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HANDWRITTEN TEXT IMAGE RECOGNITION USING FEATURE EXTRACTION

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ABSTRACT

In this paper,a new method is proposed which recognizes English handwritten text based on its features. This framework consists of a formal model definition and the algorithm for recognition. In pre-processing stage, determinant value makes recognition process feasible for recognizing given text from the dataset. The determinant value produces the feature, which is obtained by the division of the image into blocks. Later with the help of chain code further recognition is done. The output text file is matched with the one in the database to check the similarity.

Keywords: chain code, determinant value, feature extraction, neural networks, offline handwriting, text image recognition,

I. INTRODUCTION

Image processing is a technique, in which various images are processed and the input is an image or video whereas output obtained may be a text file of set of characters. Text Recognition is a process in which the system matches the input given with the existing database in order to recognize the characters in the image. Characters in the image shows variability as different people have writing styles. Also same person may have different handwriting if they write too fast or too slow. Variability may also be in size of words, slant, skew, and thickness of characters [1]. Therefore pre-processing and normalization is required before the recognition process. A slant correction gives an upright character and continuous strokes are removed. A scaling method is used in images to reduce its size, to obtain the words of same size as to reduce complexity in recognition procedure. Chain code, an algorithm is used here which separates the connected components in the text of an image. Binarization is performed on image to convert the gray scale into binary image [2].

Recognition may be online or offline. Offline involves direct conversion of text, which are converted into letter codes and Online involves tracing the pen tip-point movement. As it becomes easy to extract the features, online method gets the better results [3]. HMM model has been widely used in offline recognition where neural network is used instead of Gaussian mixtures [4]. HMM have few drawbacks, like they assume that each observations probability is dependent only on the current state. Proposed system used neural network, where set of neurons store the features of the characters and match with the input file to get the desired result. There is a probability of getting a miss-match also two or more neurons may get the same character matched or the feature matches with one character. Neural network is divided into two types supervised and unsupervised learning. Supervised learning has a target output while there is no target output in unsupervised [5]. Most appropriate technique is unsupervised which recognizes patterns. Kohonen is the most widely used unsupervised learning technique

II. RELATED WORKS

Being highly accurate character recognition techniques prove to be useful for handwritten word recognition.

Neural network technique needs to be applied for segmentation and recognition of different components of offline handwritten word. Higher recognition results of about 80% are obtained using characters automatically segmented from the CEDAR benchmark database [6].

Text extraction plays a very important role for finding the vital information. It involves detecting, tracking, binarization of the image, and also extracting the text and enhancing it so as to recognize the text from the given handwritten text image. Various difficulties arise in this process of detection and recognition due to differences in size, style, orientation, alignment, colour background, etc. Due to growing requirement of information, its identification and retrieval, various researches have been done for extracting text from images. Various techniques have been proposed for the same. Different techniques include artificial neural network, edge detection algorithm, wavelet transform etc. All these techniques have their own benefits and limitations. This paper compares several existing systems proposed by different researchers for extracting text from images [7].

III. METHODOLOGY

3.1 Input Image:

User uploads a scanned image of the handwritten text as an input. The image is in the format JPEG or BMP. The image can be obtained using a digital camera or may be scanned using a scanner. The input image then goes through various processes to get the desired output.

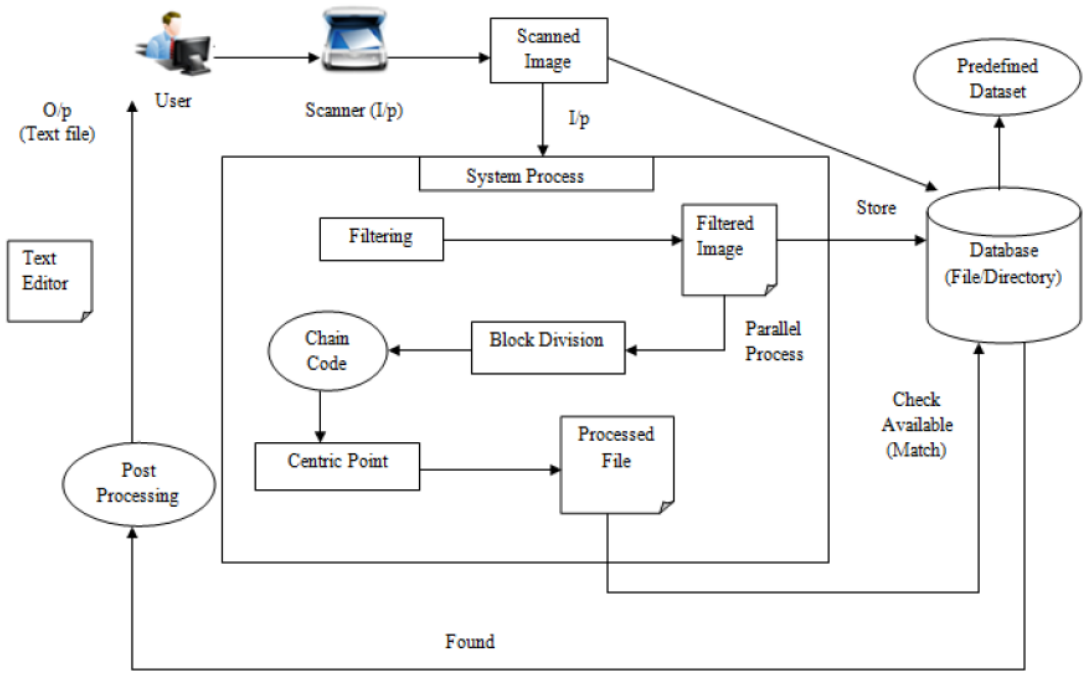


Fig.1. Proposed System

3.2 System Process:

It contains various processes through which the image undergoes. It contains all the pre-processing steps i.e. image enhancement, filtering, division of image into blocks, finding the centric point using chain code, extracting the feature. After pre-processing, the processed file is matched with the predefined dataset.

