LICENSE PLATE RECOGNITION

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Abstract

In our project we have used the knowledge of signals and systems to detect plate number from image of a license plate using MATLAB functions and algorithms. First we converted the image to a grayscale image. Then we preprocess the image to enhance it(Take the region of interest only). We apply algorithm for convolution with a special kernel for edge enhancement then binarize the image by thresholding the values above the mean value of all the pixels as 1 and rest as 0. At last we tried to apply horizontal and vertical projections to get the positions of bounding boxes(rectangles), and thus to segment the individual characters. We wanted to calculate the correlation coefficient between our segmented characters and the text already in a database so as to give a textual output based on highest correlation coefficient value. Though we found the process of vertical and horizontal projection to find the position of bounding boxes difficult to execute at this stage without inbuilt functions hence we couldn't segment characters and do further steps as per plan.

1. Introduction

License Plate detection process is a method which reduces the requirement of manual labour at places like parking areas, toll booths, etc. By making the process of detection automatic through the use functions and algorithms in MATLAB we can generate better results in shorter time, as well as we can reduce the labour costs.

1.1 Problem Statement

When we go in a big mall we may forget our vehicle's location in the big and confusing parking area. Or if we manage a parking area, presently it's a quite involving process to collect the parking charges from each car. Similar problems arrive at the toll booths on highways.Hence we tried to make an algorithm to detect the plate number which can be processed further in various ways according to our requirement.
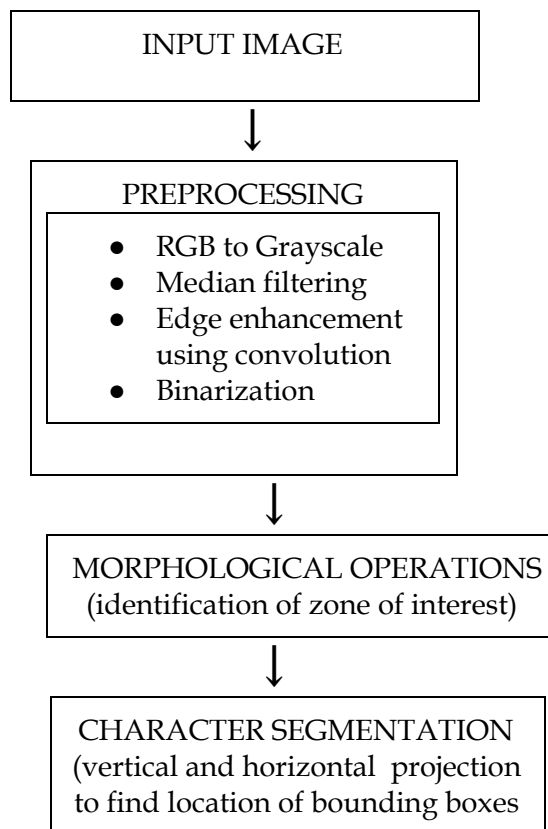
1.2 Practical Applications And Scope[1]

Our idea is to install cameras in parking lots and toll booths in such a direction that they can focus on number plate of each car. A database of all such images is sent to our algorithm for detection. The algorithm returns the detected plate number which can further be used for purposes like checking the payment of toll,parking charges, or it can be used to know the location of parked car etc. It will thus make the process faster and better with less human labour involvement.

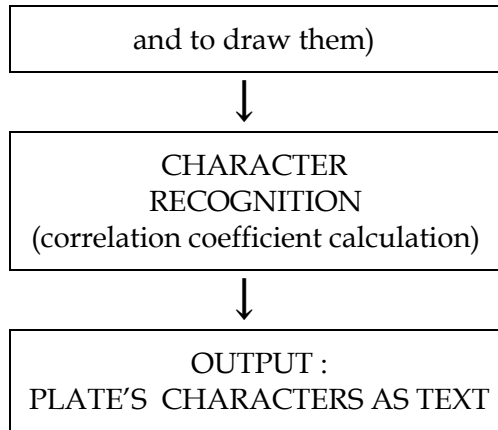## 1.3 Tools of Signals and Systems

We have used our knowledge of convolution in image enhancement also we have used the knowledge of kernels for filtering. Further the use of correlation coefficient could help to detect the letter by comparison with a predefined database.

