

Handwritten Character Recognition

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Abstract : Character recognition for read the text from image which is the huge area for research to develop computer-based application. Nowadays, there is a storing of information from handwritten documents to computer readable format for future use. One of the simple ways to store the information from paper document is to first capture or scan the paper document and save them as an image. 'Optical character recognition' it is the method to transform handwritten data into electronic format. The main challenge is to recognize the character of different people having different style of handwriting. Thus, we will design a system that recognize the handwritten character from old documents. To train the neural network it become easier because availability of huge amount of data and various algorithm which are taking place. In our system we will use of OpenCV for performing image processing and will use TensorFlow for training the neural network.

Keywords: Neural Network, OpenCV, Tensor Flow.

I. INTRODUCTION

Recognizing handwritten is easy for human being but it is difficult for computer system. When system was developed in 1950's that time need of human being is required for converting data from documents to the machine language it takes too time and errors occurred. OCR (Optical character recognition) translates image of handwritten documents into machine readable form. Handwritten character recognition is a challenging work. Because of different people have different handwriting style. Thus, it is required large no of dataset to train the neural network model. We use the convolutional neural network model in our system. We will use commonly available NIST dataset which contain sample of handwritten character from different writers. TensorFlow which is an open source library which is used to train the neural network model. OpenCV is an open source library which is used for image processing. The main requirement for this project is to design a module that can recognize character using the neural network method. Our system focuses on dealing with handwriting of a single chosen person.

II. PROPOSED METHODOLOGY

A character recognition system receives an input in the form of image which contains some text information. The output of this system is in electronic format. There are three modules: (A) pre-processing (B) text recognition (C) post-processing. Each module is further described in detail as bellow:

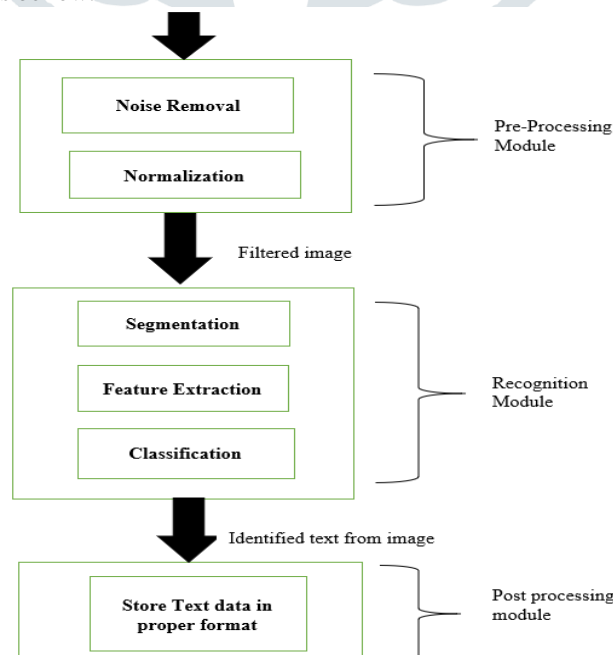


Figure 1: Basic Block Diagram

2.1 Pre-Processing Module

The document is captured by the camera and is converted in the form of a picture. It is the combinations of pixels. At this stage we have the data in the form of image and this image so that's the important information can be retrieved. So, to enhance the quality of the input image, few operations are performed on image such as noise removal, normalization, binarization etc.

2.1.1 Noise Removal

The quality of the image will increase, and it will affect recognition process for better text recognition in images. And it results in generation of more accurate output at the end of character recognition processing. There are many methods for image noise removal such as mean filter, min-max filter, Gaussian filter etc.

2.1.2 Normalization

The process for which the data need to be organized in the database where range of pixel intensity values changes.

2.1.3 Binarization

A handwritten document is first scanned and it is converted into a gray scale image. Gray scale images are converted to binary images by using binarization.

2.2 Recognition Module

This module can be used for text recognition in output image of pre-processing model and give output data which are in computer understandable form. Hence in this module following techniques are used.

2.2.1 Segmentation

In recognition module, the segmentation is the most important process. Segmentation is done to make the separation between the individual characters of an image. A user can write text in the form of lines. Thus, the image is first segmented into line. Then each individual line is segmented into word. Finally, each word is segmented into individual character.

2.2.2 Feature Extraction

Feature extraction is the process to separate the most important data from the raw data. There are different classes are made to store the different features of a character. There are many methods used for feature extraction like Principle Component Analysis (PCA), Linear Discriminate Analysis (LDA), Independent Component Analysis (ICA), Chain Code (CC), Gradient Based features, Histogram, character geometry etc.

2.2.3 Classification

Input to this stage is output of the feature extraction process. The input feature with stored pattern is compared and find out best matching class for input. There are many methods used for classification such as Artificial Neural Network (ANN), Template Matching, Support Vector Matching (SVM) etc.

2.3 Post-Processing Module

The output of recognition module is in the form text data which is understood by computer, so there we need to store it in some proper format for further use such as editing or searching in that data.

