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Character Recognition System for Handwritten English Alphabets

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Abstract: Handwritten Character Recognition has been one among the active and challenging research areas in the field of image processing and pattern recognition .Its employed in numerous applications which include, reading aid for blind, bank cheques and conversion of any hand document into structural text form. Handwritten characters for English alphabets without feature extraction using multilayer feedforward neural network. Each character data set contains the 26 alphabets. The trained network is employed for classification and recognition.
Keywords: HCR, CNN, ANN.

I. INTRODUCTION

Character recognition is a system which is an art of detecting, segmenting and identifying characters from image. An ultimate objective of hand written character recognition is to simulate the human reading capabilities in order that the pc can read understand edit and work as human do with text. Handwriting recognition has been one of the foremost fascinating and challenging research areas in field of image processing and pattern recognition within the recent years. HCR contributes immensely to the advancement of automation process and thereby improves the interface between man and machine in numerous applications. Several research works are that specialize in new techniques and methods that might reduce the time interval while providing higher recognition accuracy Handwriting recognition is that the ability of a machine to receive and interpret handwritten input from multiple sources like paper documents, photographs, touch screen devices etc. Recognizing the text of a document would be useful in many diverse applications like reading medical prescriptions, bank cheques and other official documents. Handwriting recognition are often broken into variety of relatively independent modules. The aim of this project is to style hand written character recognition system using neural networks which will effectively recognize a specific character of type format using the synthetic Neural Network approach. Recognition and classification of characters are done by Neural Network. the most aim of this project is to effectively recognize a specific character of type format using the synthetic Neural Network approach

This is helpful in recognizing characters of English . one among the first means by which computers are endowed with human like abilities is thru the utilization of a neural network. Neural networks are particularly useful for solving problems that can't be expressed as a series of steps ,such as recognizing patterns and classifying

II. PROBLEM STATEMENT

To design and develop a model that recognizes and classifies the hand written characters of English alphabets.

III. RELATED WORK

A. A Survey on Handwritten Character Recognition (HCR) Techniques for English Alphabets.(DoP: March 2016)

Authors: Manoj Sonkusare and Narendra Sahu.

Hand written Character Recognition (HCR) is difficult and remarkable domain of research in the area of Image processing. Recognition of handwritten English has been broadly researched and studied about in previous years.Presently various recognition methodologies are in well-known utilized for recognition of handwritten English alphabets (character). Digital document processing like mining information from data entry, cheque, applications for loans, credit cards, tax, health insurance forms etc are the major application domains of HCR.During this survey an overview of current research work conducted for recognition of handwritten English alphabets has been presented. Handwritten alphabets are complicated to acknowledge due to miscellaneous human handwriting technique, difference in size and shape of letters, angle.

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B. Neural Network based Handwritten Character Recognition system (DoP 22-mar-2018)

Authors: Savitha Attigeri

The nature of HCR has been one of the active and challenging research in the field of image processing and pattern recognition. It has number of applications which include,the reading aid for blind, bank cheques and conversion of any hand document into structural text form.Without Feature Extraction using multilayer Feed Forward neural network, in this an effort is made to acknowledge handwritten characters. Each character data set will contains 26 alphabets. Fifty different character data sets have been used for training the neural network. For classification and recognition the trained network has been employed.Each character in this system is resized to the 30x20 pixels, which has been directly subjected to training. Each of the resized character has 600 pixels and these pixels for training the neural network are taken as features. The system has good recognition rates which are similar to that of feature extraction based schemes for handwritten character recognition.

C. Literature Survey on Offline Recognition of Handwritten Hindi Curve Script using ANN Approach(DoP 2012)

Authors: Madhu Shahi, Dr. Anil K Rahawat, B N Pandey

Hindi hand written character recognition has had a lot of application in different domains like reading the postal address, electronic reading of checque. Hindi handwritten character Recognition by computer machine is complicated task when compared to typed alphabets which may be easily recognized by the pc . English character recognition has been studied extensively in the last half century and has been progressed to a level that is sufficient enough to produce the applications driven by the technology. It helps to ease the job of the humans and more complex problems has been solved in the past few years. The companies involved in research of hand written recognition are increasing continuously.

IV. IMPLEMENTATION DETAILS

A. Major Modules

1) *Image Acquisition:* In Image acquisition, the opencv provides the flexibility to capture the image from the camera input feed or through the directory path . The image needs to have a specific format such as JPEG, png etc. In the Opencv the images are converted into multi dimensional arrays.

