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Vehicle Identification and Location Detection at Closed-Circuit Television to Find Vehicles Using OCR and OpenCV

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ABSTRACT:

This project can be used to identify a vehicle's license plate from pictures kept in a database (the information can be obtained from security cameras). In other words, it seeks to identify a car's license plate and then collect data about that vehicle. A government agency collects this data at motor vehicle registration in order to connect the vehicle's owner or user to the vehicle. The registration number, which is often alphanumeric, uniquely identifies the vehicle in the database of the issuing body. Depending on the country and its regulations, these number plates might have varied colors, fonts, and sizes. Automatic vehicle identification is accomplished by number plate recognition. The only way to identify a specific car is via its number plate. Real-time number plate identification is crucial for sustaining both traffic laws and law enforcement. It has numerous application locations; including border crossings, parking lots, and regions requiring high levels of protection. Number plate recognition is intended to automatically identify the number plate from a moving vehicle and then recognize the vehicle number plate. The two main components of automatic number plate recognition are:

1. Vehicle Number Plate Extraction (VNPR).

2. Optical Character Recognition (OCR).

Number plate extraction is the process of identifying a vehicle's license plate and extracting the text from it. After being normalized, the segmented characters are given to an OCR algorithm. The optical character data will finally be transformed into encoded text. Utilizing template matching, the characters are identified. The output must be a string of characters as the end product.

Keywords: Optical Character Recognition (OCR), Closed Circuit Television (CCTV), Vehicle Number Plate Extraction (VNPR), Unique Identification Number (UID).

INTRODUCTION

It has become exceedingly difficult to locate and monitor vehicles used in crimes in recent years. Because they are able to travel by public transportation or their own means of transportation from one location to another. So it is challenging to locate that individual. But these days, every place has been digitalized and is protected by CCTV. We can locate the location of that car using the area code and location ID they provided while establishing the CCTV link. In this application, we must link all of the CCTV cameras to a single database and control its entire functioning. We must utilize technology and certain machine learning approaches to detect the person or vehicle by using the car number plate because it is difficult to identify and store the information (to convert the picture file to alpha-numeric). Since they use the box filter technique, which smoothes the image by making each output pixel the average of the surrounding ones and eliminating details, noise, and edges from images, many applications that were previously introduced and put into use do not produce the best results. The process of transforming an image of text into a machine-readable text format is known as optical character recognition (OCR), and it is one of the two machine learning techniques we are introducing in this study that may yield the greatest results. Your computer will save the scan as an image file, for instance, if you scan a form or a receipt. The words in the image file cannot be edited, searched for, or counted using a text editor.) and Gaussian Blurring (carried out using the cv.GaussianBlur() function. The kernel's width and height should be positive and odd, respectively. Additionally, we must supply sigmaX and sigmaY, which stand for the standard deviations in the X and Y axes, respectively. SigmaY is assumed to be the same as sigmaX if only sigmaX is supplied. If either or both are provided as zeros, they are determined based on the kernel size. Gaussian noise can be effectively eliminated from an image using Gaussian blurring. The key distinction between the Gaussian Blur and Box Filter techniques is that Gaussian filters place more weight on the pixels that surround the central pixel. As a result, pixels located farther away have lower weights. Mean-filter, often known as a box-filter, simply takes the average of all adjacent pixels' pixel values.

LITERATURE REVIEW

This essay demonstrates how a camera initially records a video of a vehicle's license plate. This video is read by our software. During operations, a 10- to 15-second clip is used. The 10-second video consists of 240 frames, or pictures. The video is converted to frames at a frame rate of 24 fps in the second step. The final step, when frames are turned into images, is very important. The opening and closing processes are then finished. To retrieve the car number plate, image processing methods like segmentation, recognition, and localisation have been applied. A sophisticated edge detection method first identifies the image's edges. Following is the use of morphological operators. And in this way, the license plate is identified. [1].

