CHARACTER RECOGNITION USING IMAGE PROCESSING

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ABSTRACT

Creating an android character recognition app to read text from an image is a great area for research. Today, it is customary to store information from handwritten documents for future reference. Translated text can be easily edited, searched and processed in many other ways depending on the needs. Character recognition systems translate such scanned images of printed, typed or handwritten documents into coded text. How to convert handwritten data into an electronic format for Visualization. Includes a few steps that include pre-processing. separation, feature removal and post-processing. Image information is enhanced with the help of a technique called pre-image processing. This image data is used as input. For the subsequent processing of the inserted image, the pre-image processing method also enhances the image attributes. The biggest challenge is seeing the characters of different styles of handwriting. Thus, the system is designed to detect handwritten data for editing text. The outcome of this program depends on the information that the author has to write. Representation of the samples as points in the mapped space so that the samples of each category are divided using a large vector known as the SVM model. Supporting vectors are the same distances from the main vector both from left and right from that larger vector. The results show that the proposed system produces excellent recognition standards similar to those of schemes based on the characteristics of handwriting recognition, high accuracy, precision and memory compared to the existing method.

Keyword : - *Image Analysis, Image Restoration, Image Enhancement*

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1. Introduction

The fashion of image processing is getting precipitously advanced and the trend is to develop more automation. Image processing is concerned with the quantitative analysis and or algorithmic approaches enforced to the data of digital images. This technology can be used to induce 3D parametric charts and tools reckoned values that must ultimately be modular and rater-independent. Digital image processing is an integral branch of image processing DIP(Digital Image Processing) makes use of digital computers for manipulating images. The exponential growth in the use of this technology has been noticed in the once several decades. Research and development in digital image processing are driving advancements in multitudinous high- tech fields including drug, geological processing, entertainment, remote seeing etc. An important pillar of the modemistic information are called multimedia systems, depend on digital image processing to a great extent. The range of digital image processing is extremely vast, encircling digital signal processing styles along with image specified ways[1]. A picture may be considered us a function f(x, y) of two nonstop variables x and y. In order to reuse this image digitally, it must be tried and converted into a matrix of figures. Since a computer denotes figures by means of finite perfection, these figures must be quantified to represent them digitally. Digital image processing involves the running of those finite perfection figures. The pre-processing activities such as binarization, noise removal, skew detection, character segmentation and thinning performed on the datasets considered. The feature extraction is performed through fuzzy Hough transform. The feature based classification is performed through important soft computing techniques viz rough fuzzy multilayer perceptron (RFMLP), fuzzy support vector machine (FSVM), fuzzy rough support vector machine (FRSVM) and fuzzy markov random fields (FMRF).

There are numerous classes in which processing of digital images can be grouped. These classes are image improvement, image restoration, image analysis, and image contraction, and image conflation. These classes are compactly described as follows :

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1.1 Image Enhancement:

Image improvement is concerned with highlighting certain image features for consecutive analysis or for image display. Some popular exemplifications of this approach are discrepancy and edge improvement, mock coloring, noise filtering, stropping, and magnifying.

1.2 Image Restoration

Image restoration is expected to remove or minimize linked image corruptions. This process consists of deblurring of images decayed by the restrictions of a detector or its surroundings, noise filtering, and rectification of geometric damages or non linearity's because of detectors.

1.3 Image Analysis

The thing of image analysis is to measure quantitative features of an image for generating a picture of it. In the simplest way, this operation can be applied to read a marker on a grocery item, sort different portions on an assembly line, or measures the size and direction of blood cells in a clinical image.

1.4 Image Compression

Due to the large volume of data related to visual information, massive storehouse capacity will be needed to store this information. Although the capacity of numerous storehouse middles is sufficient, their access speed is generally the contrary of their capacity. Image data compression styles aim to reduce the number of bits demanded to store or transfer images without any considerable information loss.

1.5 Image Synthesis

Image Synthesis is concerned with creating new images from other image .The regeneration of axial, or" slice," tomographic images from projection data , similar to x-ray computed tomography is good example of image synthesis .