2) Pre-processing: The pre-processing are a series of operations carried out on an input image. It essentially enhances the input image, thereby making it more suitable for segmentation. This uses opencv which is a free open source library employed in real time image pre-processing. Convolutional Neural Networks(CNN) is the main architecture used for pre-processing. The various tasks performed on the image in the stage of pre-processing are, Binarization: In this process a gray scale image is converted into a binary image by the global thresholding technique. Dilation of edges: The binarized image undergoes the dilation of edges using sobel technique, filling the holes present in image and dilation are the operations that are performed in the last two stages which produce the pre-processed image which is suitable for segmentation.

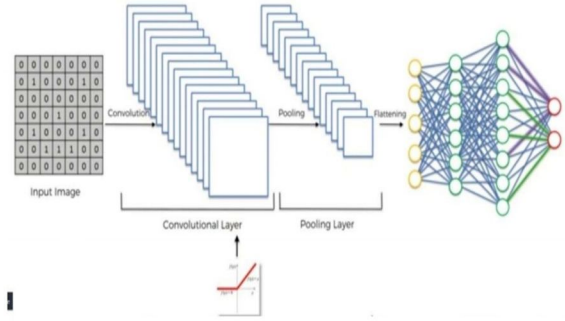

Fig1 : CNN Architecture

3) *Segmentation:* In the segmentation stage, the sequence of characters in an image has to be decomposed into sub-images of individual character.The input image that is pre-processed is segmented into isolated characters using labeling process which assigns a number to each character. Therefore the information about the number of characters in the image is given by the labelling process.

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4) *Classification and Recognition:* The decision making part of the recognition system is the classification stage .In the classification stage output of CNN is fed as an input to the ANN. The dataset is trained by the ANN model. It has two algorithms ie, feed forward neural network(FFNN) and back propagation(BP). The dataset is trained by the FFNN and error minimization through the BP. The neural classifier consists of two hidden layers besides an input layer and an output layer . Input layer makes use of linear activation function. The hidden layers and output layer use sigmoid activation function.

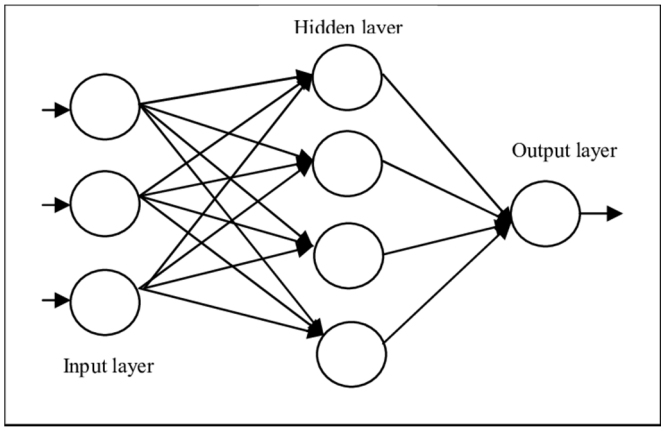

Fig2 : ANN Architecture

5) *Post-Processing:* This is the final stage of the recognition system. In this the recognized characters are printed correspondingly in the structured text form by calculating the equivalent ASCII value with the help of recognition index of the test samples **.**

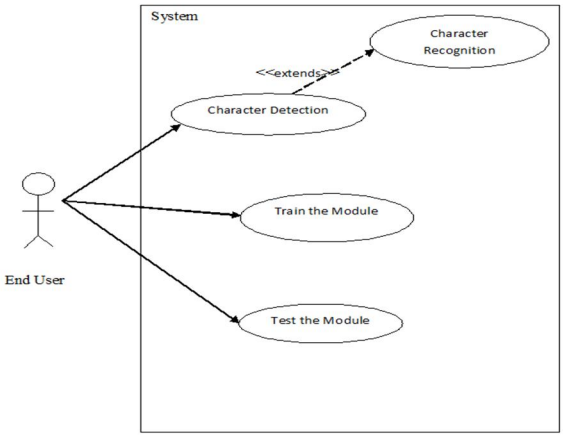

Fig 3 : use case diagram

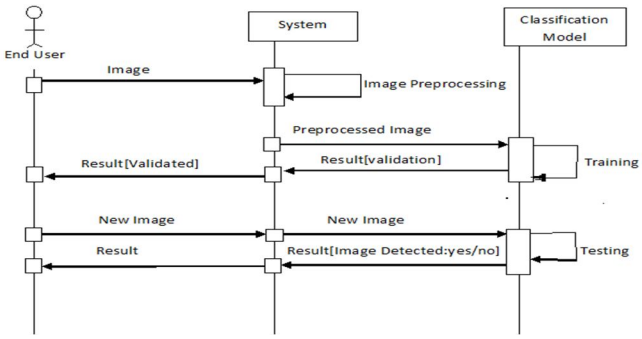

Fig 4: Sequence diagram

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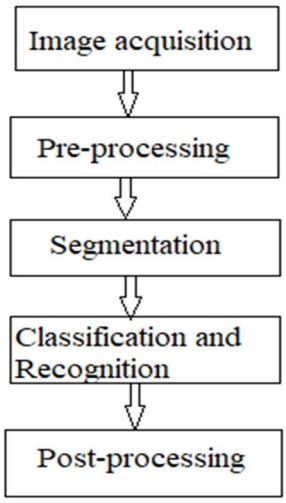

