

Recognition of Number Plate

Rajat Sharma¹, Akanksha Mishra², Aditi Sharma³

^{1,2,3}Department of Information Technology, Raj Kumar Goel Institute of Technology, Ghaziabad-India

Abstract –

Today traffic control and vehicle owner detection and identification has become major problem all over the world. Sometimes it becomes very difficult to identify that which vehicle owner violates the traffic rules or drive too fast. So, it is impossible to catch and punish those peoples, because the traffic people might not retrieve the vehicle number because of the speed of the vehicle. To solve this problem Recognition of number plate plays a vital role in it. The main goal is to track traffic and for the purpose of defense. Number plate recognition uses some image processing, character segmentation or OCR techniques to detect the characters on number plates. Most of the systems work under these limitations. In this paper, we discuss about how we detect the number plate of a vehicle, what is the process, what are the steps and how it is useful.

Key Words: Image Processing, Character Segmentation, Optical Character Recognition(OCR), OpenCV, Number Plate.

1. INTRODUCTION

In the last few years, Recognition of Number Plate has been one of the useful approaches for vehicle surveillance. It can be applied at the number of public places for fulfilling some of the purposes like on Toll Plaza to verifying the number, on the parking areas, on some access control areas, on border areas etc. Recognition of Number Plate algorithm are generally divided into four steps: (1) Vehicle number plate image capture, (2) Number plate localization, (3) Character Segmentation, (4) Character Recognition.

As we can show in Fig.1, the first step i.e. to capture image of vehicle and pre-processing it looks very easy but it is not so easy it is quite exigent task because it is very difficult to capture the image of moving fast vehicles in real time in such a manner that none of the components of vehicles especially the vehicle number

plate should be missed. As of today number plate detection and recognition processing hardly take time less than 50-60 ms in many of the systems. The total success or we can say the success of the fourth step is depend on how the second and third steps are performs i.e. localization of number plate and separation of each character.

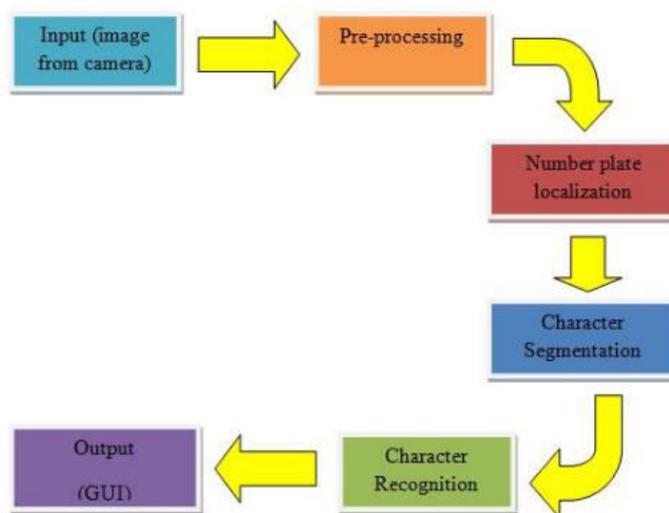


Fig -1: Work Flow Diagram

The second step is number plate localization in which the number plate is localized from the vehicle and move towards the next step which is Character Segmentation in which we segment every character of the number plate from the breaking numbers and recognize the character. The recognize character is the output of the process and it will check with the existing database or match with the database that whether it is acceptable or not. The final output is checked and we get the result .

2. METHODOLOGY

The number plate recognition system used in various places and it uses various techniques to detect the number plate. Here I will explain one of the simple method. This method is mainly used at toll plaza. I will explain the whole method of toll plaza in three steps in a very simple way-

2.1 Detection of Vehicle

When the vehicle approaches in the loop area of the camera then this detection of vehicle process is started. The loop sensor detected the vehicle through the sensor and perform their next step.



Fig-2: Detection

2.2 Capture of Image (Number Plate)

When the sensor detected the vehicle the camera took some images of the number plate. These images are send to the system for further process.



Fig-3: Image capture

2.3 Process of Number Plate Recognition

The unit analyses those images with different image processing software. The software checks whether the vehicle is authorized/registered or not. If it is authorized

the gate is opened and vehicle goes otherwise not. The gate again closed and process repeated.



Fig-4: Processing

The method which is discussed previously is the common method for plate detection. Apart from this method, various methods are also used for number plate detection. Most of the method uses more than one approach to detect the number plate. There are various methods and techniques, but here I will explain it in the simple words.

