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License Plate Detection using Optical Character Recognition

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Abstract- A unique use of optical character recognition is automatic license plate detection. Using digital photos, a car can be recognized from its license plate using image processing technologies. In this paper, we present a method for optical character recognition-based license plate detection (OCR). OCR, which is an optically processed character on digital images, is used to identify text from a digital image. Tests of this method are conducted using various photos and lighting setups. To identify the real characters on the license plate, we have employed image processing and image segmentation in this study. By identifying the edges throughout the entire image, edge detection, an image processing technique, is utilized to determine the precise location of the license plate.

Keywords: Optical Character Recognition, KNN, Edge Detection, Template Matching, Component Analysis, Localization, Image Processing, Image Segmentation.

I. Introduction

A method of automatically recognizing a vehicle is license plate detection. The unique way that a car is identified is by its license plate. It is an image processing method that uses a car's license plate to identify the vehicle. The maintenance of traffic regulations and the enforcement of the law both heavily rely on license plates. It has many uses, including managing parking spaces, analyzing travel times, managing traffic, securing retail parks, keeping track of toll booth transactions, and managing security-sensitive locations. The purpose of license plate detection is to recognize the vehicle license plate from a moving vehicle after first identifying the license plate. The three major components of automatic license plate detection are optical character recognition, character segmentation, and vehicle license plate extraction (OCR).

When alternative inputs cannot be predefined and the information needs to be accessible by both humans and machines, optical character recognition is required. Optical character recognition is distinct from other automatic identification methods in that it doesn't require control over the information-creation process. The issue of recognizing characters that have undergone optical processing is addressed by optical recognition. Unlike on-line recognition, which a computer recognizes while they are being drawn, optical recognition is done offline after the writing or printing has been finished. Characters written by hand or printed on paper may both be recognized, however performance is mostly based on the caliber of the input documents.

Figure.1 Model of Number Plate Recognition

A system for Korean plates has been meticulously designed by K. K. Kim et al. He developed a Support Vector Machines-based system and reported impressive overall character recognition. Most recently, M. A. Ko et al. and T. Naito et al. [2][3] created a 2D- plane employing an optical recognizer that can only sustain a high success rate across a constrained range of shot distance and visual angle. Combining statistical and structural recognition techniques, X. Pan et al. [4] introduced the two-stage hybrid recognition model. The authors of this study demonstrate how to discriminate between identical characters using local structural features and how to build a system architecture that combines statistical and structural recognition techniques. To identify the number plate in the image taken by the video camera, Y. Huang et al. [5] are present. The gradient operator is used to determine the likely number plate area, the Otsu method is used to binarize the image, and template matching is utilised to recognise the object. The root-mean-squared-error (RMSE) is used to determine how similar a prototype and binary image are to one another.

Using an artificial neural network and OCR, Parul Shah et al. [6] describe a unique technique for car number identification. This strategy yields a zero wrong identification rate and a significantly high figure for the accurate identification rate. Automatic vehicle recognition system is presented by Muhammad Tahir Qadri and colleagues [7]. The OCR technology used in this work is sensitive to character misalignment and size variations. A real-time and reliable approach for car number plate detection and recognition was presented by S. Hamidreza Kasaei et al. in paper number 8 [8]. The morphological operator is utilised in this study to find the license plate and to match templates for character recognition. An Artificial Neural Network for ANPR applications employing OCR algorithm was presented by Xiaojun Zhai et al. [9].The provided algorithm satisfies the ANPR system's real-time requirement, according to Nabeel Khan et al. A brand-new algorithm for number plate extraction has been presented by al. [10]. After a grayscale image has been detected, the brightness of the image is increased by assuming that the power of each pixel is equal to $I(I,j) = I(i,j)^n$.

After license plate detection comes license plate extraction. In order to recover the individual characters from the extracted license plate, the detected number plate is first pre-processed utilising tools like Gray scale and edge detection to eliminate noise. The OCR algorithm is then given the extracted numbers. The optically identified character information is then transformed into text that has been encoded on the input image. The result is shown as a string of characters. A commonly utilised technology called optical character recognition (OCR) turns printed text from scanned photos and handwritten text into encoded text information like ASCII characters. The quality of the input and output determine how well the OCR performs.

II.RESEARCHELABORATIONS

1. Algorithm:

Step 1:Number Plate Extraction

A high quality camera is used to photograph the vehicle from a distance of a few metres. An IR camera is a preferable option. With regard to the license plate, the camera may roll and pitch.

Step 2:Preprocessing

Preprocessing is simply the system's analysis of the input image. Resize - The camera's image size can be huge, which can make the system slow. It has to be scaled down to a workable aspect ratio. Convert Color Space - Photographic or infrared cameras will either collect images in raw format or encode them according to a variety of multimedia standards. Typically, these images will have three channels and be in RGB mode.

Step 3: Localize

An image of the vehicle's front or back is taken. Other aspects of the car and the surroundings are present in the image, but they are not necessary for the system. The license plate needs to be distinguished from the background noise because it is the part of the image that interests us. In essence, localization is the process of binarizing the image. The image is changed to black and white, as seen in Fig. 2.

Step 4: Component Analysis

The binaries plate candidate is first subjected to a connected component method in order to remove undesirable image regions. To recognise the characters in the image, connected component analysis is used. The basic concept is to circle the plate in order to count the plates.

Step 5: Segmentation

The act of segmenting involves removing the identified blobs from the image. It is anticipated that these blobs represent the necessary part of the license number. Here, we introduce Image Scissoring[1], a unique algorithm. This approach involves scanning the license plate vertically, scissoring at the row where there are no white pixels, and copying the scissor area into a new matrix.

Step 6: Character Recognition

The chosen blobs are then sent to an optical character recognition (OCR) engine, which outputs the license number in ASCII.

