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Moving Vehicle Registration Plate Detection

K. Poojitha[1], V. Pooja[2], K. Sunitha[3], Dr. Shruti Bhargava Choubey[4]
[1, 2, 3]*Student,* [4]*Dean-Innovation, Associate Professor, Sreenidhi Institute of Science and Technology (SNIST),Affiliated to JNTUH, ECE Department, Ghatkesar, Telangana, India.*

Abstract: ***Generally, video surveillance system is used for security purpose as well as monitoring but recognition of moving object is a difficult part of video surveillance. Now a days, due to decreasing costs of high quality video surveillance systems, detection and tracking has becomeincreasingly in practical with the help of human activities. Nowadays, these kind of systems have been designed for various tasks, but the task of detecting illegally parked vehicles has been left largely to the human operators of these systems. The recognition of Registration platesof Indian vehicles is the most interesting and challenging part from past few years. It is noticedthat the registration plates of vehicles are in different shapes and sizes and colours in various countries. We need to identify the registration plate of moving vehicles using python librariessuch as OpenCV and Pytesseract. This project will enable us to identify the numbers and characters of a registration plate easily. The major technology which we use here is Edge detection technique.***

Keywords: Surveillance system, Pytesseract, Edge detection technique, etc.

I. INTRODUCTION

Automatic detection of registration plates requires several image processing techniques and algorithms to be utilized within a single application. Text localization, extraction and enhancement, character segmentation and recognition operations are used to determine the license plate number in a given image or video frame. Only a few of the previous studies involved all the steps of a typical LPR system, from image acquisition to verification. In this research, a complete license plate recognition system, which is based on constraints and operates in real time, has been designed and implemented. Registration plate localization and extraction are the most time consuming stage of a typical system. Assumptions as well as optimizations are required in order for RPD systems to be able to locate registration plates in real time.

However, the computational requirements increase in parallel. To minimize this side-effect, constraints and prior knowledge are utilized.

After extracting the license plate area, the resulting region is further processed for character segmentation and recognition. Registration plate Recognition is a combination of number plate detection, character segmentation and recognition technologies used to identify vehicles by their registration plates. Since only the registration plate information is used for identification, this technology requires no additional hardware to be installed on vehicles. The registration plate recognition systems have two main points: the quality of registration plate recognition software with recognition algorithms used and the quality of imaging technology, including camera and lighting. Elements to be considered: maximum recognition accuracy, faster processing speed, handling many types of plates, manage the broadest range of image qualities & achieve maximum distortion tolerance of input data. Registration plate recognition applications apply image processing and segmentation algorithms to extract license plates, and each operation is computationally intensive.

Regulatory agency standards used in license plates can significantly reduce computational requirements and improve accuracy. Limits include a range of values, not exact measurements, as the size, style, and placement of license plate text can vary greatly from image to image. The license plate recognition system has two main points. The quality of the license plate recognition software using the recognition algorithms and the quality of the imaging technology, including cameras and lighting. Factors to consider: maximizing recognition accuracy, achieving faster processing speed, processing as many plate types as possible, managing a wide range of image quality, maximizing input data distortion tolerance. The main aim of this proposed project is to identify the registration plate of moving vehicles in different areas. We can identify the number plates of both authorized and unauthorized vehicles.

This project is based on the approach which uses OpenCV and Pytesseract. This approach is very simple to segment all the letters and numbers used in the license number plate by using edge detection method. The main focus of this project is to locate the registration plate region properly to segment all the numbers and letters separately.

