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OPTICAL CHARACTER RECOGNITION USING RBFNN

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Abstract— Optical character recognition (OCR) is process of classification of optical patterns contained in a digital image. The process of OCR Recognition involves several steps including pre-processing, segmentation, feature extraction, classification. Pre-processing is for done the basic operation on input image like noise reduction which remove the noisy signal from image. Segmentation stage for segment the given image into line by line and segment each character from segmented line. Future extraction calculates the characteristics of character. A Radial Basis Function Neural Network (RBFNN) is used to classification contains the database and does the comparison.

Keywords— Optical character recognition (OCR); Pre-processing; Segmentation; Feature Extraction; RBFNN;

I. INTRODUCTION

OCR has gained increasing attention in both academic research and in industry. OCR technology enables us to convert different types of documents such as scanned paper documents, pdf files or images captured by a digital camera into editable and searchable data. OCR systems have become one of the most successful applications of technology in pattern recognition and artificial intelligence fields [1]. Though many commercial systems for performing OCR exist for a wide variety of applications, the avail-able machines are still not able to compete with human reading capabilities with desired accuracy levels. Conversion of handwritten characters is important for making several important documents related to our history, such as manuscripts into machine editable form, so that, it can be easily accessed and pres independent work is going on in Optical Character Recognition that is the processing of printed/computer generated document, handwritten and manually created document processing i.e. handwritten character recognition. External factors like pressure, speed of writing have any influence in case of offline system but they have great impact on online system. Again, offline or online system canbe applied on optical character Fig 1.

Fig 1. (a) Optical character (b) Handwritten character.

Character recognition is an art of detecting segmenting and identifying characters from image [2]. More precisely, character recognition is a process of detecting and recognizing characters from input image and converts it into American Standard Code for Information Interchange (ASCII) or other equivalent machine editable form [3].

Character recognition is generally known as optical character recognition because it uses optical means to acquire the characters. Optical character recognition has huge applications including conversion of any handwritten document into structural text form, automatic number plate recognition, reading aid for blind, bank cheques etc. Character is the basic building block of any language that is used to build different structure of a language [4]. Character recognition is a process which associates with a symbolic meaning with objects (letters, symbols & numbers) drawn on an image. OCR contributes immensely to the achievement of automation process and improves the interface between man and machine in numerous applications. OCR deals with the problem of recognizing optically processed characters. Optical recognition is performed offline after the writing or printing has been completed whereas the online recognition is achieved where computer recognizes the characters as they are drawn. Both hand printed and printed characters may be recognized but the performance is directly dependent upon the quality of input documents. The more constrained the input is, better is the performance of OCR system. But when it comes to totally unconstrained hand-writing performance of OCR machines is still questionable. The Fig. 2 shows the schematic representation of different areas of character recognition.