India has a standard format for license plates that includes four distinct codes for each individual vehicle number plate, followed by two state codes, two district codes, and two more state codes. If the color of the number plate and the background are the same, mistakes may be made when locating and recognizing it. Processes including opening and shutting, erosion, and dilatation are applied to images. The assignment is divided into several pieces, including The first colorful image is taken with a camera. The picture is then converted from color to grayscale. to remove noise from an image. The segmentation method is then used to divide the quantity of plates into segments. [2].

Techniques for character segmentation and image processing are utilized to recognize number plates. Given that the high resolution camera can be used to take photos or movies, the output after receiving it as input should be clear. There are four basic steps in this system: In the first step, a video captured by the camera is input. A single standout frame or image is then selected from each of the video's frames. The region of the plate is then retrieved using the edge density and aspect ratio of two features. The segmentation procedure divides and identifies each number on the license plate. Recognition is then finalized in order to accurately and properly identify the numbers on the license plate [3].

This essay illustrates the following techniques: The first method involves preprocessing. The colored input image is changed to a grayscale version in this process, which separates the image into a set number of pixels. The next step is the detection of edges using a clever edge detector, where the edges of the image are recognized to minimize discontinuities. The input image is then dilated using a morphological operator to thicken the number so that it can be easily spotted. The segmented image is one that has been dilated. It functions as though the plate's numbers were acquired individually. The segmentation makes use of an OCR-like template matching method. Finally, the statistics are improved to get a better intended image. In order for the output to be of the highest quality possible, the camera must have a very high resolution [4].

The primary goal of this paper is to use the Restoration technique to find license plates in various environments.

The restoration process is comparable to image enhancement. Image enhancement raises the image's quality. The system used in this article operates as follows: First, a video is recorded using a camera that is fixed in place. With the aid of our software operations, the video is divided into frames after being captured. The video lasts for 10 seconds and has 240 frames or images. After being transformed from frames of video to pictures. On these photos, specific operations are carried out to extract the license plate. On the chosen, several resolution approaches are used.

Image On extracted photos, restoration and contrast enhancement are conducted in order to find number plates. Filtering with an un sharp mask is used to get rid of background noise like rain and fog. An output image including the license plate appears after the noise has been eliminated [5].

In the first step of this study, a picture is shot with a Raspberry Pi camera, video is used as input, and the acquired photo graphs are saved in color JPEG format. The system contains the noise. Grey processing and median filtering are employed to reduce noise. The image is transformed into a grayscale format using grey processing, and noise is eliminated using median filtering. The borders of the rectangular license plate are recognized using a bounding box, and the edge of the car is detected using an edge detector. Segmentation is completed after extraction. The characters on the license plate are divided via segmentation. To identify various characters and digits, OCR is employed. Following recognition, the characters are printed in the form of a.txt file [6].

METHODOLOGY

A security system that relies on camera surveillance must perform the critical task of recognizing a vehicle's license plate. Using some computer vision techniques, we can extract the license plate from an image, and then we can utilize optical character recognition to identify the license number. Here, I'll walk you through the entire process of doing this task. Identify every curve in the picture, each contour's boundary rectangle may be found via With an average license plate, compare and verify the sides ratio and area of each surrounding rectangle. Use image segmentation to discover characters in the image inside the verified contour. Use OCR to recognize characters.

Step 1: Original Image Captured by the CCTV

Figure 1: Original Image Captured by CCTV

Step 2: The input image must first be gray scaled and then blurred using a Gaussian blur in order to reduce noise.