During the detection of the number plate, there are various types of number plate, characters on the number plate, size of the character, formats of the characters and numbers. To detect multiple style of the number plate a configurable method is proposed. For detecting different style of the number plates, the user can configure the algorithm by changing its parameter value of the number plate detection algorithm. The user may define these four parameters mainly:

1. Plate rotation angle – Rotate the number plate at certain angles so that characters are detected easily.
2. Character line number – It will determine whether the characters are spanned in one than one line or column. The algorithm works for maximum three lines.
3. Recognition models – It will determine whether the number plate contains the alphabets, alphabets with numbers or alphabets with symbols, digits and symbols.
4. Character formats- In this every character has its format that for alphabets the format is different and for numeric the format is different. For example, Symbols are represented as S, Numeric as N and alphabets as A. Let the number be UP74-K5833 then it will be converted as AANNSSANNNN.

3. CHARACTER SEGMENTATION

In character segmentation, we extract only characters from the words. Character segmentation is the difficult step of OCR systems because it only extracts meaningful regions for analysis. This step decomposes the whole images into a single unit which is called character. A bad segmentation leads to an incorrect recognition or leads towards a bad result.



Fig-5: Character Segmentation

Segmentation of characters is quite easy in case of printed documents as compared to the documents which are handwritten. We use vertical projection for character segmentation. We use several segmentation techniques, they are classified into three categories:

- **Explicit segmentation –**
In this segmentation, the input word image of a sequence of the characters are divided into sub images of individual characters, which are further then classified. Vertical projection approach lies in the category of explicit segmentation. This whole process is known as dissection.
- **Implicit segmentation –**
This segmentation is also known as recognition based segmentation. In this approach recognition and segmentation of characters are achieved at the same time. This approach means to split words into segments that should a characters, and then pass these each segments to a classifier.

- **Holistic segmentation –**
Holistic segmentation is also known as segmentation free approach. By using this approach one can extract the whole word as a unit from the string. This segmentation approach directly concern with words, not with letters. This approach is limited to a predefined lexicon.

4.CHARACTER RECOGNITION

Character recognition is a technique that translates a scanned image of the document into a text format document that can be further edited. To know more about character recognition we have to know about the phases of OCR(Optical Character Recognition) in brief.

4.1 Phases of OCR –

Phases of OCR can be listed in the form of following flowchart shown in fig. 6.

- **Preprocessing –**
In this step we process the scanned image/documents. Preprocessing aims to produce a useful data that is easy for OCR system to operate on it and gives accurate result.
- **Segmentation –**
The second stage is segmentation in which a clean document is obtained. Now this clean document is segmented into its sub-components. It will separates the different logical parts, like lines from the paragraph, text from its graphics and characters from the words etc. It is very important phase of OCR because it will separate the words, characters or lines from the images. We can say the correct recognition comes from the correct segmentation.

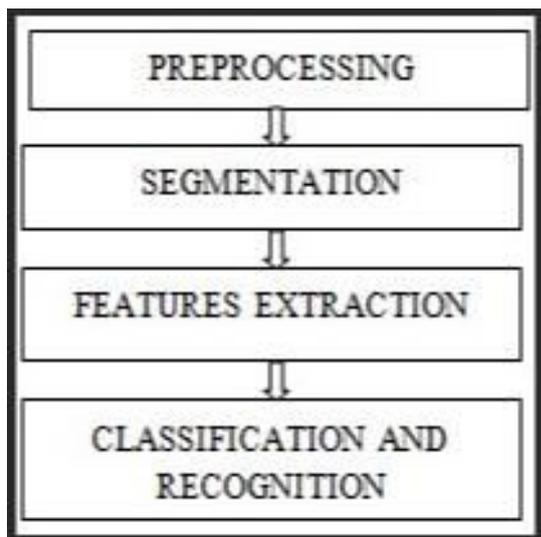


Fig-6: Steps in OCR

- Features Extraction –
In feature extraction there are certain rules of OCR which compares every character's shape and its features that differentiate each character. The main part of the recognition is selecting a stable representative set of features. It is the main issue in building an OCR system.
- Classification and Recognition –
The decision making stage of OCR system is classification. It uses the feature extracted in the feature extraction stage to verify and identify the text segment. It is the final stage, it will recognize words using context. It is responsible for the best result output which is the best solution.

5. LIMITATIONS

Everything has its pros and cons so it also has some limitation where it is not applicable. There are certain factors which affect its accuracy. Some of them are discussed here.

- ❖ Extreme Weather Condition-
In some cases, bad weather and hindrances can make recognition of number plate system not completely effective. When this happens the security measures might be turned off and manned surveillance will be more needed.
- ❖ Privacy Concerns –
People are usually afraid that the records/footage of their vehicle number might be misused. It become a subject of data theft.

6. CONCLUSION

This paper describes a study of number plate recognition in traffic. It is very helpful and reliable for efficient traffic monitoring. Those devices which have high image processing technique can easily detect the number plate from the vehicle from different angles and view the output. This system plays an important role in the growth of today's transport system. Recognition of number plate may use the image processing technique which is combined with some neural networks to identify the number plates where the angled or side view images or moving images can be improved. For better recognition systems, the choice is to use high-resolution cameras with an increased number of frames to achieve good accuracies and improved the result for recognition.

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