Fig 5 : schematic Diagram of the Process

V. CONCLUSION

Handwritten character recognition system has been implemented for recognizing and classifying the 26 English alphabets.The hand written recognition system will take the image as input and pre-process it and segments and then classifies and recognizes the alphabets making it easier to read the handwritten English alphabets. Languages have different writing styles throughout world which can be recognized with HCR systems using respective applicable algorithms and strategies. We have learning for recognition of English characters.

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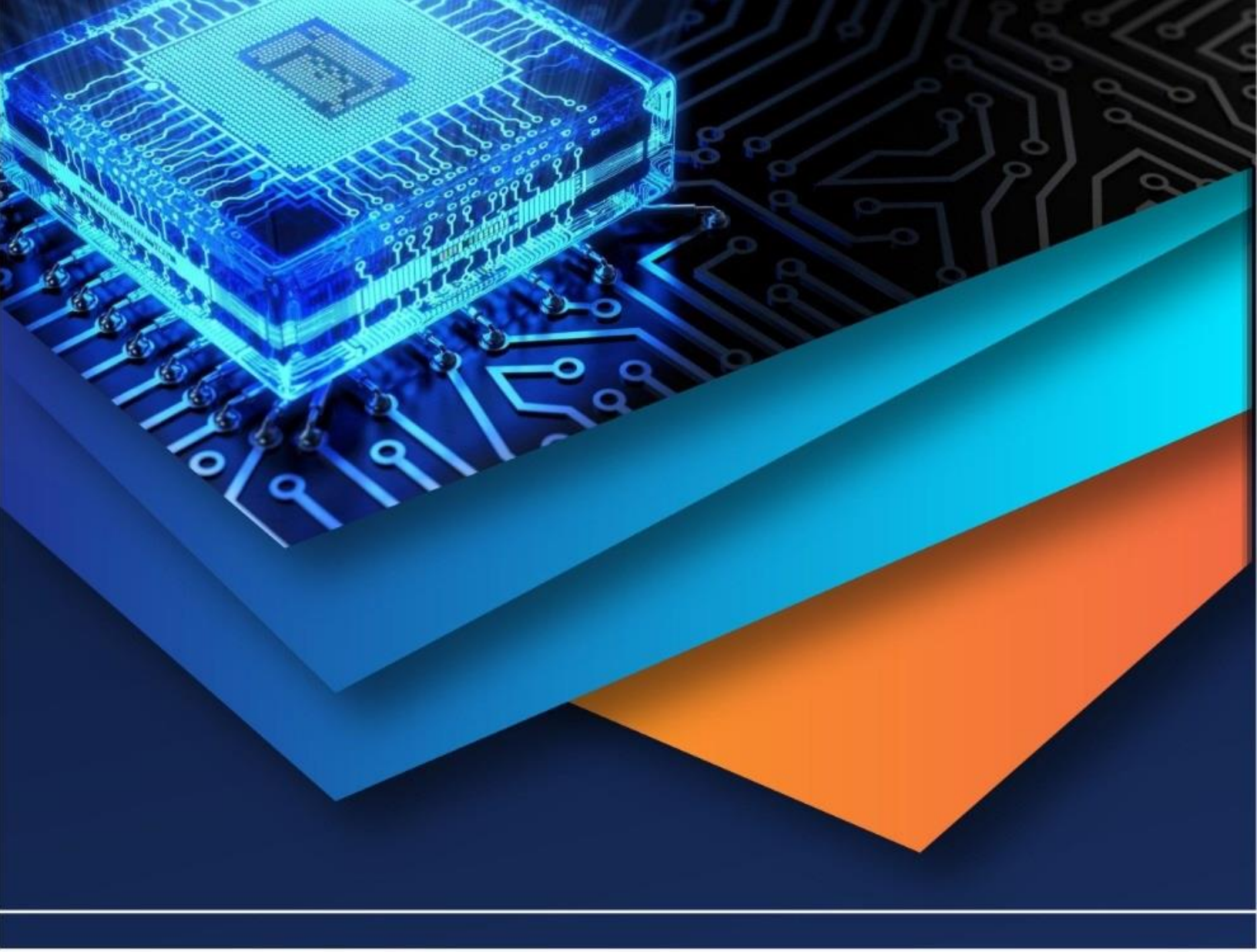

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