2. License Plate Detection

INPUT IMAGE

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PREPROCESSING

- RGB to Grayscale
- Median filtering
- Edge enhancement using convolution
- Binarization

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MORPHOLOGICAL OPERATIONS
(identification of zone of interest)

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CHARACTER SEGMENTATION
(vertical and horizontal projection to find location of bounding boxes

[1] "Automatic Number Plate Recognition Pros and Cons List ...." 21 Dec. 2016, https://nyln.org/automatic-number-plate-recognition-pros-and-cons-list. Accessed 23 Nov. 2019.

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┌─────────────────────────────────┐
│        and to draw them)        │
└─────────────────────────────────┘
               │
               ▼
┌─────────────────────────────────┐
│          CHARACTER              │
│         RECOGNITION             │
│ (correlation coefficient calculation) │
└─────────────────────────────────┘
               │
               ▼
┌─────────────────────────────────┐
│          OUTPUT :               │
│  PLATE'S CHARACTERS AS TEXT     │
└─────────────────────────────────┘
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The input image is first converted into grayscale image and preprocessed to remove the noise by median filtering. The edge enhancement is done through convolution of the image with a kernel. Then the image is binarized so that the value of pixels above the global threshold value(taken as mean of all pixels) turns 1 else remains 0. Using morphological operations then the region of interest is extracted.Using vertical and horizontal projection location for bounding boxes is determined and they are plotted. Thus characters are segmented and further compared with predefined database for identification.

3. Results and Observations

Input Image

Our Code	**Another code from internet[2]**
	Grayscale Conversion

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[2] "8. Number plate detection."
http://www.spit.ac.in/wp-content/uploads/profkttalele/project/2010-11/(7)Number%20Plate%20Recognition/Report%20Number%20Plate%20Recognition.docx. Accessed 23 Nov. 2019.

	 Binarization
	 Dilation
	Edge Detection
	Segmentation

4. Conclusion

We couldn't obtain results with accuracy as compared to other algorithms due to less knowledge about other operations and functions available in MATLAB. But the number plate image can be processed using above mentioned algorithms.

Future Scope of project can be seen in Automatic toll plazas construction[3]. This will reduce the human force required and make the process of charging people for over speeding and red-light violation easy by recognising the car and looking through the database and sending an e-ticket. It will also make the process of identifying cars being used for illegal purposes and with invalid numbers.

Limitations

1. Bad Weather Conditions[4] : In case of fog and rain it would be difficult for the camera to capture clear images.
2. In case of scratched or damaged plates it is very difficult for the system to identify characters and numbers (problem in character segmentation and recognition).

References

[1]   Binarization,geeksforgeeks, Oct,2019. [Online].
Available:https://www.geeksforgeeks.org/matlab-converting-a-grayscale-image-to-binary-image-using-thresholding/

[2]   Convolution, mathworks.com, Sept,2019. [Online].
Available:https://in.mathworks.com/matlabcentral/fileexchange/62776-eeconv2-kernel-target mat

[3   ]Median filtering,youtube, Sept,2019. [Online].
Available:https://www.youtube.com/watch?v=SkZlpe0nD64

[4]   J. K. Author, "Title of paper," in Abbreviated Name of Conf., City, State, Country, year, pp. xxx–xxx. Examples:
Dhiraj Y. Gaikwad , Pramod B. Borole, "AReview Paper on Automatic Number Plate Recognition (ANPR) System," in International Journal of Innovative Research in Advanced Engineering (IJIRAE) Volume 1 Issue 1 (April 2014)

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[3] "Automatic Number Plate Recognition System (ANPR ... - IJERT."
https://www.ijert.org/research/automatic-number-plate-recognition-system-anpr-system-IJERTV3IS071132.pdf. Accessed 23 Nov. 2019.

[4] "Automatic Number Plate Recognition Pros and Cons List ...." 21 Dec. 2016,
https://nyln.org/automatic-number-plate-recognition-pros-and-cons-list. Accessed 23 Nov. 2019.