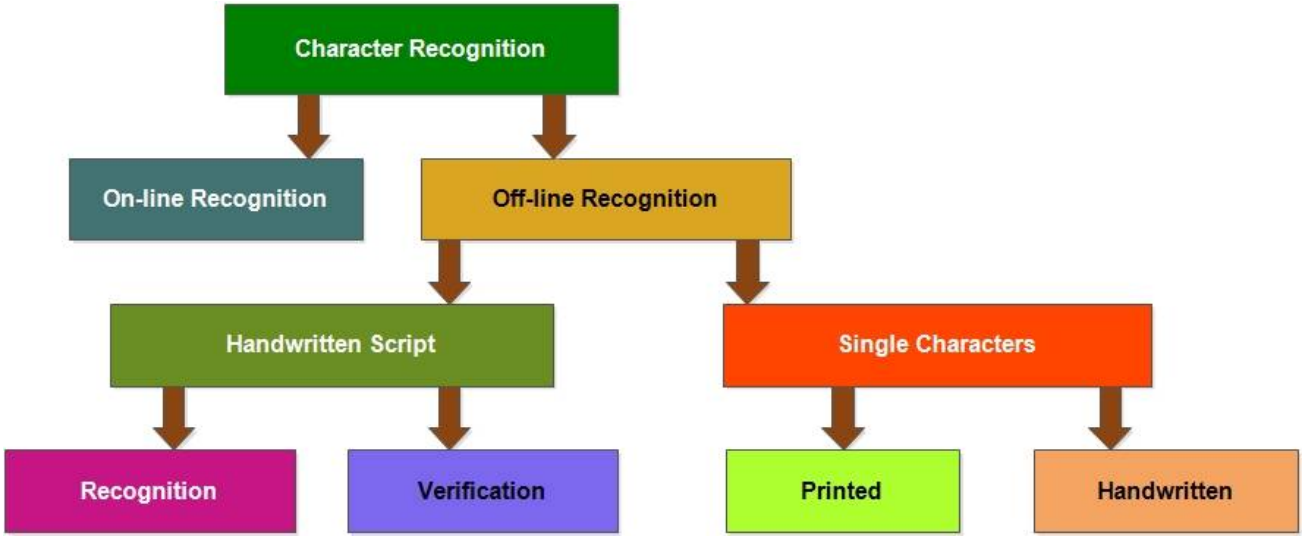

Fig. 2. The different areas of character recognition

II. IMPLEMENTATION

A typical OCR system consists of several components as shown in Fig. 3. The first step is to digitize analog document using an optical scanner. When regions containing text are located each symbol is extracted through segmentation process [6]. The extracted symbols are pre-processed, eliminating noise to facilitate feature extraction. The identity of each symbol is found by comparing extracted features with descriptions of symbol classes obtained through a previous learning phase. Finally contextual information is used to reconstruct words and numbers of the original text.

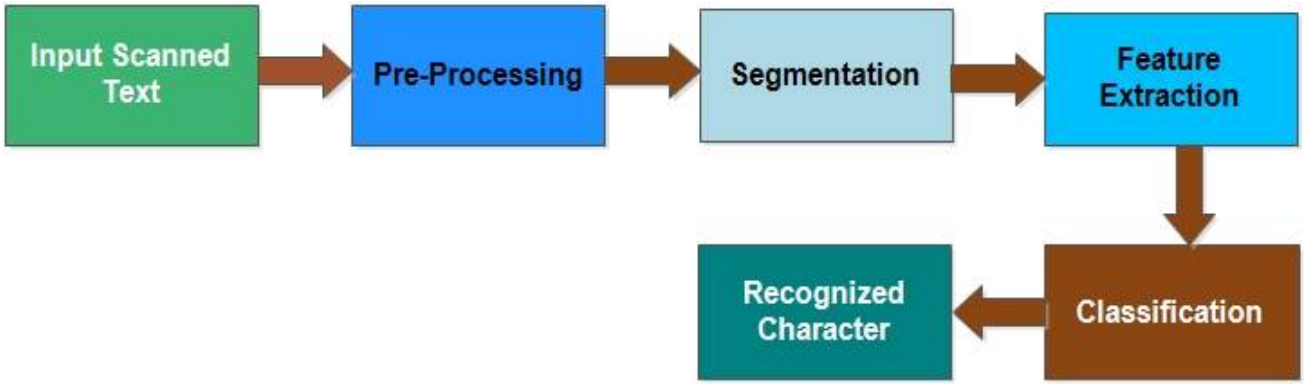

Fig. 3 The components of an OCR system for Proposed System

A. Input Scanned Written Text

The proposed OCR starts with image acquisition process that takes an input of a digital image by using a digital camera or scanner. The first component in OCR is optical scanning. Through scanning process digital image of original document is captured. In OCR optical scanners are used which consist of transport mechanism and sensing device that converts light intensity into grey levels. Printed documents consist of black print on white background. When performing OCR multilevel image is converted into bi-level black and white image.

B. Pre-processing

The raw data depending on the data acquisition type is subjected to a number of preliminary processing steps to make it usable in the descriptive stages of character analysis. The image resulting from scanning process may contain certain amount of noise. Depending on the scanner resolution and the inherent thresholding, the characters may be smeared or broken. Pre-processing of the character image is much significant for maintain the novelty of the image for classification. Here in the pre-processing phase we have performed filtering of image using median filter. Subsequently we make normalize and performed skeleton of images and extraction of boundary edge pixel points [7].

C. Segmentation

The pre-processing stage yields a clean character image in the sense that a sufficient amount of shape information, high compression, and low noise on a normalized image is obtained. The next OCR component is segmentation. Here the character image is segmented into its subcomponents. Segmentation is important because the extent one can reach in separation of the various lines in the characters directly affects the recognition rate. Internal segmentation is used here which isolates lines and curves in the cursively written characters.

D. Feature Extraction

The objective of feature extraction is to capture essential characteristics of symbols. Feature extraction is accepted as one of the most difficult problems of pattern recognition. The most straight forward way of describing character is by actual raster image. Another approach is to extract certain features that characterize symbols but leaves the unimportant attributes. Feature extraction techniques are used to evaluate the uniqueness of each character image by which they differs from the rest character images [8].

