AUTOMATIC LICENSE NUMBER PLATE RECOGNITION SYSTEM

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Abstract: Every country now has a serious issue with traffic regulation and vehicle ownership identification. Identifying the driver of a car that breaches traffic laws or goes too fast can be challenging at times. Due to the possibility that the traffic official may not be able to obtain the vehicle number from the moving car due to the speed of the vehicle, it is impossible to catch and penalize those types of offenders. Therefore, one of the solutions to this problem is to develop an automatic number plate recognition (ANPR) system. Today, a variety of ANPR systems are accessible. Despite the fact that these systems use various approaches, the work is still quite difficult because to things like the vehicle's rapid speed, non-uniform number plate, and language. The total rate of recognition can be significantly impacted by the quantity and type of lighting. Most systems function with these restrictions. In this work, various ANPR strategies are described while taking into account processing time, success rate, and image size as criteria. An ANPR expansion is proposed at the end of this work. Artificial Neural Network (ANN), Character Segmentation, and Automatic Number Plate Recognition (ANPR) image segmentation, optical character recognition, and license plate analysis**.**

***Index Terms* - Automatic Number Plate Recognition (ANPR), Artificial Neural Network (ANN), Character Segmentation Image Segmentation, Number Plate, Optical Character Recognition.**

I. INTRODUCTION

One of the most efficient ways to keep an eye on moving vehicles in recent years has been automatic license plate recognition. It can be utilized in a range of open spaces for some tasks like enforcing traffic safety, automatic toll text collection, car park systems, and automatic vehicle parking systems. An ANPR algorithm typically includes these four steps: 1. The car was photographed Identifying the license plate 2. character analysis, segmentation, and recognition of characters. As shown in Fig. 1, the first step, photographing the car, seems to be fairly straightforward but is actually very difficult since it is extremely difficult to snap a picture of a moving vehicle in real time so that none of the motion blur or other artefacts are visible. One should disregard the license plate. Nowadays, a lot of technologies can detect and recognize number plates in under 50 milliseconds. To successfully complete the fourth step, the third and second phases must be able to recognize the vehicle's license plate and tell apart each character.

II. LITERATURE REVIEW

• Supervised K-means algorithm

The characters are first divided into subgroups using the supervised K-means machine learning method, and then these subgroups are further categorized using the Support Vector Machine (SVM), which increases accuracy by identifying hazy license plate photos. Due to the camera angle, vehicle speed, and ambient light and shadow, this method will be able to distinguish between obstacles in character recognition. The camera records dim, indistinct images of the characters' is utilized for regression and classification because of its excellent performance and high accuracy. Different classes of samples must be able to be classified by multi-

classification SVM classifiers. Large sample sizes increase the effort of SVM classifiers, which has an impact on accuracy. Using supervised K-means, it is simple to classify difficult-to-recognize characters. Using SVM is additionally used to categorize the character of subgroups and to lower the character class sizes, both of which lessen the number of SVMs and their entanglement.

- KNN Algorithum

The KNN method, which is used to categorize characters from license plates, is the subject of research. A camera with image processing positioned on a roadway evaluates the feed it receives while recording photographs of the moving traffic there. A number plate's contours are calculated as though they were valid characters, coupled with their size, and then plates are split from the contours that were found. The KNN method is used to classify each contour. A new set of training data including 36 characters, including 26 alphabets and 10 numeric digits, is used to train the KNN algorithm. On previously segmented characters, the algorithm is evaluated and contrasted with character recognition methods like artificial neural networks.

- Deep Learning

For the training process, deep learning is used. Extensive machine learning appropriately categorizes the plates. The first half of this system uses HOG to pre-process and extract characteristics, while the second component classifies each number and letter to examine and separate each one that appears on the car's number plate. The classification performance of the Extreme Learning Machine (ELM), a quick supervisor learning system that uses single hidden layer feed forward networks, is comparable to that of the SVM. Thai characters on number plates are recognized using ELM as a classifier and HOG to extract significant features from the plate. The ELM system is employed due to its quick speed and dependable teaching and testing principles.

