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THE EVOLUTION AND IMPACT OF AUTOMATIC LICENSE PLATE RECOGNITION (ALPR) TECHNOLOGY

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ABSTRACT :

Automatic Number Recognition (ANPR) is one of the technologies used for vehicle identification and it provides all the information about the owner of a particular vehicle. This process usually consists of three steps. The first step is to locate the license plate, regardless of the size and orientation of the license plate. The second step is to segment the characters and the last step is to recognize the characters from the license plate. Thus, this project reveals the basic idea of various algorithms needed to perform character recognition based on a vehicle license plate. This feature of the algorithm mentioned above helped achieve faster number plate character recognition. This character recognition process consists of steps such as image processing, defragmentation, resizing, and character localization to be performed on the image. Today, security seems to be the main concern of organizations, requiring automation of security measures. However, existing solutions often fall short in real-world scenarios and are often based on various limitations. This project investigates license plate recognition using the Python programming language and recognizes the urgent need for strong security measures. The project uses OpenCV to recognize license plates and Python Tesseract to extract characters and numbers from these tiles. In addition, it introduces a flexible and efficient Automatic Number Recognition (ANPR) system built on the state-of-the-art YOLO object detector. This system aims to address the limitations of current solutions and improve the reliability of number plate recognition in diverse and difficult environments.

KEYWORDS: ANPR, Vehicle Identification, Localization, Segmentation, Python, OpenCV, Tesseract, YOLO, Image processing.

INTRODUCTION :

Cruisers have continuously been the essential mode of transport in creating nations. In later a long time, there has been a rise in cruiser mishaps. One of the major reasons for fatalities in mishaps is the motorcyclist not wearing a defensive head protector. The foremost predominant strategy for guaranteeing that motorcyclists wear protective caps is activity police physically checking motorcyclists at street intersections or through CCTV film and penalizing those without protective caps. But, it requires human mediation and endeavors [1].

Number Receipt (LPR) plays a critical role everywhere in this active world as the number of vehicles is increasing day by day. Taking vehicles, violating work rules, and also entering tight spaces expand directly, so this action is a confirmation of the promotional code planned for the dam. In the basic steps of the handle, such as the location of the number plate, the distribution of characters, and the recognition of each character, the division is professional, because the accuracy of the recognition depends on how the division is made. [2].

Vehicle location and following could be a major and challenging issue in numerous genuine time vision executions for example within the zone of reconnaissance, exploring vehicles, and programmed self-decision robots. Video assessment in an ineffective environment, particularly for people groups and engine vehicles, is right now the foremost requesting region of inquiry in real-time vision. The key step for following a vehicle is to check and recognize[3].

This article shows you how to convert images to text. This article describes several functions for extracting text from an image file (jpeg/png) and creating a separate text file containing the data extracted from the image file. We consider the weaknesses of various image processing applications and try to overcome them at different levels in image processing and analysis.. [4].

Locating and recognizing vehicle number plates (LP) is a key technology for most vehicle mobility applications. It is a very popular and intensively researched topic in the field of image processing. Many methods, techniques, and algorithms have been developed to find and understand LP. However, due to the nature of LPs, numbering systems, colors, sign languages, fonts, and sizes vary from country to country. [5].

LITERATURE SURVEY :

Yoshihiro Shima, 2016 Suggested that mechanized Number Plate Acknowledgment may be a strategy including picture handling which is utilized to distinguish a vehicle by perusing its number plate. A proposed strategy can extricate the number plate locale within the picture captured from its raised conclusion at different car separations. The framework analyzes the input picture and recognizes the area of the number plate. [6].

Thanh-Nga Nguyen, et al., 2018 Suggested that permit plate acknowledgment could be a frame of a clever transportation framework. Even though, there have been numerous thinks about plate location, character division, and character acknowledgment, numerous challenges have remained. Convolutional Neural Organize (CNN) has proven to be an effective classification device to attain state-of-the-art results on different acknowledgment assignments [7].

Dening Jiang, et al., 2012 Suggested that the framework has color picture inputs of a car and the yield has the enrollment number of that car. The framework has three primary steps to induce the specified data. Those are plate localization, character division, and character recognition. To begin with, the number of plates is extricated from the first picture, at that point the characters from it are disconnected, and at last, each character is recognized [8].

