Optical Character Recognition Using MATLAB with Image Processing Tool Box

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Abstract- *In the running world there is a growing demand for the user to convert the printed documents into electronic documents for maintaining the security of the data. Hence, this technique is developed to convert the data available on papers into computer process-able documents, so that the printed documents can be edited and reused. Optical character recognition usually abbreviated as OCR, involves a system designed to translate images of typewritten text into machine editable text. This paper focuses on conversion of pictures of text documents into a standard editable text format using MATLAB software with image processing toolbox.*

Keywords- OCR (Optical Character Recognition), VNPR (Vehicle Number Plate Recognition), Pre-Processing, Post Processing, Feature Extraction.

I. INTRODUCTION

OCR is a technique of conversion of images of printed or handwritten text into editable text format. This OCR technique finds its application in different areas such as industrial sector, banking sector, healthcare sector, and vehicle number plate recognition.

OCR basically involves digitization of these handwritten or printed text documents so that they will be suitable for further processing steps. This conversion into editable text format makes it easy to edit, search, store the document more compactly and can be displayed online

II. LITERATURE SURVEY

1. As per reference to the paper published in IJERA, ISSN: 2248-9622, Vol-5, Issue-4, (Part-6); this paper gives an approach for character recognition for Devanagari script.
2. As per reference to IJARECE Volume 2, Issue 5, May 2013, this paper implements the OCR technique in MATLAB and explains how MATLAB is more convenient and effective for OCR technique.
3. As per reference, International Journal of Research in Computer and Communication Technology, Volume 2, Issue 9, September -2013. This paper presents basics of OCR technique.

III. PROPOSED WORK

As taking into consideration the development of OCR system, OCR also finds its application in recognizing Devanagari script. A system can be implemented which will be able to recognize English as well as Devanagari script; thus providing a single program which will be applicable for recognizing printed text document or handwritten script in English as well as Devanagari font and can be converted into editable text form (i.e. digitizing text documents), which will help in cases where you want to make changes in any printed document and the soft copy is not available with you. This will reduce the efforts for typing it again. This system will also reduce space required to physically store documents (as they are being digitize and can be stored in computer memory) and the manpower required to maintain huge set files or documents. Ultimately this system would prove to be best to help you in order to preserve previous files which are in printed document format and soft copy is not available with you.
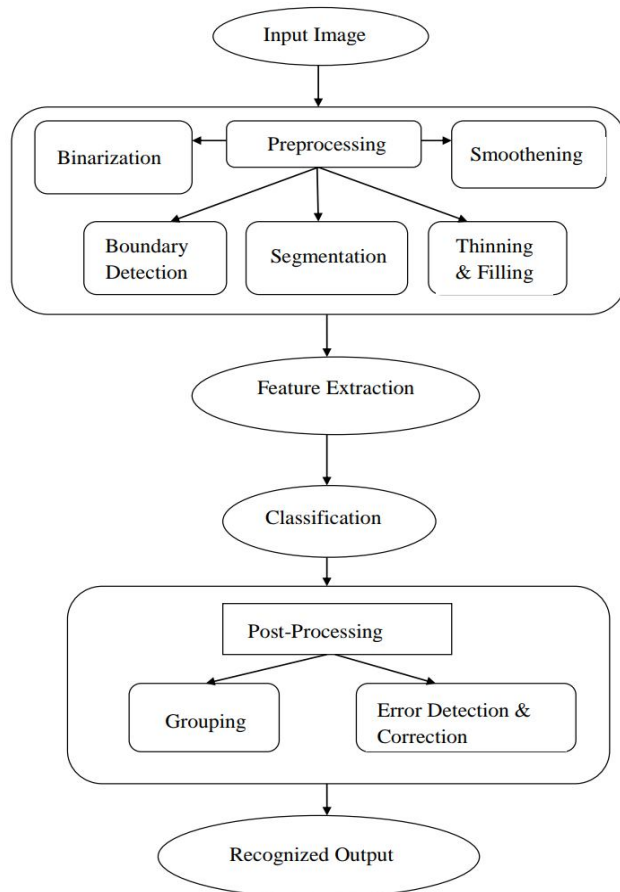
IV. PROCESSING STEPS

Fig.1.1Processing flow diagram

1. **Input Image:**

     The first step in an OCR system is to capture image of the document to be converted in editable text format. This is basically image acquisition. Image can be captured by using a webcam (or mobile camera).