E. Classification

Classification is one the vital stage of the any recognition model. After evaluating the desired key feature values we process these vector to classifier separately and noted down the overall recognition accuracy. Radial Basis Function Neural Network (RBFNN) has been used as a classifier. There are three layers in RBFNN network namely: an input layer, a hidden layer and an output layer. In this paper, a number of samples of two English characters have been taken.

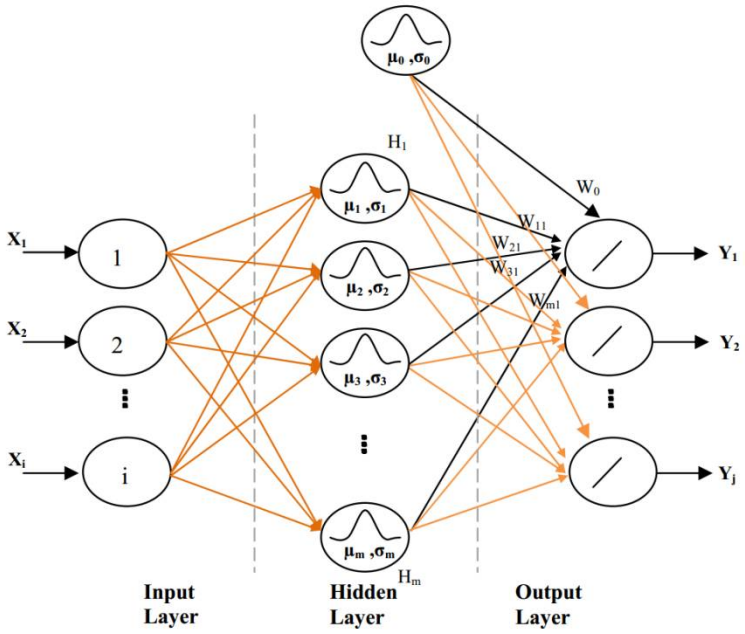

Fig. 4: RBFNN Architecture

Therefore, there are only two outputs at output layer. The outputs of output layer represents whether the character has been correctly recognized or not. The structure of multi-input and multi-output RBF neural network is represented by Fig. 4.The parameters of an RBF type neural network consist of the centers spread the basic functions at the hidden layer nodes and the synaptic weights of the output layer nodes. The RBF centers are also points in the input space. It would be ideal to have them at each distinct point on the input space, but for any realistic problem, only a few input points from all available points are selected using clustering [5].

III. RESULTS AND DISCUSSIONS

In feature extraction we have proposed an algorithm for evaluation of feature vector for our implementation of recognition system we have placed the image into a 3×3 grid into image. All the operations were performed over skeletonized image of handwritten characters. We have drawn the horizontal and vertical symmetric projection angel to the nearest pixel of the image. From which we have calculated the horizontal and vertical Euclidean distance for the same nearest pixel from centroid of each zone. Then we have calculated the mean Euclidean distance as well as the mean angular values of the zones with respect to the midpoint of symmetry axes. This is considered as the key feature values of our proposed system. The model generates two set of parameter for each row symmetry axis and column symmetry axis. Where one parameter show mean value of Ecludian distance of every symmetry axis pixel position to centroid of each zone and other parameter shows the angle between the points of the symmetry axis to the centroid of each zone the respective image. Thereafter we obtained four parameter of each image.

One category is appended for recognized and the other category is not recognized for the written character. By using the feature values with appended value RBFNN training is carried out. For testing the feature extraction is done on different used in the training set. The RBFN is trained by adaptively updating the free parameters, i.e. center and width of the basis function, and the weight between the hidden and output neurons of the network. To select an optimal RBFN model, the number of neurons in the hidden layer was varied from 2 to 30, and the learning rate was varied between 0.05 and 0.5. The initial basis function centers were chosen randomly from the input space, and the initial weight values were chosen randomly between ±0.9. Normalized datasets were used for the training, testing, and validation of the RBFN model. The best network was found to be one having 26 basis functions with a learning rate of 0.9 and 0.05 for center and weight respectively. The prediction errors of the validation patterns are larger because these patterns are outside the training space. The Fig. 5 shows the comparison of various means in RBFNN.