Derby, P . 2012 Suggested that recent Advances in camera, database, and optical license plate recognition technologies have contributed to the emergence of a new hybrid surveillance technology, Automatic Number Plate Recognition (ANPR), also known as Automatic Number Plate Recognition (ALPR). Since its inception, ANPR has been used in a variety of applications, from tolling and traffic management to access control, counter-terrorism, and more recently general policing. Until now, the use of vehicle license plate recognition as a law enforcement technology has received little attention from surveillance investigators and criminologists. [9].

Merola, L. et al., 2014 Suggested that the the use of police license plate recognition (LPR) technology is becoming more common. LPR can be used for many purposes, from tracking stolen vehicles to more sophisticated monitoring and predictive functions. The current study does not examine community support for this technology, although it may affect police legitimacy. Results from the first utility LPR study are presented and multinomial logistic regression models of citizen technology support are developed. Regression results show that several factors significantly predict citizen support for LPR use, including increased trust in the police and belief that LPR information is public information. [10].

PROPOSED SYSTEM :

The proposed system overcomes the above Disadvantages and apart from them has the beneath specified benefits.

1. Automated framework requiring less labor.
2. Number is displayed and with some modification can be stored in a database or be search processed.
3. The featured number plate is automatically cropped and displayed separately

Working of the Proposed Methodology

- In this project, a prototype of Digital Image processing and OCR are executed using different Python libraries such as OpenCV 4.2 and py-tesseract respectively.
- The primary camera of the computer is accessed and the image is clicked after any key is pressed when the vehicle is in the frame. The input image is then fed into the system, for further processing.
- The Morphed image the input image and the morphed image is then displayed when any key is pressed. The Morphed image is obtained after morphological transformation.
- After pressing one more key, the segmented plate is displayed from the morphed image in a new window which is performed using contour extraction on the morphed image.
- The final step involves performing optical character recognition on the segmented plate using the Tesseract engine and a library known as Pytesseract in Python. The vehicle number is displayed on the terminal and the plate region is highlighted in a new image in a new window, after pressing one more key.
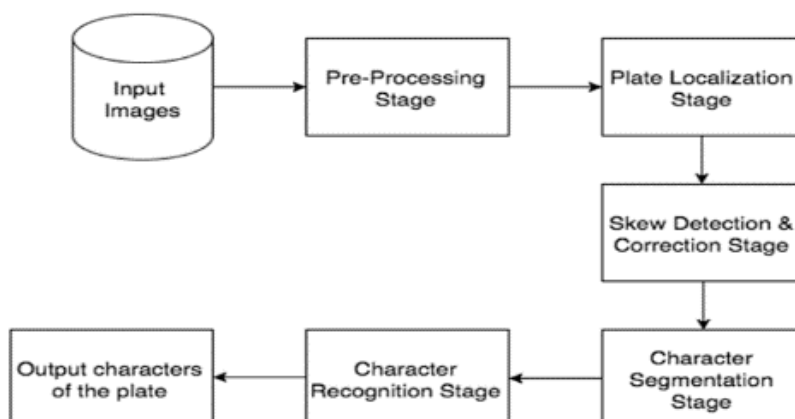
ARCHITECTURE DIAGRAM

Figure 1 Architecture diagram

MODULE DESCRIPTION

IMAGE CAPTURE

The picture of the car was taken using a high-resolution camera. One of the most coveted items is an infrared camera. To capture number plates, you may roll or pitch the camera. In picture editing, preprocessing is a collection of techniques used to improve its appearance. Almost every computer's inventive and prescient system has this component. Preprocessing for the current machine consists of the following two steps: If the picture size from your digital camera is too large, it may slow down your computer. It has to be rescaled to a reasonable factor. Image acquisition using IR or photographic cameras may result in raw images or images encoded into a variety of multimedia formats. Most of the time, these pictures are taken in RGB mode, which has three channels.

NUMBER PLATE EXTRACTOR

It is greatest vital method in the Number Plate Recognition System. In this system, we
follow extraordinary methods on photographs to realize and extract number plates. The next step is to extract the number plate number using a binary image:

1. From a binary picture, four connected locations are sought.
2. The width-to-height ratio is compared to the ratios of linked points.
3. The Number Plate area is removed from the image.
4. Extraction of a license plate and its transformation into a new one is completed. To continue processing, the extracted number plate is handed on to the next component. This method is fast and efficient, using less time and memory to run. As a result, we've included this strategy in our plan. Segmentation of a Character In this section, the number plate picture is further processed to remove superfluous information. Using character segmentation, just characters of numbers are left on the retrieved number plate. This was also accomplished by matching width-to-height ratios on extracted number plates with contours.