2. **Pre-processing:**

     Input Image is subjected to pre-processing steps which includes several operations over the image, so that input image becomes suitable and comfortable for applying to further processing stages. Basic objective of pre-processing is to improve the quality of input image.

2.1 Binarization:

     Binarization is significant step in pre-processing. It is needed to convert a color image into black and white format so that we can process over that black and white image with ease. The separation of actual image area which is the text in the document (referred as foreground) and background is called binarization.

2.2 Boundary detection:

     This binarized image is now suitable for boundary detection. This operation detects the boundaries of image (binarized image). It is important to detect the boundaries in order to select an individual character.

2.3 Segmentation:

     This is important operation of OCR as rate of recognition is directly proportional to segmentation [1]. Whenever we are performing the task of recognizing characters from image it is necessary to isolate one paragraph from other; different lines within a paragraph, different words within a line and finally each letter within a word. This task of segregation is performed by segmentation process.

2.4 Thinning & Filling:

     Sometimes it may happen that image contains disconnected segments or gaps especially in case of handwritten text. So filling operation fills those gaps. Also, if handwritten text is composed on note book which contains horizontal lines beneath the words, these lines may result in noise and thereby will produce error in final result Thus, thinning is used to reduce the thickness of these lines.

2.5 Smoothening:

     Smoothening is done so as to remove noise because image is captured by webcam which may introduce some noise in image.

3. **Feature extraction:**

     Feature extraction is simply extracting relevant information. It basically extracts information of the features such as Edges, Corners, Ridges, etc. of the alphabet. So, feature extraction plays an important role in recognizing the exact alphabet. Thus, accuracy of an OCR technique highly depends on the feature extraction method selected.

4. **Classification:**

     It is process of identifying the extracted character. It involves matching of features of a character that are extracted in feature extraction step with the features of characters in the predefined set of characters. The character which gives best match is selected.

5. **Post Processing:**

This is the final phase of OCR technique. It performs different operations like grouping, error detection and its correction. This is done so as to group the extracted alphabets to form the meaningful word/sentence according to the text which is captured in the image in the very first step.

6.   Recognized output:

At this step we get final recognized output.

V. APPLICATION

Based on the discussed OCR system, we can implement one of its significant application i.e. Vehicle Number Plate Recognition (VNPR); which can be used for security purpose of a sector.

A gate automatically opens for authorized vehicles in a secured area, thus replacing or assisting the security guard. This system implements a technique for the detection and identification of vehicle number plate that will help in monitoring the access of authorized vehicles and restricting entry of unauthorized vehicles in a specific area.
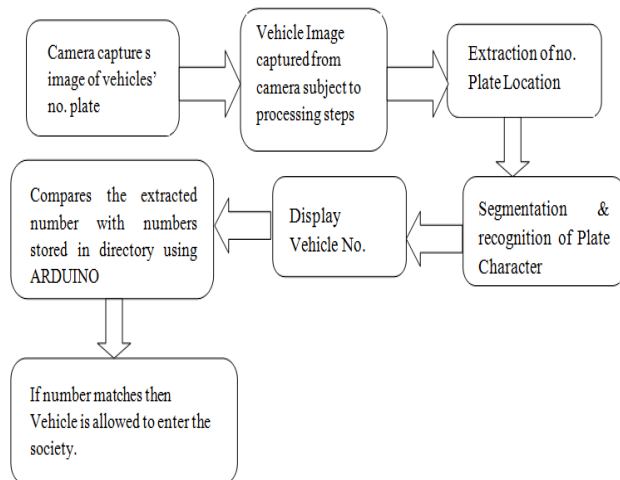

Fig. 3.1 Processing Block Diagram of VNPR system

1.   Vehicle Image Captured By Camera:
The image of the vehicle is captured using digital camera (optional webcam).

2.   Extraction of Number Plate Location

The captured image is RGB image so, in this step the image is first converted to Gray Scale Image. There are variations in intensity levels of captured image which give rise to edges. These edges may introduce noise in the extractions process; so we need to locate the position of number plate in the image. This will focus on number plate region by ignoring the edges.

