ICCSE'21 International Conference on Contemporary approach on revolutionary Science and Engineering, April 9-10, 2021 ISBN: 978-81-910765-1-6

HANDWRITTEN CHARACTER RECOGNITION

RAMYA V, RAHUL B, SANTHOSHWARAN G, SIVASANKAR N, ZIADAHMED M

Assistant Professor[1], Department of ECE, Saranathan College of Engineering, Trichy
UG Students[2, 3, 4, 5], Department of ECE, Saranathan College of Engineering, Trichy
ramyav-ece@saranathan.ac.in abrahulscott7599@gmail.com

***Abstract*—**

Handwritten character recognition is a technique tomake the program such that the computer gets handwritten image as a input from source such as paper document, photographs, live feed from the web camera etc. Then the handwritten characters are identified with the use of ANN. Initially we have to use suitable Neural Network. In training phase, text characters are extracted one by one and classification is carried out to map with target output for character recognition purpose. The program code has to be written in Python and supported with the usage of Pytesseract to compare the collected data to pretrained data. We used a technique to detect the handwritten character that is OCR.

Keywords: **OCR- HCR- ANN-SVM**

I. INTRODUCTION

It is difficult to recognize human handwritten characters, since differs from one writer to another even when same person writes same character there is difference in texture, shape, position and size of that character.The Handwritten text system is commonly used system in various applications, and it is a technology that is a mandatory need in this world as of now. Before the correct implementation of this technology we were dependent on writing texts with our own hands that result in errors. It's difficult to store, access physical data and process the data in efficient manner. Manually it is needed to update, and labor is required in order to maintain proper organization of the data.

The goal of our project is to make an efficient codebase for handwritten text recognition and convert them into speech for application in healthcare, personal care, bank sectors, and administrative sectors that can recognize the handwriting using concepts of deep learning. We approached our problem using Pytesseract and OpenCV as they contain Pre-trained Models that are directly used to provide results accurately compared to other methods over such task. The codebase that is developed in this paper is used to convert the text in different forms ie, mainly Text document and Voice files. These files are stored in respective folder and information can be extracted. We mainly use Open source models for the development of the codebase. It has some basic components of data acquisition, processing and Query and visualization.

II. LITERATURE SURVEY

K. Gaurav and Bhatia P. K [1], proposed different pre handling systems being associated with the recognition of the characters. The procedure took a shot at the various types of pictures from a basic picture-based report to a hued and changed forces including foundation. Different systems of pre-handling and standardization like skew remedy, differentiate evacuation, commotion expulsion and numerous other upgrade procedures were recommended. They reached the decision that a solitary procedure can't be connected for preprocessing the picture. Yet additionally there were a few disparities that utilizing every one of these systems likewise can't give the best exactness comes about.

 ISBN: 978-81-910765-1-6

Salvador España-Boquera [2], The analysts proposed the utilization of hybrid or half plus half concealed markov show (HMM) to perceive the handwritten content in disconnected mode. The optical model's basic part was prepared with markov chain procedure and a multilayer perceptron was likewise used to gauge the probabilities.

In [3], to perceive the disconnected handwritten numerals of six prominent Indian language, a changed quadratic classifier is utilized. A similar paper likewise manages perceiving the English letters in order. For both of these, a multilayer perceptron was utilized and Boundary following and Fourier descriptors were utilized for the component extraction. By examining the shape and looking at their highlights, the characters were identified. Also, to decide the quantity of concealed layers, back spread system was utilized. With this very calculation, a recognition rate of 94% have been accounted for with less preparing time.

R. Bajaj, S. Chaudhari, L. Dey, et al [4], for grouping the Devanagari numerals, distinctive highlights like clear part, thickness and minute highlights were utilized. sAdditionally, to increase the recognition capacity, the paper proposes multi classifier unwavering quality for handwritten Devanagari numerals.

Sandhya Arora in [5], In this paper specifically four highlights like shadow, histogram of chain code crossing point and horizontal line fitting highlights being portrayed. Among these highlights the shadow was registered all around for picture character, the rest three were processed by partitioning the character picture into the distinctive sections. In the one useful execution utilizing the dataset of 4900 examples demonstrated the exactness rate of 90.8 % for Devanagari handwritten characters.

Nafiz Arica at al. [6] This paper gave the technique because of which it was less demanding to maintain a strategic distance from the preprocessing stage along these lines lessening the loss of imperative data. The best one proposed was calculation of capable division. What's more, the different strategies supporting this calculation were utilizing neighborhood maxima and minima, additionally other, for example, stroke tallness which turned out to be ideal and furthermore character limit. What's more, these were altogether connected on a grayscale picture. Utilizing this approach, superfluous division was decreased bit by bit. Alongside that, the paper additionally proposed another model called shrouded markov demonstrate (HMM) preparing for estimation of worldwide and highlight space parameters alongside estimation of model parameters..