OWNER DETAILS:

This is a time-honored method that requires a large database to store tens of thousands
of plates and characters that have been gathered as samples. A method for detecting
number plates by sensing the edge of the plate If, on the other hand, our suggested system is required to recognize number plates, a binary image of the plate is generated. The next step is to extract the number plate numbers using a binary image: 1. From a binary picture, four connected locations are sought. 2. The width-to-height ratio is compared to the ratios of linked points. 3. The Number Plate area is removed from the image. 4. Extraction of a number plate and its transformation into a new one is completed. After that, the removed number plate is sent to the next problem for further treatment. This approach is quick, requires little execution time and memory, and has a high efficiency ratio. Our assignment is a good example of this. Segmentation of a Character This module also performs image processing on retrieved number plate data to remove any extraneous information. After segmentation, the number plate contains just those characters that pertain to the license number. As a last step, this module also compared retrieved broad variety plate data with emission testing and insurance information to width peak ratios found in this module.

RESULT & DISCUSSION

When the plate is first detected, the script performs as follows:
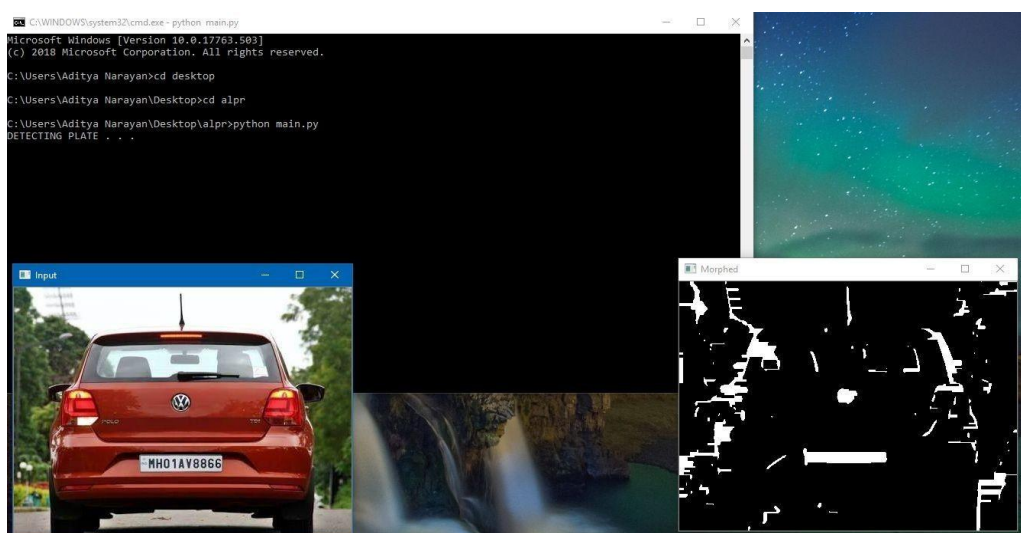
FIGURE 2 Plate is first detected

Figure 1. A plate is a rigid, flat object typically made of metal, glass, or ceramic, used for serving or containing food. It can also refer to a thin, flat sheet or layer, such as a geological or technological plate. In technology, a plate can denote a component or structure with specific functions.

