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Research Paper on Vehicle Number Plate Identification Web Application.

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Abstract: *Number plate recognition is an advanced image processing technology that utilizes the number plates of vehicles to identify and distinguish them. Its primary aim is to create an efficient and automated system for authorized vehicle identification by analyzing the vehicle's number plate. This system can be effectively employed at secure entry points, such as military zones or high-level government facilities like the Parliament or Supreme Court, to enhance security control measures. The developed system operates in several steps. Firstly, it detects the presence of a vehicle and captures its image. Then, it isolates the region containing the number plate and converts it into grayscale for further processing. Subsequently, the system extracts the number plate from the image, excluding any unnecessary information. Finally, an algorithm is utilized to accurately recognize and interpret the alphanumeric characters present on the number plate, including both digits and letters.*

Keywords: Optical character recognition, Detection, identification monitoring, OPEN CV

I. INTRODUCTION

In today's world, the number of vehicles has significantly increased worldwide, highlighting the need to effectively track and monitor them. Manual tracking of vehicles is time-consuming and prone to errors. However, with the advent of computer-based systems, it is now possible to automate vehicle tracking and achieve higher accuracy. One such technology is the vehicle number plate recognition system, which utilizes video captured by cameras to identify and extract number plates.

The system employs various methods, including plate extraction, segmentation, and character recognition, to accurately process the number plate data. It combines both hardware and software components, utilizing the number plate information and converting it into an image. This technology can be implemented at gate entrances, enabling efficient monitoring and management of vehicle access.

For optimal performance, it is crucial that the captured images of the number plates are clear and visible. High-resolution images are preferred to ensure accurate extraction and recognition of the number plate information. In a country like India, with its dense population and a large number of vehicles, there is a significant need for accurate vehicle detection through traffic management systems. The proposed system can be applied at college entrances and highly restricted areas.

When a vehicle passes through the system, the video feed is captured and processed using OpenCV software, converting it into individual images for analysis. This data can then be utilized to retrieve information such as the vehicle owner, place of registration, address, and more. The system is implemented using Python programming language and its performance is evaluated using real-world images. Experimental results demonstrate that the developed system effectively detects and recognizes vehicle number plates, showcasing its practical applicability.

II. PROBLEM STATEMENT

The continuous expansion of local, urban, and national road networks in recent decades has necessitated the efficient monitoring and management of road traffic. In line with this, the objective of this project is to develop a model capable of accurately recognizing and identifying number plates from images.

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One of the main challenges in number plate recognition arises from the diverse characteristics of license plates across different countries. These variations include differences in numbering systems, colors, language of characters, font styles, and plate sizes. Therefore, further research is required to address these variations and enhance the effectiveness of the proposed system.

The primary focus of this project is to explore and understand the implementation of Convolutional Neural Networks (CNN) in the context of number plate recognition. By leveraging the power of CNNs, the aim is to develop a robust and efficient system that can accurately analyze and interpret number plates from various sources. The system will need to handle the challenges posed by different license plate styles and configurations, thereby contributing to improved traffic management and monitoring capabilities.

III. LITERATURE REVIEW

During recent years, significant advancements have been made in the development of machine learning algorithms. With the growing number of vehicles, the utilization of machine learning algorithms for number plate recognition offers several benefits, such as reduced manual efforts and decreased error rates. Machine learning algorithms exhibit high accuracy levels, making them a valuable tool in this domain.

The proposed system aims to detect and recognize vehicle license plates from user-uploaded files. Additionally, it can perform real-time number plate detection by utilizing the device's camera with just a simple click. Once a license plate is detected and recognized, the system will display the information to the user. The front-end of the system employs HTML, CSS, and JavaScript, while the back-end is powered by Python. The Django framework is utilized, and MySQL is employed as the database management system.

To implement the system, OpenCV and Python-tesseract libraries are utilized. Python-tesseract serves as a wrapper for Google's Tesseract-OCR Engine, enabling the system to read various image types. It can also be used as a standalone script to invoke Tesseract for reading images.

IV. EXISTING SYSTEM

The existing system for determining vehicle details often relies on extensive human interaction, leading to potential human errors. For instance, in the case of e-challans issued by traffic officials, CCTV cameras continuously record traffic footage. If a motorist violates any traffic rule, the incident is recorded in the footage. The police then manually extract the number plate from a screenshot captured from the CCTV footage, and the offense is registered in the records. This process requires significant human resources, which can be reduced by employing an algorithm for automated number plate recognition.