In [7], a technique was proposed to perceive the individually Tamil written character by utilizing the grouping in the strokes. Principally a strokes' format or shape-based portrayal is utilized spoken to as a string of shape highlights. Utilizing this strategy, the unrecognized stroke was perceived by contrasting it and a dataset of strokes by the string coordinating method in an adaptable mode. Utilizing this, an individual character was perceived by distinguishing every one of the strokes and its segments

III. PROGRAMMING INTERFACE

In the development of this project we have used PYTHON version 3.9 as language to develop the software in order to meet the requirements.Various other libraries and pre-trained models we have used include Pytesseract, OS, eSpeak(used to convert text-to speech) etc.

These Programing algorithms have well defined models that are trained with some samples. We use this algorithms and models to increase the accuracy of the result. The result will be dependent on the amount of training given to the model to get better output.

For online recognition using webcamera we use this algorithm to improve the threshold level and first converted to the normal image is converted to grey scale image to reduce the noise and to recognise the text faster.

 ISBN: 978-81-910765-1-6

IV. PROPOSED METHODOLOGY

Normally HCR is categorized into six phases which are acquisition of image, pre-processing of input image, segmentation, feature extraction, classification and post processing.Fig1 Shows the flow diagram of HCR

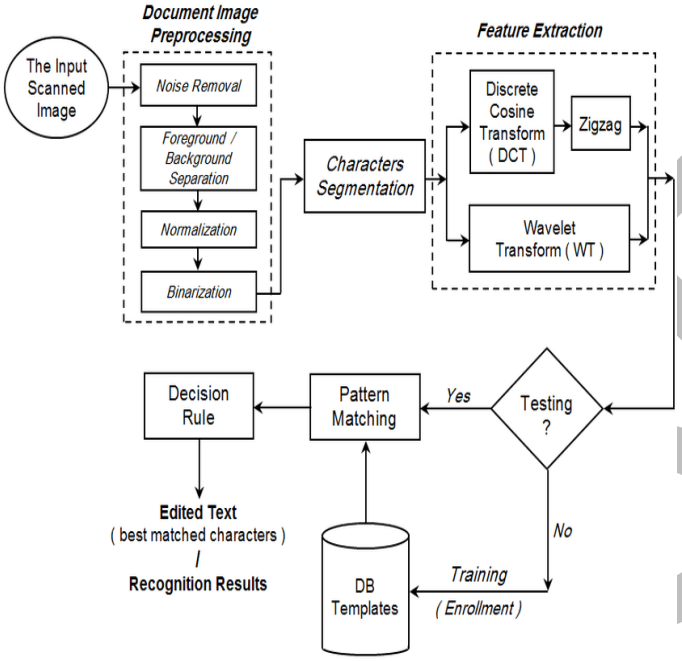

Fig. 1Flow Diagram

A. *Preprocessing*

Image pre-processing is the term for operations on images at the lowest level of abstraction. These operations do not increase image information content but they decrease it if entropy is an information measure. This technique is used to remove the background noise and to improve the text accuracy.Fig.2 shows the preprocessing image.

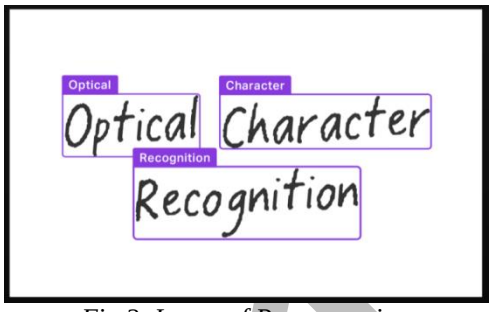

Fig 2: Image of Preprocessing

B. *Characters Segmentation*

Characters Segmentation is the process by which a digital image is separated into various subgroups (of pixels) called Image Objects, which can reduce the complexity of the image, and thus analysing the image becomes simpler and finally separated text and extracted aligned and store to compared with the trained data.Fig.3 Shows the segmentation of various characters.

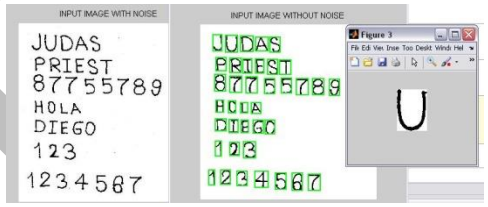

Fig 3: Segmentation of Characters

C. *Feature Extraction*

The decision making is done in the classification phase. For recognizing the characters, the extracted features are used. Different classifiers like SVM and Neural Networks are used. The classifiers sorts the given input feature withreserved pattern and find the best matching class for input, for which Soft Max Regression is used.Fig.4 shows the Feature Extraction image.