अ	आ,	इ	ई	उ	ऊ,	ए	ऐ	ओ	औ	ऋ	अं	अः

Fig -1: Vowels of Devanagari Script

क	ख	ग	घ	ङ	च	छ
ज	झ	ञ	ट	ठ	ड	ढ
ण	त	थ	द	ध	न	प
फ	ब	भ	म	य	र	ल
व	श	ष	स	ह		

Fig -2: Consonants of Devanagari Script

०	१	२	३	४	५	६	७	८	९

Fig -3: Numerals of Devanagari Script

a	ा aa	ि i	ी ii	ु u	ू uu
े ee	ै ai	ो oo	ौ au	ं am	ः aha

Fig -4: Modifiers of Devanagari Script

2. Literature Review

Atharva Hase, et.al (2022) intended a recognition method in order to recognize the handwritten Devanagari Compound Character on the basis of Legendre moment feature descriptor .The concem regarding CR was addressed using the intended descriptor. These descriptors were capable of gathering global attributes. The dataset that contained 27000 handwritten samples of numerous persons had utilized to train and test the intended method. The CNN algorithm was executed in order to carry out the classification. The results validated that the intended algorithm attained the recognition rate around 98.25% and 98.36% for compound character.

Suprava Patnaik, et.al (2020) proposed a comparative analysis of handwritten OCR for which Deep CNN and ResNet were deployed for Devanagari script. There were two components diacritics and the main grapheme contained in the Devanagari character [17]. The presented ResNet had capable of handling the vanished gradient issue and enhancing the potential of conventional Deep Convolutional Neural Network (DCNN). A dynamic flow of activation was utilized in this approach. The proposed approach provided a superior accuracy around 99% in comparison with other outcomes**.**

Shivansh Gupta, et.al (2019) emphasized on deploying the Capsule Network in order to classify the handwritten characters . This network assisted in extracting the spatial information and enhancing the potentials of conventional Convolutional Neural Network (CNN). The attributes were defined in multiple dimensions and dynamic routing through capsules for amplifying the performance of the network. The benefit of exploitation of Caps Net for dealing with the issue of recognition was also described. The output of the encoder was observed to verify the accuracy of network and the decoder was applied to determine the reconstructed image.

3. Research Methodology

Automatic Devanagari Character Recognition is an innovative, outstanding and challenging technology in today's digital world developed by combining the concepts of artificial intelligence, pattern recognition, machine learning and data mining. A field it is. Compared to Indic scripts, optical character recognition (OCR) systems for non-Indic languages including English, Chinese, Japanese, Korean, and German are already developed. Today, there is a lot of interest in the Devanagari recognition and classification system, despite its gradual development and widespread ignorance in the past. Processing his documents remains a significant challenge despite Devanagari having already adopted a number of offline OCR techniques in recent years, such as linguistic significance, large character sets, complex conjunctions, typical geometric character structures, and zone-based shapes using Shiro Rekha. (Fifth row). Furthermore to these complexities, unrestricted handwritten Devanagari character recognition is always much more difficult to process than printed ones.

The Shirorekha-Less (SL) characters are obtained, their features are extracted, and then the SI characters are recognised using the SVM classifier. As a result, an effective Devanagari Character Classification using Support Vector Machine (CC-SVM) method is proposed in this paper. It preprocesses the offline scanned imaged documents, normalises them, segments them using projection profile, removes top line, obtains SL characters, and so forth. A pseudo-thesaurus, which houses a collection of pre-defined character classes, is used in this method. The divided SL. characters are matched with the pre-defined characters based on Shiro Rekha. It is classified into that pre-defined character category if the SL character is identical to the pre-defined character; otherwise, it is not. Some characters, like अः and **ण**, may be split into two or more parts during the top line removal.

The ideas of In-Document and Out-Document modes of N-lingual text document recognition and processing systems are used in this suggested system architecture [1], where N stands for mono/bi/tri/multi. These modes, respectively, reflect the interior and exterior components of an imaged document. In contrast to the Out-Document mode, which is dependent on the page and pen quality, resolution, skew variation, and other external factors, the In-Document mode includes embedded written contents such as printed or handwritten type, text font size and type, text organisation, its structure, and external factors [14]. These In-Document and Out-Document components interact with one another in such a way that different sorts of mono-lingual documents are produced images.