II. LITERATURE REVIEW

1) Yunyang et al. He proposed Chinese License Plate Recognition (CLPR) in 2018. They usedhis CNN to extract image features and classify them, but they did not give significant resultsand used Extreme Learning Machines (ELM) for classification with better results. The authors proposed a new architecture, CNN-ELM, which uses CNN as feature extractor. The obtained results are passed as input to a kernel-based His ELM (KELM) for classification.
2) K S. Ragunandan et al. (2018) proposed a mathematical model based on the Riesz fractional operator to discriminate plate detection under various conditions such as difficult lighting conditions, bad weather, poor image quality, complex backgrounds and distortions. Since the proposed model was mainly used for recognizing edge information etc. in license plate images, the performance of text recognition automatically improves. This model performs a convolution operation that increases the fractional derivative of each input image, increasing the edge strength. A comprehensive study of local patterns used to detect contours has been performed.
3) Juan Yepes et al. (2019) → In it, the authors proposed a plate-localized neural network thatrelies on reverse residue structures and used it for feature extraction. They separated the canonical folds of the classification layers by depth wise separable folds.The authors proposed a deep learning solution to improve the accuracy and performance of automatic license plate recognition systems.
4) Meeras Salman, Shemarry et al. (2019) > The main focus of this work is to recognize license plates under various conditions such as distorted, foggy, low-contrast, and dusty. They proposed a multilevel augmented local binary descriptor pattern to capture features to which a Gaussian preprocessing filter with adaptive histogram equalization is applied. The extracted features are sent as input to a machine learning classifier for license plate recognition.
5) Md Yeasir Arafat et al. proposed Automated Vehicle License Plate Recognition (AVLPR)in 2020. Primarily, the computation uses a combination of gray scaling and arithmetic dilation, extracts features based on horizontal and vertical density, and uses Gaussian smoothing to minimize noise and improve efficiency.
6) Chris Henry et al. proposed Automatic License Plate Recognition (ALPR) in 2020. They tested the system to work with multinational license plates. To achieve this, YOLO was used. The proposed methodology is divided into three steps: license plate recognition, unified character recognition, and multinational license plate layout recognition.
7) Uma Maheswari V et al. (2020) introduced a directional pattern that detects edges based on the size and orientation of the mask operation.
8) Miguel Molina Moreno et al. (2020) proposed a boosting algorithm based on a deformablepart-based scale-adaptive model. The algorithm automatically scales the training phases by choosing the best features for each scale. This indirectly reduces test detection time. The algorithm uses an empirically constrained deformation model to identify various features of license plates.
9) Song-Lu Chen et al. (2020) proposed CNN-based detector for identifying vehicles and license plates. Even the low-level feature license plate is detected along with the vehicle's high-level features using a convolutional neural network. To obtain task-specific anchor designs with better predictions, we used a feature fusion strategy to improve small-scale object detection performance.

III. MODELING & ANALYSIS

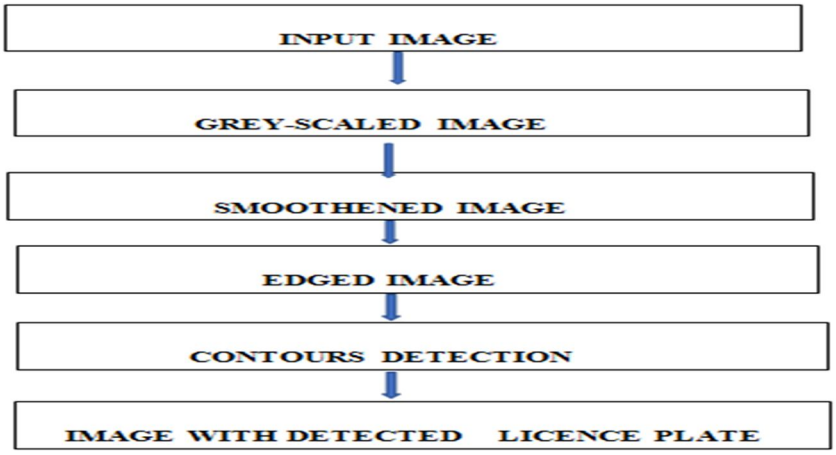

Figure: Block Diagram

The main aim of Moving Vehicle Registration Plate Detection is to detect license plate from a given input image. Here we give image of a vehicle as an input.This process is divided into3 parts - registration plate detection, character segmentation, character recognition.