III.PROPOSED METHODOLOGY

In this work we have proposed an algorithm that uses a high-resolution infrared camera to capture a picture at a few metres from the vehicle as its input. The image is then scaled down to a workable aspect ratio. After that, the image is transformed from RGB to grayscale. The image's desirable portions are located via localization, while the undesirable portions are deleted. The image is then transformed into a binary image. The edges in the image are then found using the Edge detection approach. An approach that aids in determining the maximum number of all feasible plates uses component analysis. Using the segmentation technique, the blobs that were previously cropped out are presumed to be potential locations for the license plate.The blobs are

finally sent to the Optical Character Recognition Engine (OCR), which outputs the license number in ASCII.

1 Block Diagram

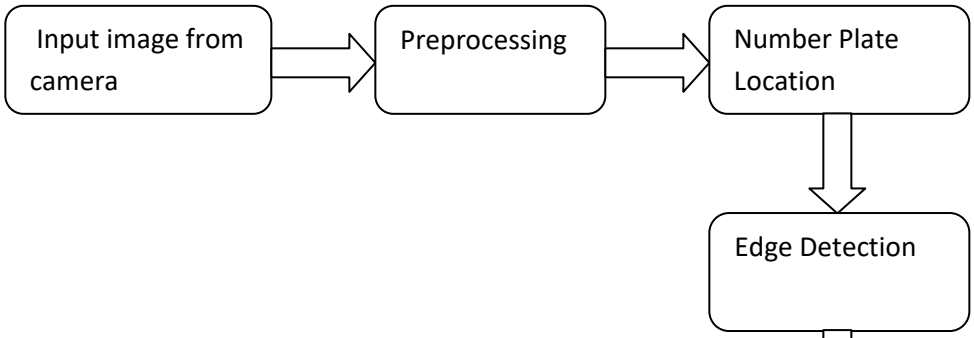

Figure – 2: Block Diagram

The above figure-1 displays the system's block diagram, in which the input image is first shrunk to eliminate any undesirable l. The in rmed to g RGB format, and the loca edge detection method. Th mentatio aracters a segmentation labled blobs are cropped out which are expected to be possible areas ofa license plate. The blobs are then transferred to the Optical Character Recognition Engine (OCR), which outputs the license number in ASCII. The result is then shown on the input image when the number plate's most appropriate characters are identified.

2 Work Flow Diagram:

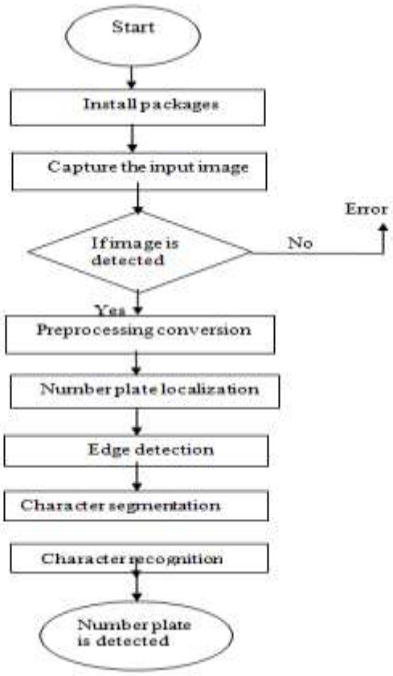

Figure-3: Flow Chart of proposed work

IV. RESULTS

Figure-4: Input Image

Figure-5: Gray Scale Image

Figure-6(a): Detection of Edges

Figure-6(b): Detection of Edges

Figure-7: Detection of Possible Plates

Figure-8(a): Detection of Characters on Number Plate

Figure-8(b): Detection of Characters on Number Plate

Figure-8: Detection of all Possible Chars

Figure-9: Output Image

Figure-10: OutputforLicensePlatein DifferentLightening Conditions

The above Figure-3 displays the system's input image. It is in RGB format, hence an image in grey scale format has been created as displayedin the Figure-4. Then using the edge detection how the location of the license plate is determined detected as shown in the Figure 5(a) & 5(b). Next the number of possible plates are detected as shown in the figure -6. After detecting the number of possible plates using the component analysis and localization, the number of all possible characters are found that are contained in the image as shown in the Figure-7.Using the segmentation labled blobs are cropped out which are expected to be possible areas of the number plate which is shown in the figure-8.The Optical Character Recognition Engine (OCR) receives the blobs at the end and outputs the license number in ASCII.Then the most suitable characters of the number plate are recognized and the output is show on the input image, Figure 9. We have tested against different images containing different license plates under both bright and dark lightening conditions as shown in the Figure-10.

V. CONCLUSION

In this study, four algorithms for character recognition, license plate segmentation, license plate placement, and picture pre-processing are introduced. The origin of image pre-processing is the location of the license plate. Character segmentation accuracy directly depends on the placement of the license plate. In our project, character recognition is used to detect automobile license plates. also an area of attention. This paper presents an automatic number plate recognition system that uses a vehicle's license plate. This technology uses image processing methods to identify the car from the computer's database. For a wide range of situations and number plate kinds, the system performs satisfactorily.Performance of the system is evaluated using real photos once it has been constructed and run in Matlab. Although this ANPR system functions fairly effectively, there is definitely potential for advancement. High quality cameras that can take clear pictures of the vehicle can boost the speed of this ANPR system. We must develop many types of templates for various RTO standards because the OCR method is sensitive to misalignment and variable widths. The statistical analysis can also be used to determine the likelihood that the vehicle number plate will be seen and

recognised. Currently, there are several restrictions on criteria like vehicle speed, script on the license plate, and image skew that can be eliminated by improving the algorithms.

VII. REFERENCES

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