V. PROPOSED SYSTEM

The proposed system begins with the collection of a database, obtained from Kaggle.com, a trusted platform renowned for its diverse and reliable datasets. This dataset includes number plates from different states and encompasses a wide range of registration number variations. The next step involves data preparation using the Kaggle dataset.

ALGORITHM :

Step 1 : Get the image from User

Step 2 : Convert to Gray image gray_

```
img = cv2.cvtColor(plate, cv2.COLOR_BGR2GRAY)
```

Step 3 : Find contours of Image

```
num_contours,hierarchy=cv2.findContours(thresh.copy(),
cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_NONE)
```

Step 4 : If num_contours: then

```
contour_area = [cv2.contourArea(c) for c in num_contours]
max_cntr_index = np.argmax(contour_area)
max_cnt = num_contours[max_cntr_index]
max_cntArea = contour_area[max_cntr_index]
```

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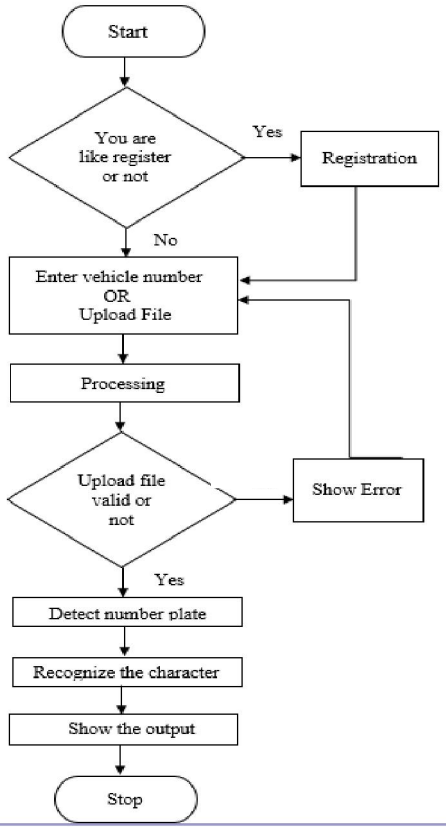
```
x,y,w,h = cv2.boundingRect(max_cnt)
 if not ratioCheck(max_cntArea,w,h):
 return plate,None
final_img = thresh[y:y+h, x:x+w]
 return final_img,[x,y,w,h]
else:
return plate,None
```

Step 5 : Make loop till num_contours and find the text and number in image and return string of alphabet for i,cnt in enumerate(num_contours):

```
min_rect = cv2.minAreaRect(cnt)
 if ratio_and_rotation(min_rect):
x,y,w,h = cv2.boundingRect(cnt)
plate_img = img[y:y+h,x:x+w]
 if(isMaxWhite(plate_img)):
clean_plate, rect = clean2_plate(plate_img)
 if rect:
fg=0
 x1,y1,w1,h1 = rect
x,y,w,h = x+x1,y+y1,w1,h1
plate_im = Image.fromarray(clean_plate)
 text = pytesseract.image_to_string(plate_im, lang='eng')
 return text
```