3.   Segmentation and Recognition of Plate Character:

A Dilated image is obtained in previous step. Now bounding box technique is used for segmentation. The bounding box technique is used to find the properties of the desired image region which is nothing but the number plate area. The segmented image is multiplied with gray scale image in order to obtain only the number plate region.

4.   Display Vehicle Number:

After finishing with above steps a message (or dialogue) box appears on the screen ; which displays extracted number of vehicle and extracted number is also stored in notepad file.

5.   Arduino:

A directory is made which contains list of number plate of authorized vehicles. The extracted number of vehicle is compared with the numbers stored in predefined directory. Arduino is used to monitor the working of servo motor to which a solid bar is connected which will stop the car for recognition process. If the match is found then "open" message is sent via Serial Communication Port to Arduino which in turn controls the motor and the vehicle is allowed to enter (area for which it is implemented). If match is not found; then the alarm rings. Also, IR sensor can be used in order to initiate a signal indicating that vehicle has arrived at the gate (i.e. to start recognition process) or the vehicle has left (i.e. recognition process is done; vehicle has left and now the solid bar which was shifted up to allow the car to enter the area should return back to its initial position).

VI. CONCLUSION

This paper presents the description of OCR system using MATLAB Image Processing Toolbox and also its important application in the branch of technology which develops security purpose systems.

VII. FUTURE SCOPE

- The confidential documents can be converted into text format and further encrypted and saved thereby making them secure.

- Also, by doing this conversion the space and manpower required to maintain this huge stock of documents will be reduced gradually.

- **Reading Device for visually impaired ones:** In future, this OCR system can prove to be helpful for reading in case of blind people. This can be achieved by integrating text-to-speech conversion with this OCR system.

- **Border Security:** Similar to the VNPR system, a security system can also be implemented at national boundaries for security purpose by taking into consideration terrorist attacks. A directory containing numbers of all vehicles having authorized access to our country can be created. So, when a vehicle is willing to cross the border; image of the number plate will be captured and then converted to text format and checked in the directory. If the match is found then only the entry would be allowed. Otherwise entry will be prohibited.

REFERENCES

[1] Avani Oza, Paras Gosai, "Optical Character Extraction under Different Illumination Conditions Application in Real Time System", IEEE paper, 978-1-5090-0396-9/16, April 2016.

[2] Nikhil Pai, Vijaykumar S. Kolkure, "Optical Character Recognition: An Encompassing Review", International Journal of Research in Engineering and Technology, Vol.4 ISSN: 2319-1163, ISSN: 2321-7308, January 2015.

[3] Rajini Bhat, Bijender Mehandia, "Recognition of Vehicle number Plate using MATLAB", Journal of Innovative Research in electrical, Electronics, Instrumentation and Control Engineering, Vol,2, Issue-8, ISSN-2321-2004, September 2014 .

[4] Sandeep Tiwari, Shivangi Mishra, Priyank Bhatia, Praveen Km. Yadav, "Optical Character Recognition using MATLAB", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 2, Issue 5, May 2013.

[5] Mahesh Goyani, Harsh Dani, Chahna Dixit," Handwritten Character Recognition – A Comprehensive Review", International Journal of Research in Computer and Communication Technology, Volume 2, Issue 9, September -2013.

[6] Ankita Karia, Sonali Sharma, Reevon Rodrigues, Maitreya Save, "Character Recognition: Devanagari script", International Journal of Engineering Research and Applications, ISSN: 2248-9622, Vol. 5, Issue 4, (Part -6) April 2015.