III. METHODOLOGY

Image Acquisition: A camera mounted on a fixed pole or a moving vehicle is used by the ANPR system to take a picture of the license plate. Pre-processing: To improve the quality of the acquired image, pre-processing techniques are used. Among these methods are image scaling, rotation, cropping, and noise removal. Identification of the location of the license plate inside the photograph is the task of plate localization. Techniques including edge detection, morphological procedures, and color-based segmentation are used to accomplish this. Character Segmentation: Following the identification of the plate region, the characters are divided into distinct groups using segmentation methods including linked component analysis and projection-based segmentation. The most important phase in ANPR is character recognition, which involves identifying the segmented characters. Numerous methods, including template matching, neural networks, and optical character recognition (OCR), can be used to accomplish this. Post-processing: To improve the system's accuracy after the characters have been identified, post-processing techniques including character verification, error correction, and character filtering are used..
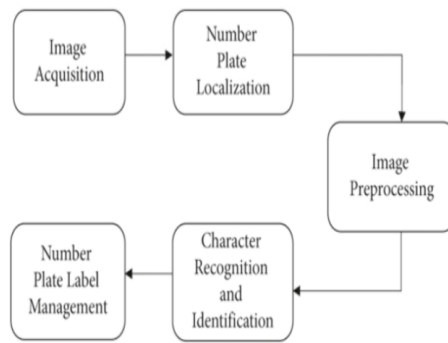
- **Problem Statement**

There is now an increasing demand for devices or systems that would minimise human to human interactions in order to reduce the risk of infection, whether from covid or any other disease, as a result of the emergence of covid and the growing significance of social distance and minimising human to human interactions. Additionally, increasing the amount of work that needs to be automated will make it more efficient than using human labour. Such systems have become more prevalent in forms such as cashless or online payments, online ticket booking, online purchasing, etc. However, one industry that is almost entirely run by people and is severely plagued by disorganisation and inefficiency is building parking.

IV. LIMITATION OF THE CURRENT SET-UP

The following list of significant systemic shortcomings includes some. These also impeded the realisation of our vision, and we plan to do away with the majority of them in subsequent iterations.

- Low-quality files, occasionally due to the use of a traditional gray scale sensor but frequently as a result of the plate being too far away

- Images that are blurry, especially as they move.

- Dim illumination and low contrast brought on by overexposure and shadow reflection.

- A tow bar or other object that obscures (part of) the licence plate, or the plate is untidy.

- Examine licence plates that, due to campers, trailers or other towed equipment, are different at the front and the back.

- The camera's angle of view varies as the vehicle's lane changes during number plate.

- Another font that is favored for vanity plates.

- A lack of cooperation among nations or states. The same number but a distinct pate design can be found on two cars from separate nations or states.

- While some of these issues can be resolved by software, the hardware side of the system is primarily responsible for finding solutions.

3.1 Description of the Preffered System

Program Specification

The system can be separated into four primary sections: character segmentation, character recognition, number plate localization.

3.2 Pre-Approach

Change-Over a colour image to black and white: This action turns an imported colour image into a grayscale version, which is then displayed in the genuine picture Plate.

Gaussian Filter: In particular filtering technique smooths the imported image by eliminating its noises. This may improve the character recognition step's success rate.

3.3 Plate Localization

Contour spotting: Apply the contour spotting method to the imported image to strip out everything but the edges. Following the application of this algorithm, the edges of the original image that will be shown in the genuine picture of the plate converted to white, while rest of the space will be converted to other dark colour.

Panel Isolation : move a predetermined slide window to seclusion the number plate from the given input. The remote part of input picture would appear in the locating plate after moving around the image to discover the region with the most white pixels.

Dimensions and material of Number Plates: reduce the size of the remote part image of the vehicle number by trimming the contour parts.

3.4 Letters based image Segmentation

Picture based binarization Obtain the original report sub-image with the scaled number plate region in the same size and location, change the sub-picture to a 0-1 binary form, and display the result in the remote panel.

To determine how many white pixels there are column per size, use vertical projection to the binary sub-image. Using information from a vertical projection, character segmentation separates a binary sub-image into various pieces. All of the divided portions are displayed in the segmentation panel, and each part is designed to contain a single character.

3.5 Character Recognition

Recognition of words/numbers Apply the character recognition method on the split portions of the portioning of the picture to identify the words present there and change the words to ASCII.