1) *Registration Plate Detection:* An input image is provided to the system the image is converted in to pixels and each pixel is sent to model to detect the registration plate from it.
2) *Character Segmentation:* Registration plate coordinates are given to the character segmentation method which contains pixels. These pixels are preprocessed and each character of registration plate are segmented by using OpenCV.
3) *Character Recognition:* To recognize these characters a neural network model is trainedwhich converts input images to digital letters and get stored.

An algorithm is developed which is very efficient to detect registration plate in various conditions. This algorithm helps us to detect the number plate from an input image.

Python is a general purpose language which helps us to write the program to detect the numberplate and recognize it. OpenCV is an open-source library for machine learning, image processing, which has more than 2500 optimized algorithms. It is a great tool for image processing and used to identify the number plate in our project.Python-Tesseract or Pytesseract is an Optical Character Recognition (OCR) tool for python.

It will read and recognize the textin images, registration plates etc. Here we will use the tesseract package to read the text from the given image.

It will automatically recognize text in vehicle registration plates.The key advantage of optical character recognition(OCR) technology is that it simplifies the data entryprocess by creating effortless text searches, editing and storage.

IV. WORKING

1) As we see in the flow chart, we first give input image to our system which is an image of vehicle and we resize this input image's width to desired number of pixels.
2) This input image is converted into the grey-scaled image and to remove noise from theimage we convert grey-scaled image to smoothened image.
3) To detect the edges of the smoothened image we are forming an edged image.
4) We will find the contours from the formed edged image and we will sort those identifiedcontours.
5) After finding the contour with four sides and cropping the rectangular part identified asregistration plate or number plate.
6) Finally we will extract the text from the image of the cropped registration plate and itwill be displayed as output.

V. ADVANTAGES

Improved security and prevention of crimes such as auto theft: Security teams and agencies would rather prevent crimes in the first place than catch criminals who commit crimes. When cameras are constantly installed in high-risk areas, people are less likely to commit crimes, making it harder to escape police attention. It's difficult, if not impossible, to hide from things like license plate recognition systems while you're out and about. This means that criminals have less chance of escaping. Everyone in the community is happy to see crime levels go down,and adding cameras is one way he achieves that.

Provide better evidence and investigative tools: Similar to video surveillance systems, licenseplate recognition systems for moving vehicles can provide details of when someone was at your location, whenever you need it. Images captured by this camera can be used as evidence and provide valuable information that can be used in investigations. It's easy to prove when the vehicle in question was on your premises and is all the hard evidence you need.

VI. DISADVANTAGES

The main disadvantage is entrance and exit management system: the key to how far the licenseplate recognition system can be applied in the entrance and exit management system lies in therecognition rate. Although the pixels of the surveillance camera have been greatly improved, the recognition effect of the license plate recognition system on the stained license plate is notvery good.

In addition, due to the diversity of the collected license plate images and the influence of many factors, such as smoke and fog, rain and snow, different angles of sunlight and so on, the quality of some license plate images varies in varying degrees. In general, the background of the collected image is very complex.

The location of the license plate in the image is often not fixed, and the size of the license plate is also different. Moreover, the lightsand body advertisements will also interfere with the recognition, thus affecting the recognitionrate of the license plate.

VII. APPLICATIONS

This system helps applications such as the assistance in the detection and identification of stolen vehicles, access control to some exclusive places, etc. On roads, it is used to identify thecars that are breaking the traffic rules. In security, it is used to capture the license plates of thevehicles getting into and out of certain premises. In parking lots, it is used to capture the licenseplates of the cars being parked.

VIII. CONCLUSION

Finally, we conclude that the main focus of this research project is to extensively experiment with image segmentation and character recognition problems within license plate recognition frameworks and find alternative solutions. Three main principles are involved.

1) Finding and extracting the license plate area from a large scene image is very important.

2) We need to extract alphanumeric characters from the license plate area.

3) Finally, send it to the OCR system as input for recognition.