3.2.1. Filtering:

Filtering is an image processing process required for cleaning up the image in order to highlight specific information. It is used to reduce noise and thus to enhance the image. Different techniques are available for the same and which technique to use when depends on the image to be filtered. Here, we make use of median filter. It is mainly used for noise removal. Median filter is preferred over mean filter as is helps in preserving important details of the image. Thus, it helps in removing ambiguity [8]. Median calculation is a process of arranging all the neighbouring pixel values in ascending order and then replacing the considered pixel with the middle pixel [9]. The filtered image is stored as a backup in the database. The image then goes for further processing.

3.2.2. Block division:

The obtained filtered image is then saved in the database as a backup. Filtered image is of size 256*256. It is divided into small blocks of size 3*3 to simplify the further process. The determinant of the divided block is found. Determinant of the square 3*3 matrix is calculated by adding six triple products.

$$\det(A) = |A| = \begin{vmatrix} a11 & a12 & a13 \\ a21 & a22 & a23 \\ a31 & a32 & a33 \end{vmatrix} \begin{matrix} a11 & a12 \\ a21 & a22 \\ a31 & a32 \end{matrix}$$

Fig. 2. Determinant Calculation

det(A)= |A| = a11a22 a33 + a12 a23 a31 + a 13a21a32 -a31a22a13-a32a23a11 -a33a21a12

Thus, [10] Threshold (T) is designed to check the value of image. From a gray scale image, thresholding can be used to create binary images [11]. Value of the image is checked using the formula:

If im(I,j) > T im(I,j) Else im(I,j) =0

3.2.3. Calculate centric point:

Chain code is useful for finding features. Thus, it helps in recognizing the characters and document analysis. It is an effective and efficient way to recognize the handwritten words. A chain code is a loss-less compression algorithm [12]. It is used to represent the text boundaries by a connecting line sequence of specified length and direction. This representation can be of 4-connectivity or 8-connectivity where each character has a unique chain code representation which then helps in recognition [13]. But then there arises a problem for the algorithm to choose a path after it returns to the cross point to follow a different path. Thus, to solve this problem paths have been classified as terminated, forked and circular. Using these paths, centric point is calculated. When cross points are reached while tracing, it analyses the path and number of pixels. Paths are then sorted with the circular paths first followed with terminated and lastly the forked path. Paths are sorted based on number of pixels it contains. Then, normalization of coordinates of the collected pixels takes place. Below mentioned formulae are used for mapping x and y coordinates to their corresponding normalized values.

$X_n = X - X_{min} / D$

$Y_n = Y - Y_{min} / D$

This processed file is then sent to the database for matching it with the predefined dataset in the database.

3.3 Database:

Scanned image which is the input is stored in the database. Filtered image is also stored here as a backup.

Processed file is then sent to the database for recognition. Database also maintains a predefined dataset which is using to match with the processed data. Processed data is matched with the database and the character is recognized.

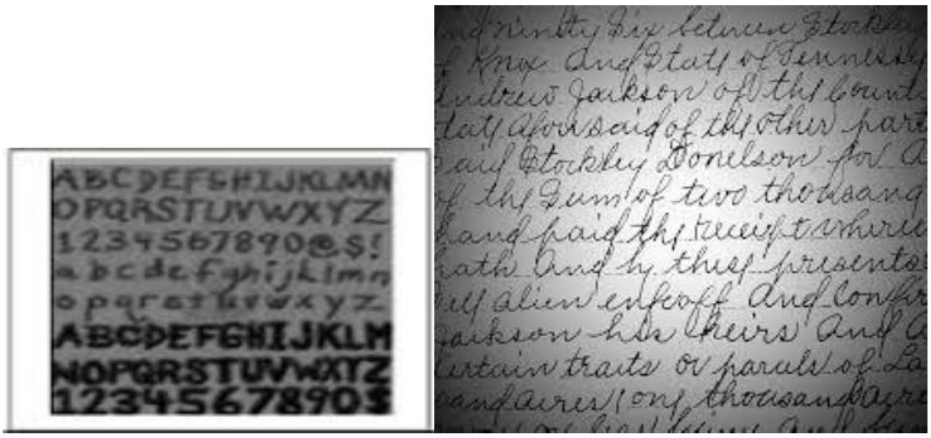
3.4 Post Processing:

In this step the file obtained from pre-processing is matched with the dataset. If the match is found the output is displayed to the user. If it does not match, error message will be displayed to the user. A text editor is used to display the output as a text file to the user.

IV. EXPECTEDRESULTS

The system or idea present in the paper simply converts a hard copy of data to soft copy by undergoing some stages. All these stages occur into the input to evaluate some relevant data required for computation.

Hand written text recognition system requires an input image whose size is based on application configuration capabilities, this input image can be black & white or colour format. The input image is processed first for the filtering, where filtering is useful to extract features easily from the scanned or captured image.



(a) (b)

Fig.2. Filtered Output

User gets an auto generated text document file as a final output after providing input image, having generated character strings from given input.

V. CONCLUSION

The system is able to generate the results of various kind of users having different writing features like writing style, usage of space ,special character etc in their own writing. Even the problem of different writing styles of single user due to some issues like injury, speed or age is solved. But all these problems are not concern of this application.

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