate recognition results.

1.5 SIGNIFICANCE OF THE PROJECT

This project has significant potential to advance the field of license plate recognition systems, particularly in multiple close-up image recognition. By improving the accuracy and efficiency of license plate recognition, this system can facilitate automation in various applications such as toll collection, parking access control, and law enforcement, those saving time and reducing errors. Furthermore, the proposed edge detection-based methods can contribute to the development of computer vision and image processing techniques, expanding the knowledge and application of these fields.

1.6 PROJECT ASSUMPTIONS AND LIMITIONS

1.6.1 Project Assumptions

Assuming clear and well-defined license plate images, this project aims to enhance license plate edge detection accuracy through image preprocessing techniques like gray scaling, Gaussian blur, and adaptive thresholding. It will implement the efficient Tesseract OCR algorithm for real-time license plate number recognition. The system will feature a consolidated user interface integrating live camera feed management, edge detection, and OCR, aiming for user convenience and streamlined operation. Overall performance and accuracy depend on the quality of techniques, OCR algorithm, and hardware capabilities.

1.6.2 Project Limits

1. This system can only be used on pc / laptop / raspberry Pi.
2. The host(pc / laptop / raspberry Pi) must support Python.
3. The system has difficulty recognizing license plates in low-light conditions.

4. The system is not able to recognize license plates that are partially damaged.
5. The system is not able to handle non-standard license plate formats or fonts.