Figure 2: Image Converted by using Gaissian blur Technique

Step 3: Locate the image's vertical edges. The image must be binarized in order to disclose the plate. Apply Otsu's Thresholding to the image of the vertical edge for this. Other thresholding techniques require us to select a threshold value in order to binarize the image, whereas Otsu's Thresholding chooses the threshold value for us. On the threshold image, apply Closing Morphological Transformation. In a threshold image, closing is effective for filling in tiny black spaces between white areas. It makes the license plates rectangular, white box visible. We must locate contours in the image in order to detect the plate. Before identifying contours, it is crucial to binarize and morph the image in order for it to find a smaller number of more pertinent contours. It would appear as follows if you drew all the retrieved outlines on the original image: Next, confirm the side ratios and area of the rectangle with the smallest area that each of the contours encloses. The minimum and maximum areas of the plate have been established at 4500 and 30000, respectively. Next, locate the contours in the region that has been confirmed and verify the side ratios and area of the bounding rectangle of the largest contour there. You will obtain a beautiful license plate shape after validating. Now take that contour out of the starting picture. You will see the plate's image: Clean_plate and the ratioCheck function of the class PlateFinder carry out this procedure.

Figure 3: validating you will get a perfect contour of a license plate

Step 4: We must use image segmentation in order to accurately recognize the characters on the license plate. The HSV format of the plate's picture must first be processed in order to retrieve the value channel. Binarize the value channel picture of the plate using adaptive thresholding to make the characters visible. Since adaptive thresholding employs different threshold values for different regions dependent on the brightness of the pixels nearby, it may be more appropriate to binarize the picture of the plate if it has varying lighting conditions in different parts of the image. Once the image has been binarized,

use the bitwise not operation to identify any related image components so that we can extract character candidates. Create a mask that displays every aspect of the character, and then look for contours in the mask. Take the largest contour after the contours have been extracted, identify its bounding rectangle, and check the side ratios. Locate the convex hull of the contour and draw it on the character candidate mask after the side ratios have been verified. Locate every contour in the character candidate mask, and then extract those contour areas from the value threshold picture of the plate. This will give you every character separately.

Figure 4: Finally we will get all characters separately.

Step 5: In the end, we will store the information in our database. If a vehicle makes a mistake on our property, we must input the vehicle's number so that CCTV equipment can locate the vehicle's location. So, by utilizing this program, we can quickly identify and resolve any concerns and reduce crime in our nation.