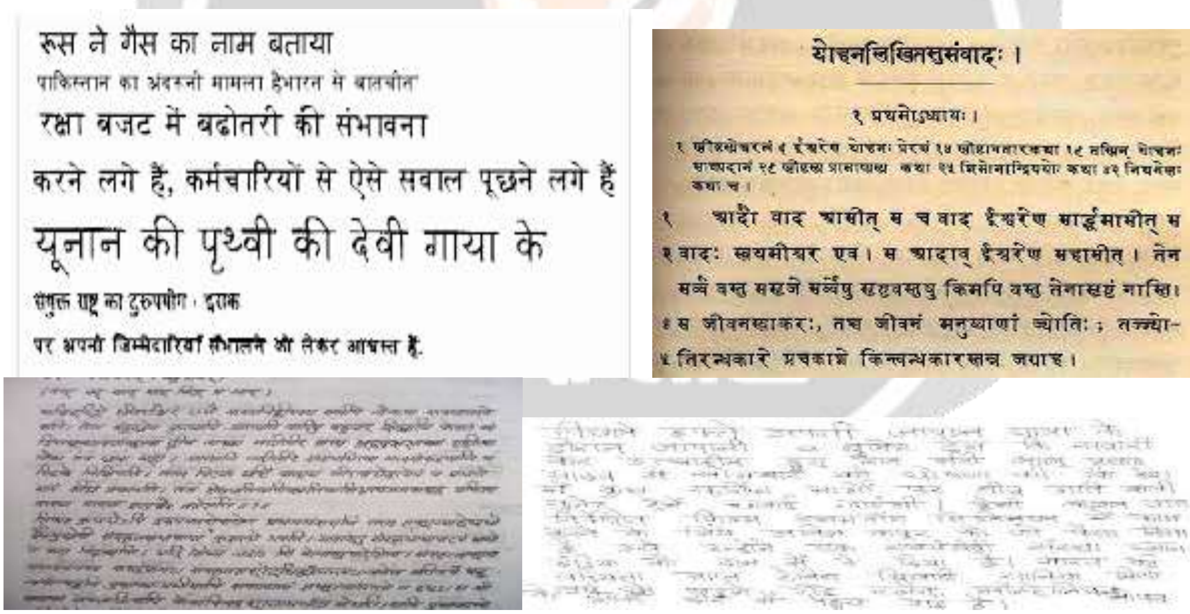

Fig -5: Sample Documents

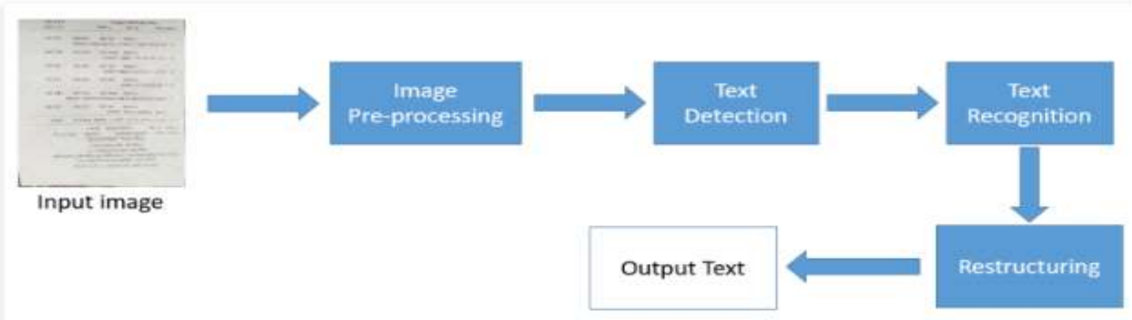

Fig -6: Image Segmentation

4. RESULTS AND DISCUSSION

4.1 Results

For this implementation, printed documents that were scanned and collected from several government portal websites, news stories, and traditional shlokas. Two writers each wrote the handwritten materials in each of the three languages. 60 documents total are being reviewed, of which 60% were utilised for testing and 40% for training. All six document types—handwritten Hindi, handwritten Sanskrit, handwritten Marathi, printed Sanskrit, printed Marathi, and printed Marathi—have received an equal number of these documents. Additionally, this system is made to analyse photographs that include a coloured background, coloured text, a multicoloured backdrop, bold lettering, and 12 to 18 point font sizes (printed). For handwritten papers, the following guidelines have been followed: Shiro Rekha must be roughly straight, characters and Shiro Rekha cannot overlap, and characters may only touch in places necessary for language writing.