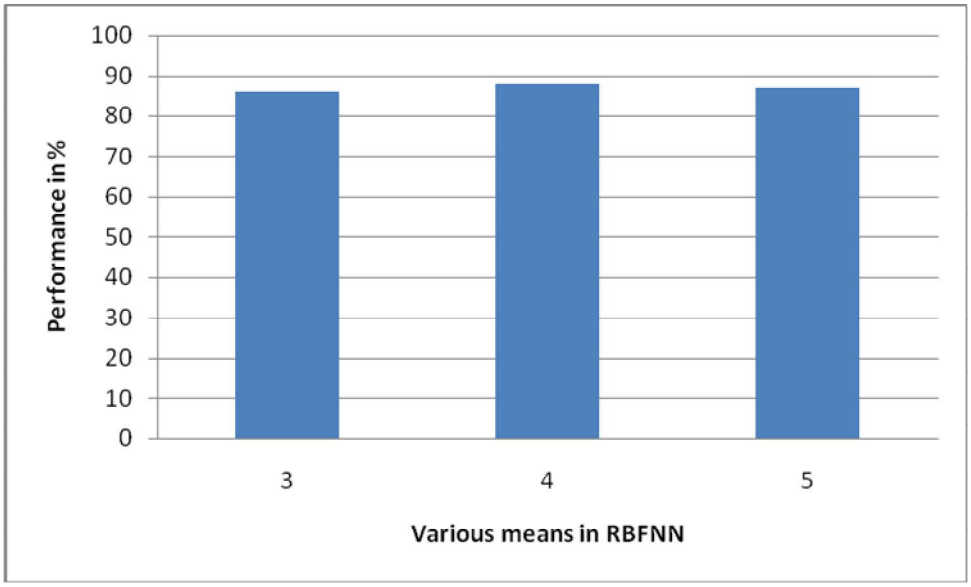

Fig: 5 Comparison graph for various means in RBFNN

Experimental result shows that this directional group values technique requires less training time. In this paper, recognition accuracy, training time and classification time obtained by implementing RBFNN better accuracy with requires less training time and classification time. Implementing directional group values with RBFNN yields recognition accuracy around 88% accuracy achieved It is also analyzed during experiment that only 50 iterations are sufficient for training the network using this technique.

IV. CONCLUSIONS

The system recognized the written character. It is currently the state of the art approach for categorization. In order to the process of OCR Recognition involved several steps including pre-processing, segmentation, feature extraction, classification is done the basic operation on input image like noise reduction which remove the noisy signal from image. Segmentation stage for segment the given image into line by line and segment each character from segmented line. Future extraction calculates the characteristics of character. A Radial Basis Function Neural Network (RBFNN) is used to recognize rate of 88% accuracy.

REFERENCES

1. Bunke, H., Wang, P. S. P. (Editors), Handbook of Character Recognition and Document Image Analysis, World Scientific, 1997.
2. Kai Ding, Zhibin Liu, LianwenJin, Xinghua Zhu, A Comparative study of GABOR feature and gradient feature for handwritten 17hinese character recognition, International Conference on Wavelet Analysis and Pattern Recognition, pp. 1182-1186, Beijing, China, 2-4 Nov. 2007.
3. Pranob K Charles, V.Harish, M.Swathi, CH. Deepthi, "A Review on the Various Techniques used for Optical Character Recognition", International Journal of Engineering Research and Applications, Vol. 2, Issue 1, pp. 659-662, Jan-Feb 2012.
4. M. F. Kader and K. Deb, "Neural network based English alphanumeric character recognition", International Journal of Computer Science, Engineering and Applications (IJCSEA)Vol.2, No.4, August 2012
5. D.Tjondronegoro, Y.Chen, and B.Pham, "The power of play break for automatic detection and browsing of self consumable sport video highlights", In Proceedings of the ACM Workshop on Multimedia Information Retrieval, pp. 267-274, 2004.
6. Saleem Pasha, M.C.Padma" Handwritten Kannada Character Recognition using Wavelet Transform and Structural Features" International Conference on Emerging Research in Electronics, Computer Science and Technology,pp 346- 351, IEEE 2015
7. Kalyan S Dash , N.B. Puhan and Ganapati Panda , "BESAC: Binary External Symmetry Axis Constellation for unconstrained handwritten character recognition" Pattern Recognition Letters, June 25, 2016.
8. Krupa Dholakia "A Survey on Handwritten Character Recognition Techniques For Various Indian Language" International Journal Of Computer Application (0975-8887) Volume 115-No. 1, April 2015