To read the license plate number and correctly identify the vehicle, it is obviously necessary toidentify the license plate number in the scene image provided by the capture system (such as video or still camera).

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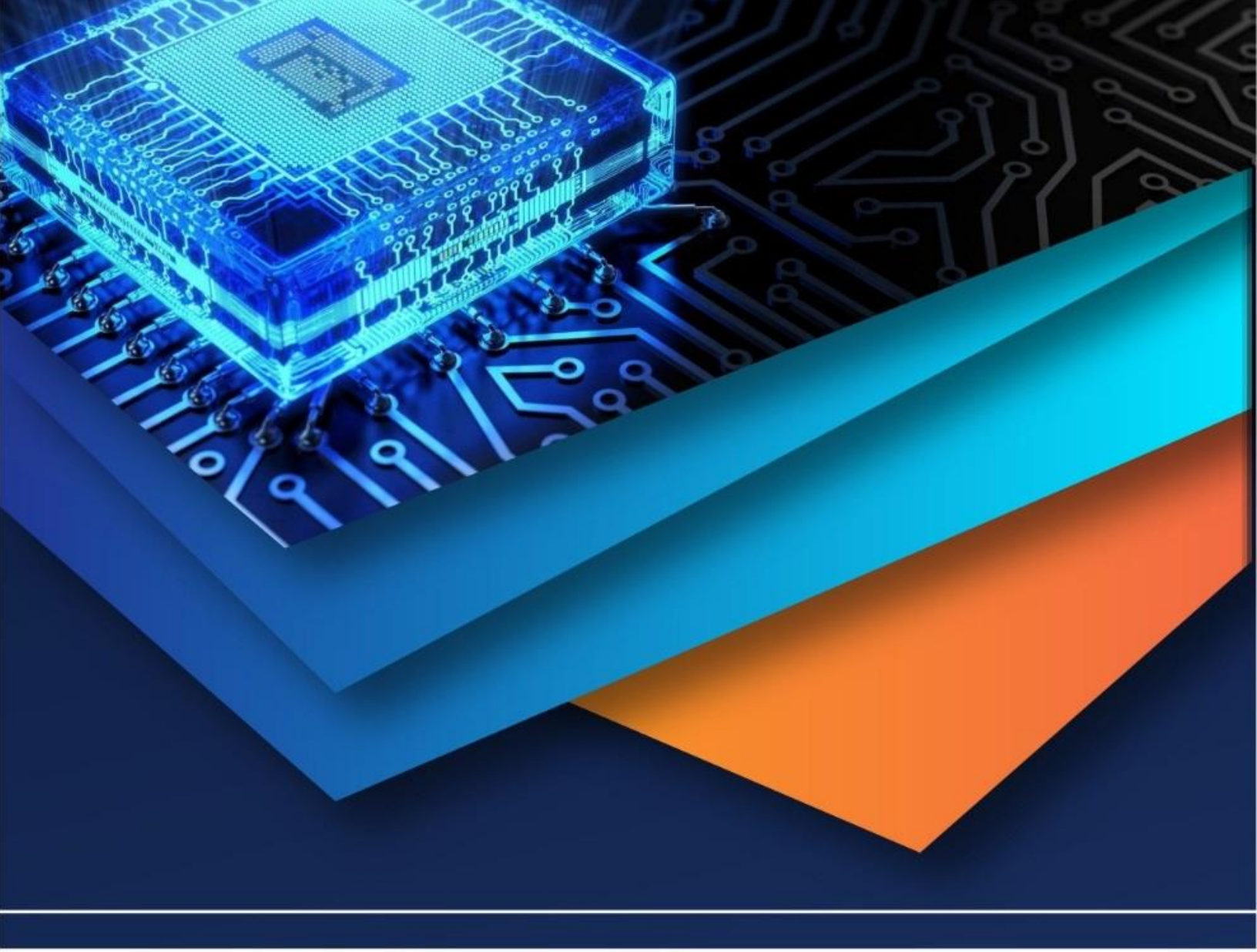

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