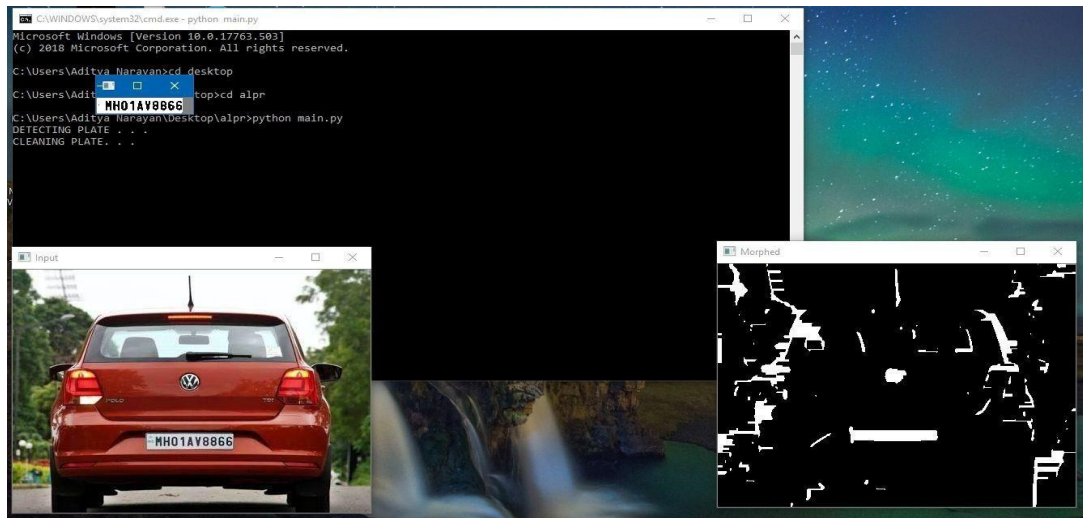**When the plate is extracted in a separate window:**

FIGURE 3 plate is extracted

Figure 2. A license plate, commonly known as a license plate, is a metal or plastic sign affixed to a vehicle with a unique combination of numbers and letters. It serves as identification for legal and administrative purposes, facilitating vehicle registration, ownership, and law enforcement

The final output on the terminal and the featured plate is highlighted as:
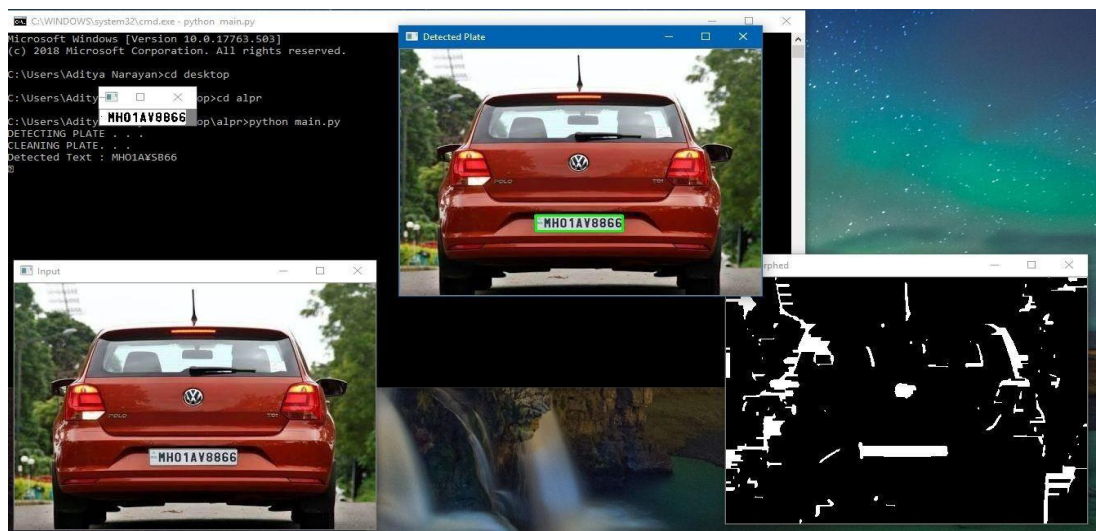

FIGURE 3 final output

Figure 3. The terminal refers to a device or interface where users interact with a computer system to input commands or access information. The featured plate, often highlighted, could denote a significant or highlighted item within a set or collection, drawing attention to its importance or relevance in a particular context.

CONCLUSION:

This project mainly performs four tasks. The first task is to enter an image of the car, and this is done using the webcam of the prototype computer. As the image is embedded, the image quality improves. Resolution and thresholds are improved. The image is limited to a fixed image frame size. After enhancement, the image is processed to segment the license plate based on a mathematical model of a rectangle of the entire image. The segmented disk will appear in a new window with all characters in binary format. The advanced segmented disk is then processed for OCR or OCR to segment all the characters in the image as text, which can then be stored in a database or displayed as in this prototype. The project is designed so that we can understand the technology used today in automatic license plate systems and OCR systems used in most developed countries such as Germany, France, Singapore, Japan, etc. It can be seen that security forces all over the world have trouble finding or registering vehicles to find the culprit. It is also seen that technology can help us a lot in this situation by solving it.

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