VI. FLOWCHART



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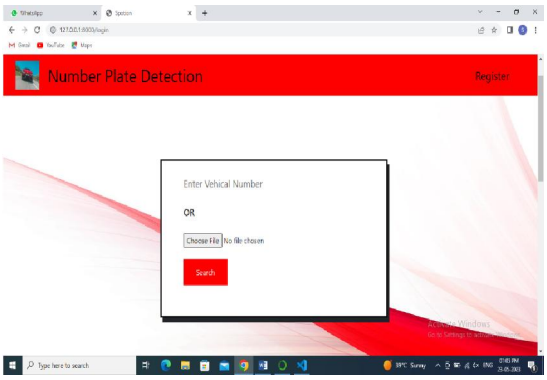
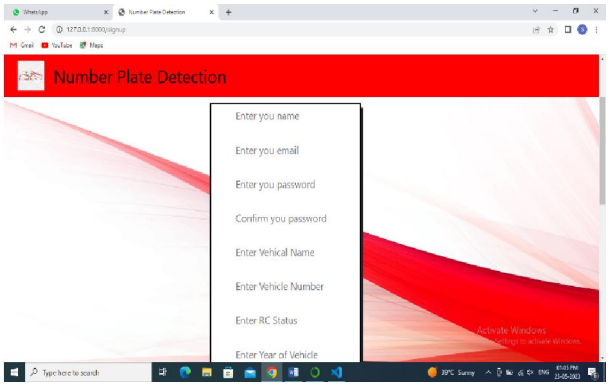
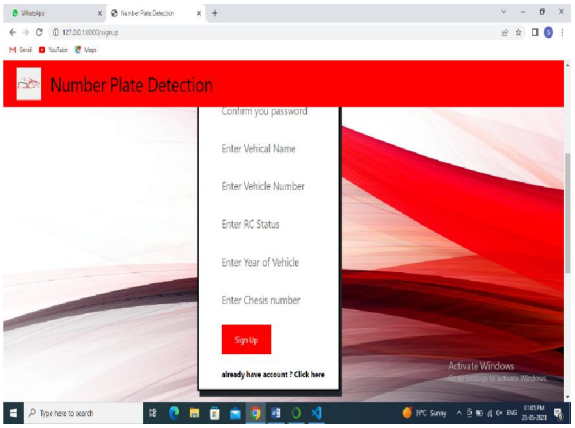
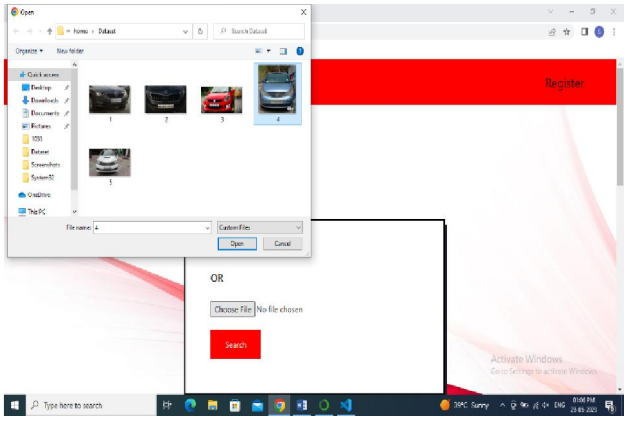
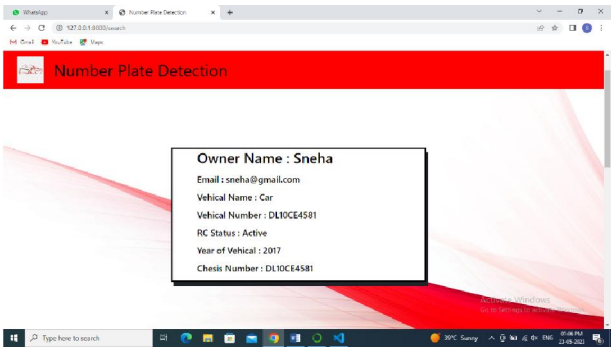
VI. RESULT:

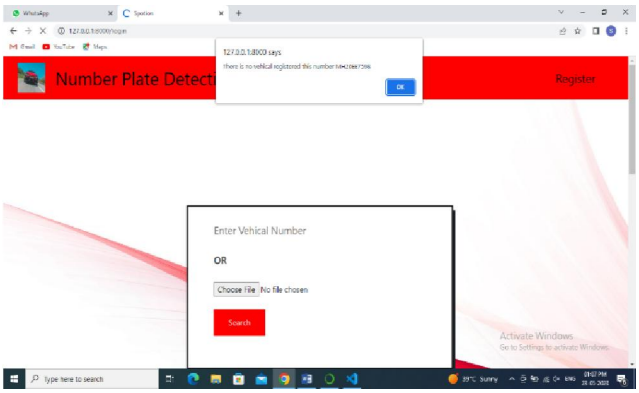












VII. CONCLUSION

In conclusion, machine learning algorithms have proven to be highly effective in vehicle number plate recognition. The system's performance was evaluated based on various parameters, including the recognition of individual characters and the success ratio of character and digit recognition from a group of characters.

The results obtained demonstrate that number plate recognition performs optimally when high-quality cameras are used for scanning the plates. The use of low-quality cameras can degrade performance and potentially lead to misclassification of characters.

The focus of this project was on a two-step process: license plate detection and extraction, followed by Optical Character Recognition (OCR) of the license plate. The implemented program can be applied in various applications where license plate recognition is essential, such as parking management systems and traffic control.

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While the current application is suitable for smaller-scale use, such as parking areas or specific traffic lanes, further enhancements and optimizations can be made to expand its capabilities for broader implementation. Continued research and development in this field will contribute to more accurate and efficient vehicle identification and tracking systems.

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