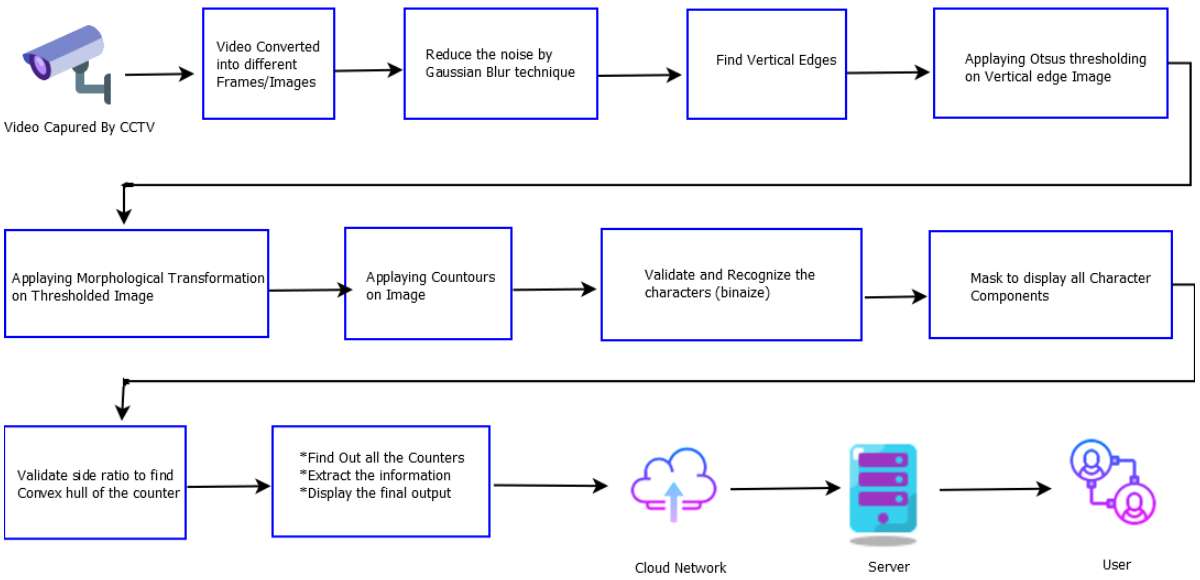

Figure 5: Block Diagram of Proposed approach

IMPLEMENTATION

VANPR technology has become increasingly popular in recent years as a result of its numerous advantages for a variety of applications. A few benefits of ANPR include the ability to identify the vehicles implicated in crimes, traffic management, intelligent parking, toll automation, intelligent transportation systems in smart cities, and journey time analysis.

Automatic Number Plate Recognition (ANPR) is a technique that reads a vehicle's registration number from photographs of its license plate using optical character recognition. To swiftly and automatically identify vehicles in still photos or live video from one or more cameras, automatic license plate recognition system uses several image processing techniques. If we use this program, we can minimize both traffic and security issues.

DISCUSSION

EXISTING SYSTEM

In the current system, it is quite difficult to locate the car used in a crime, but many large cities are deploying CCTV cameras to defend their cities. High definition cameras are now being used, but they are all connected to a single server, so automatically recording is taking place. If there is a problem or difficulty, we have to inspect it manually, which takes a lot of time. for instance, it takes longer and requires manual verification if you want to check any vehicles that have been used in crimes.

PROPOSED SYSTEM

In the suggested method, we make use of CCTV material that has been cut up into several kinds of frames. To identify the car that was used in the crime on those frames, we are employing machine learning techniques. We can also control traffic in big cities. In this system, we employ methods including segmentation, vehicle number plate extraction, and optical character recognition. Using the aforementioned method, we can locate and administer the

system and get the best outcomes. By using this method, we can offer additional protection, simply identify the vehicles used in crime, and do so with less staff.

RESULTS:

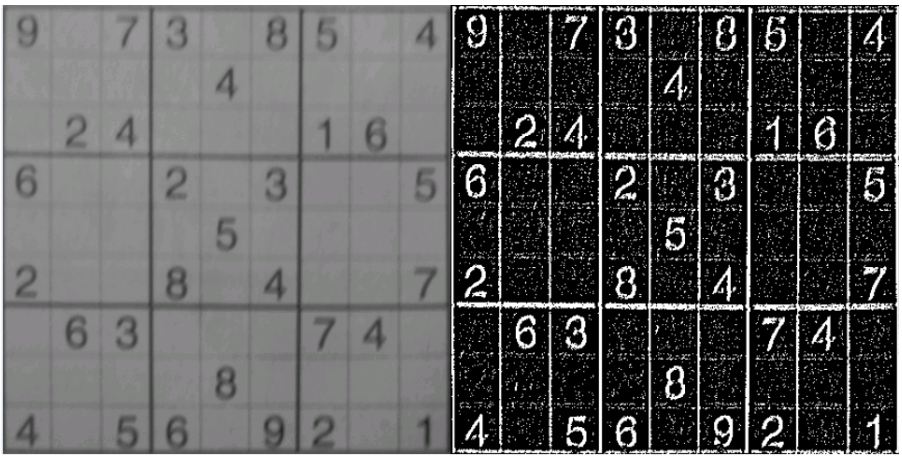

FIGURE 6: Accuracy levels of proposed method

CONCLUSION

With the help of this application, people will be more secure and the nation's security environment will be maintained. We are using the Python programming language and new machine learning methods to create this application in order to reduce the amount of manpower required and the image noise. This program gives handlers additional time savings and security.

FUTURE EXTENSION

Since ensuring people's security is a never-ending process, we can employ this methodology and connect our service to mobile platforms (such as Android, IOS, or others). Because everyone uses a cell phone these days, it is tremendously beneficial to society. If a problem arises, they may quickly resolve it by utilizing their device.

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