I.   ALGORITHM FOR RAPID PLATE RECOGNITION

4.1 Start

- **Identify moving cars.**
- **Camera input.**
- **Photograph the front and back of the vehicle.**
- **Apply the Grab Cut Algorithm to the image.**
- **If Grab Cut fails:**
- **Binarization of a fresh image.**
- **Vertical projection of the acquired image**
- **Analysis of the binary image projection.**
- **Take out characters after analysis.**
- **Skeletonize each character individually.**
- **Use OCR to recognise characters.**
- **Number plate value output**

END
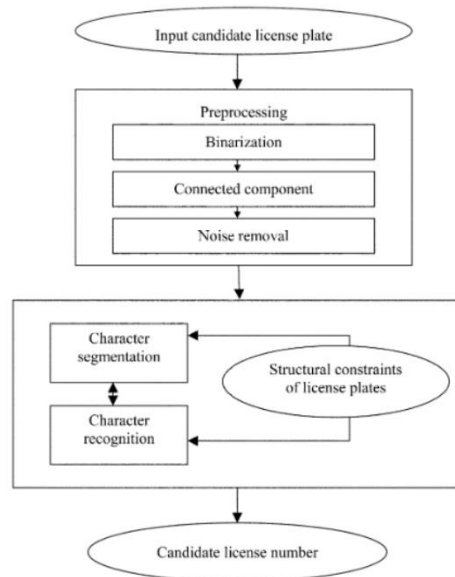
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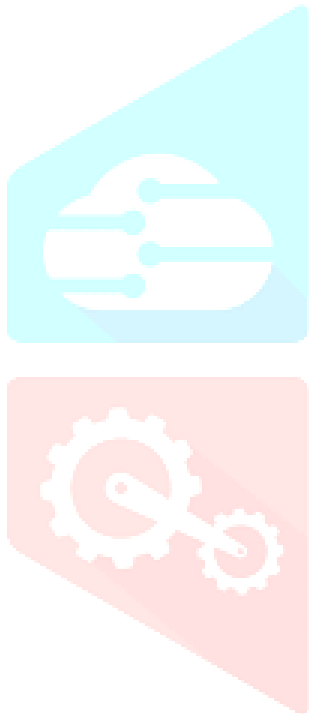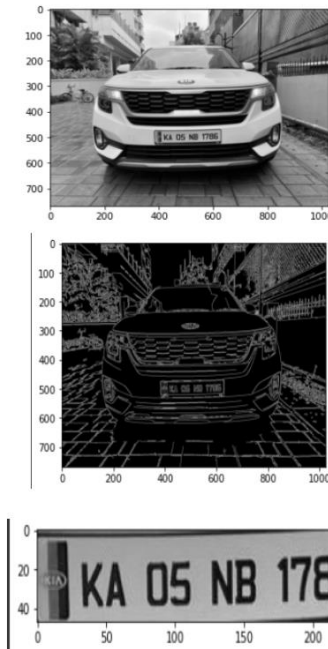
V. CONCLUSION

Future Work

Convolutional neural networks and recurrent neural networks are two examples of deep learning techniques that can help ANPR systems become more accurate. These methods' application to ANPR systems can be studied in more detail in the future.

Performance in Real-Time: By creating algorithms that can analyse photos and extract features in Real-Time, ANPR systems' Performance in Real-Time can be increased. Real-time ANPR systems that can process photos in real-time can be the subject of future research.

Edge Computing: Through data processing at the network's edge, this innovative technology has the potential to enhance the performance of ANPR systems. To increase the efficiency and precision of ANPR systems, future research can examine the usage of edge computing.

Support for several languages: ANPR systems ought to be able to read licence plates written in various tongues. Future studies can look towards creating ANPR systems that can read number plates written in other languages.

Summary

Due of the several stages required, it is clear that panel recognition is a difficult method, and that 100% overall accuracy is currently not attainable because each phase depends on the phase before it. The effectiveness of ANPR is impacted by various elements such as various lighting panel words , varied typeface very important the backdrop colour. Some systems can only function under these specific circumstances, and they might not produce accurate results under challenging circumstances. It is summarised that some of the systems were created and used for particular countries. Table 3 excludes the systems in which the country is not mentioned. It is clear that relatively few ANPR were created specifically in our country. Therefore, there is a lot of room to develop such a methods from which our nation can be advanced. The scholars working on these advances can benefit from the thorough analysis of current trends and potential developments in ANPR provided in this paper.

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