2.4 Artificial Neural Network

Artificial Neural Network is a computing model of brain, having paralleled distributed processing elements. It can be used for computational processors for different tasks like data compression, optimization problem solving, pattern recognition etc. ANN has many benefits over the other existing methods. These methods include Artificial Neural Networks, Kernel Methods including Support Vector Machines (SVM) and multiple classifier combination. We can train a neural network to perform a function. An artificial neural network as the backend is used for classification and recognition task.

2.5 Character Dataset

In this project, we will use our own dataset. We will collect handwritten character samples from 10-20 people and use it for training. For testing we will use standard dataset. The original size of the images in dataset is of 128x128 pixel. We will crop the character to remove the noise from the background and resize the image into size of 28x28 pixel.

III. FLOW CHART

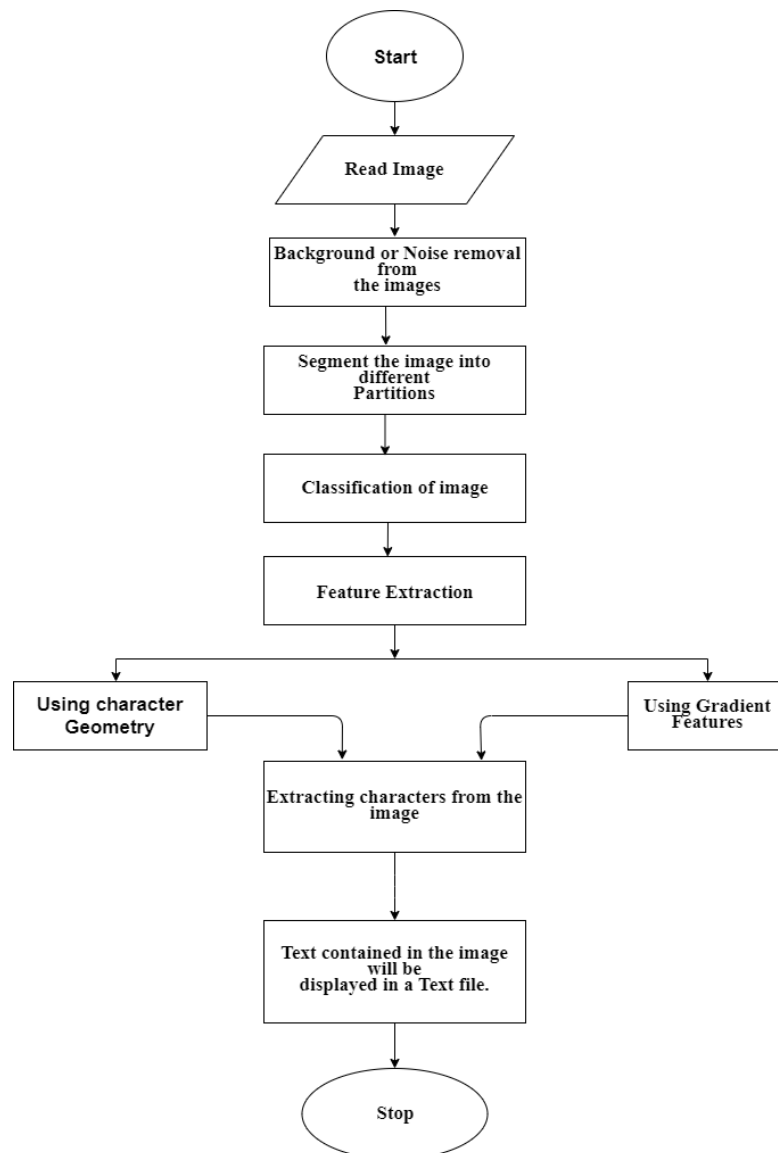


Figure 2: Flowchart of Proposed Methodology

IV. APPLICATION

Character recognition technology is presently used in the entire spectrum of industries. This technology need scan documents to recognize the text. With the help of this technology, no need to manually retype important documents when convert them into electronic format. For e.g. Banking, Healthcare, Government offices.

4.1 Banking

In banking, it is used to process checks without human involvement. A check can be inserted into a machine, the writing on it is scanned first, and the money is written on the check is transferred. This technology has nearly been perfected for printed checks, and is quite accurate for handwritten checks as well, though it occasionally requires manual confirmation. Overall, this reduces wait times in many banks.

4.2 Healthcare

Healthcare use of text recognition technology to process paperwork. Healthcare professionals always deal with large number of forms for each patient. To keep up with all this information, it is useful to store data into an electronic database that can be accessed as necessary. By using image recognition technology, they can extract information from forms and put it into databases, so that every patient's data is easily recorded.

V. CONCLUSION

We studied different algorithms which has been already implemented. Using this algorithms, recognition of character has been done but still having some improvements in the accuracy and efficiency. In order to obtain accurate result, successful method should be use and it can be done by using neural network.

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