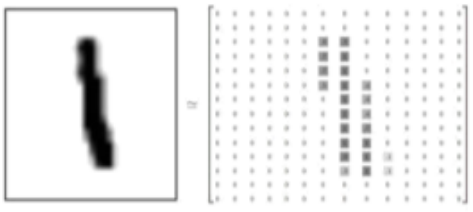

Fig. 4 Image of Feature Extraction

 ISBN: 978-81-910765-1-6

D. Classification

This process is to categorize all pixels in a digital image into one of several land cover classes, or "themes". This categorized data may then be used to produce thematic maps of the land cover present in an image.Image classification is perhaps the most important part of digital image analysis. It is very nice to have an image, showing a magnitude of colors illustrating various features of the underlying terrain, but it is quite useless unless to know what the colors mean.Fig.5 shows the characters classification.

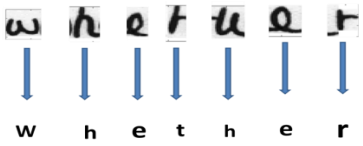

Fig.5 Characters Classification

V. RESULTS

This paper is to predict the outcome of the character recognition and when incorporated with training data, SVM algorithm predicted the highest accuracy. So, we have normalized the dataset during preprocessing stage. Normalization is done in order to bring the features of the training dataset to the same scale. The fig. 6 & 7 represents Output image and Recognition Accuracy percentage. The images can be used for training and testing for different images and achieved accuracy which a rate of 98%.

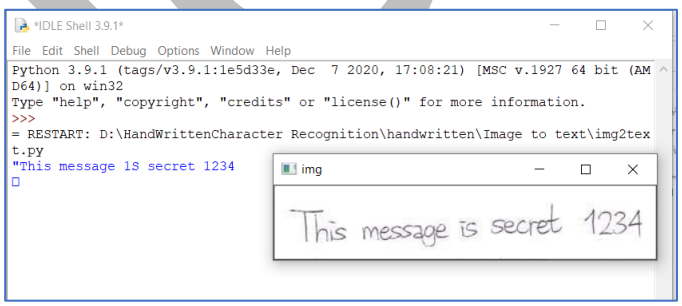

Fig.6 Output

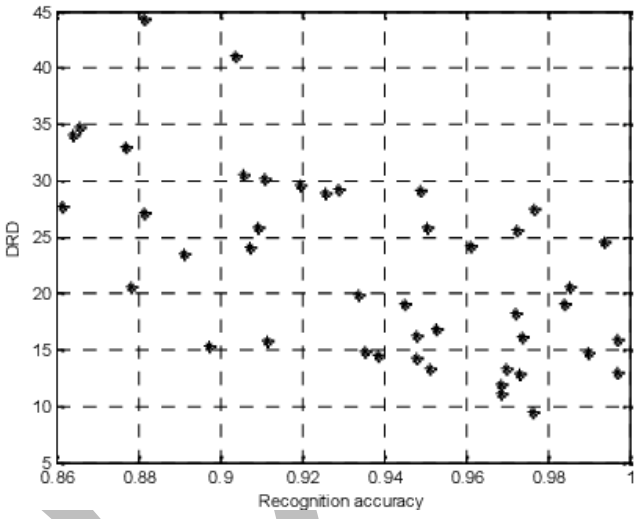

Fig.7 Recognition Accuracy

VI. CONCLUSIONS

The version many regional languages throughout world have different writing styles which can be recognized with HCR systems using proper algorithm and strategies. We have learning for recognition of English characters. It has been found that recognition of handwritten character becomes difficult due to presence of odd characters or similarity in shapes for multiple characters. Scanned image is pre-processed to get a cleaned image and the characters are isolated into individual characters. Preprocessing work is done in which normalization, filtration is performed using processing steps which produce noise free and clean output. Managing our evolution algorithm with proper training, evaluation other step wise process will lead to successful output of system with better accuracy efficiently. Use of some statistical features and geometric features through neural network will provided better recognition result of English characters. This work will be helpful to the researchers for the work towards other script.

 ISBN: 978-81-910765-1-6

VII. REFERENCES

[1] K. Gaurav and Bhatia P. K., "Analytical Review of Preprocessing Techniques for Offline Handwritten Character Recognition", in 2nd International Conference on Emerging Trends in Engineering & Management, ICETEM, 2013.

[2] Salvador EspañaBoquera, Maria J. C. B., Jorge G. M. and Francisco Z. M., "Improving Offline Handwritten Text Recognition with Hybrid HMM/ANN Models", IEEE Transactions on Pattern Analysis and Machine Intelligence Vol. 33, No. 4, April 2011,pp 52-58.

[3] Nafiz Arica, and Fatos T. Yarman-Vural, ―Optical Character Recognition for Cursive Handwriting, IEEE Transactions on Pattern Analysis and Machine Intelligence, vol.24, no.6,June 2002, pp. 801-113.

[4] U. Bhattacharya, and B. B. Chaudhury, "Handwritten numeral databases of Indian scripts and multistage recognition of mixed numerals", IEEE Trans. Pattern analysis and machine intelligence, vol. 31, No. 3, pp. 444-457, 2009.

[5] Reena Bajaj, LipikaDey, and S. Chaudhury, "Devnagari numeral recognition by combining decision of multiple connectionist classifiers", Sadhana, Vol.27, part. 1, pp.-59-72, 2002