Document	Segmentation result	
	Printed	Handwritten
HINDI	100%	100%
SANSKRIT	100%	100%

Table 1: Segmentation result

Document	SL Classification Result	
	Printed	Handwritten
Sanskrit	99.65	98.34%
Hindi	100%	98.65%

Table 2: SL Classification Result

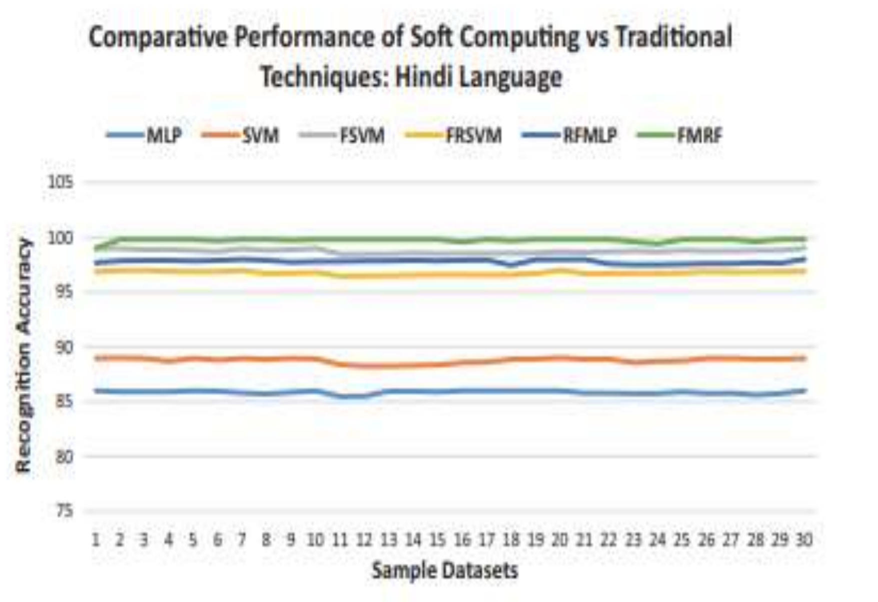

Chart1: Sample Datasets

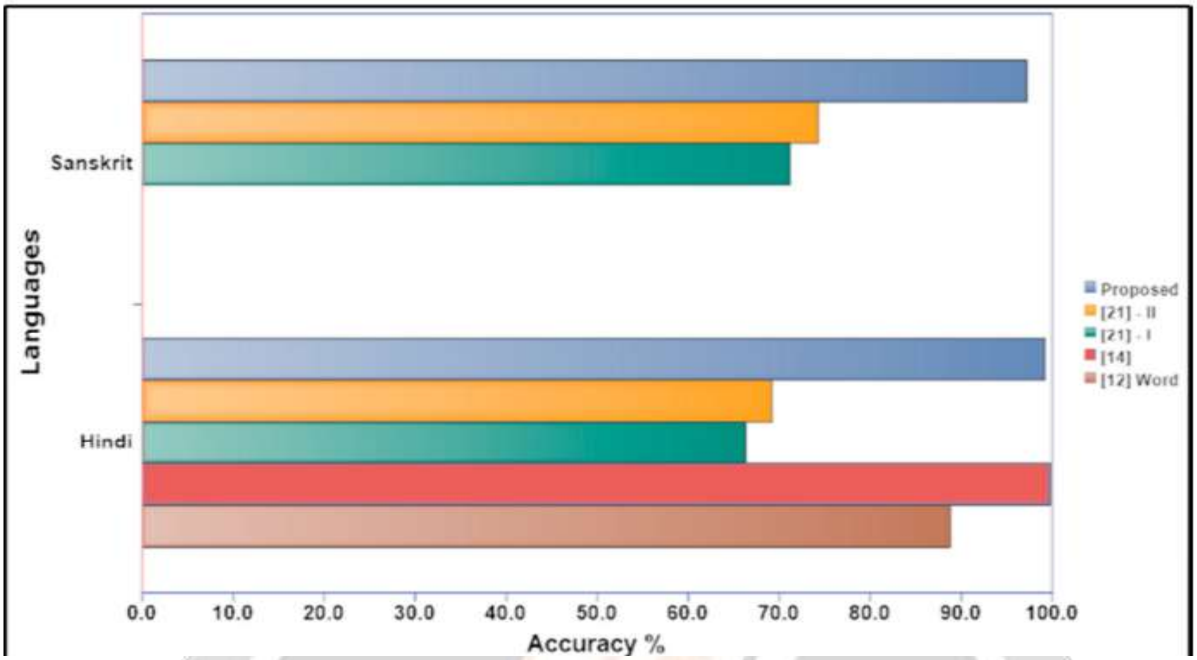

Figure7:Result Comparison

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