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Survey of Techniques for Modi Script Character Recognition

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Abstract: ***A script is most important part while writing any language and also it is useful in inter-society communication. A script, which is generally neglected to be mentioned in the discussion on the Indian scripts, is Modi. The Modi script is used in India since 12th century until mid of 20th century. In official Marathi documents and in administration purpose Modi script was commonly used in Maharashtra till the end of 19th century. Optical character recognition is a process to recognize various characters from digital image of documents. Automatic character recognition has attracted many researchers all over the world to contribute character recognition domain. This paper primary focus will be to analyze some of the existing systems on Modi script character recognition and also shed some light on the work of character recognition of ancient script such as Modi script. Different techniques have been used for character recognition whose first step consists of image processing methods that are applied on the characters to be recognized. There are various algorithms are used for Modi script character recognition such as neural network, structure similar approach, support vector machine, HU, zeneric moments and zoning.***

Keywords: Ancient script recognition, optical character recognition, Modi script, Neural Networks, Structure Similar Approach, Support Vector Machine, HU, Zernike moments and Zoning.

I. INTRODUCTION

Traditionally it is believed that the Modi script was developed by Hemadpant, a well known administrator in the court of Ramdevrao, the last king of Yadav dynasty at Devgiri. Modi script has been used since 13th century. Modi is a Brahmi-based script used mainly for writing Marathi, which is an Indo-Aryan language spoken in western and central India, predominantly in the state of Maharashtra. Modi script was also used for writing different Indian regional languages such as Hindi, Gujarati, Kannada, Konkani, Persian, Tamil, and Telugu.

There are main four styles of modi those are Bahamani Kalin, Shivakalin (Chitnisi), Peshvekalin and Anglakalin. Another style of Modi was used in the primary school books produced during the 19th and 20th centuries.

II. LITERATURE SURVEY

"Pro-posal to Encode the Modi ScriptinISO/IEC10646"(2011) by Anshuman Pandey. In this paper encoding of all the characters present in the modi script is more emphasized. The author have proposed all the letters, vowels and consonants in a proper encoding style. In this paper author have discussed all the aspects of modi script for e.g. conjunct initial, conjunct non-initial, head strokes, word and section boundaries. the author have mainly proposed the encoding styles for the modi. script for e.g.

11601;MODI LETTER AA;Lo;0;L;;;;;N;;;;;
11602;MODI LETTER I;Lo;0;L;;;;;N;;;;;
11603;MODI LETTER II;Lo;0;L;;;;;N;;;;
11604;MODI LETTER U;Lo;0;L;;;;;N;;;;;
11605;MODI LETTER UU;Lo;0;L;;;;;N;;;;;
11606;MODI LETTER VOCALIC R;Lo;0;L;;;;;N;;;;;

Authors have also described some ancient documents which were written in period of C hhatrapati Shivaji Maharaj and also some books have been shown in the document which were used in primary school. The writing styles have been described that how much variation is in the writing of the people belongs to different areas.

"Feature Extraction Algorithm for Handwritten Numerals Recognition of MODI Script using Zoning-based Approach "Nov(2012) by D. N. Besekar, R. J. Ramteke. Cursive character recognition is one of the most important area in the field of character recognition. MODI script is one of the cursive type of writing in Marathi. It has greater im- portance due to acquiring knowledge from ancient history which is written in modi script (i.e. Peshwe Kalin, Shivaji maharaj). The major problem in a cursive character recognition system is the di- varsity of the handwriting styles, which can be completely different for different writer . These conditions make this one of the most challenging problem in the computer vision field. in this paper proper method for extracting

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the feature, the zone-based method is proposed. The most important aspect of the handwriting recognition scheme is the selection of a good feature set, which is reasonably invariant with respect to shape variations caused by various writing styles. The major advantage of this approach stems from its robustness to small variations ease of implementation and good recognition rate.

"An Approach for Recognizing Modi Lipi using Ostu's Binarization Algorithm and Kohenen Neural Network by Sidra Anam, Saurabh Gupta In this paper more focus is given on developing a model of character recognition based on Kohonen neural network and Otsu's binarization. The processing of Modi script is a difficult task because the Modi handwritten characters are naturally both cursive and unconstrained. In this paper neural network technique is used for training, testing and validating the software system developed to recognize offline handwritten Modi script. Kohonen neural network:- The structure of the Kohonen neural network contains only an input and output layer of neurons, without hidden layer. The input to the network is input neurons; each allocated a floating point number (normalized between the range of -1 and 1). When the pattern is presented to Kohonen neural network, one single output neuron is chosen as the output neuron. Otsu's binarization:-Process of converting Grayscale image into bi level image is known as binarization. Binary image is a digital image that has only two possible values in a single bit (0 or 1) for each pixel. Performance of subsequent steps in OCR depends on the accuracy of the binarization process. The purpose of binarization of image is to extract the text from the image, remove the noise and reduce the size of the image.



Fig1. Modi Consonents, Vowels and Numerals

The processing of Modi script is a difficult task because the Modi handwritten characters are naturally both cursive and unconstrained. Neural network technique is used for training, testing and validating the software system developed to recognize offline handwritten Modi script. But less number of sample data may degrade the performance of that system. Modi script is written in cursive type, hence it creates extra branches in letters. major problem in a cursive character recognition system is the diversity of the handwriting styles, which can be completely different for different writer . This variability is also an of evident that some system can identify the writer based on a handwritten text.. Even the same writer can change his writing style due to variation on neurological conditions, type of pen and position . These conditions make this one of the most challenging problem in the computer

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III. EXISTING SYSTEM

There are four main character recognition phases

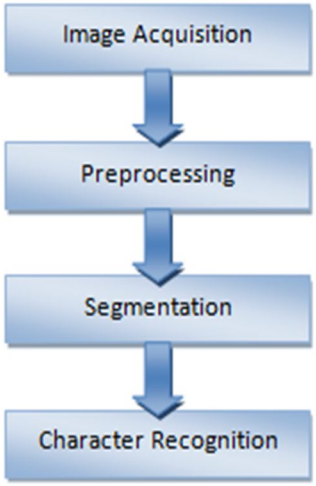


Fig2. Block Diagram Of Character Recognition Phases

Image Acquisition: The character recognition systems first get a scanned image of modi document as an input image. The images are in specific format like .jpg .png etc as per the requirements. This image are get through the the scanner or any other suitable input device. This image is store on the server and forwarded to the preprocessing phase.

Preprocessing: The input image may be contained with noise and other distortion to remove those unwanted things and create a quality image the preprocessing phase perform following two methods.

1) Grayscale Conversion :- Grayscale image contains single intensity value for each pixel, as opposed to the three intensities needed to specify each pixel in a color image. Following equation is used to convert the color image into Grayscale image. A single intensity value is calculated for the image. Here R, G and B shows intensity value of Red, Green and Blue colors respectively. Gray = 0.2126*R + 0.7152*G + 0.0722*B

2) Binarization :-Binarization Converts grayscale image into bi-level image. The binary image is also known as digital image which is consists of two possible values in a single bit that is 0 or 1.

Segmentation:- Segmentation converts the digital image into multiple segments by performing some process of partitioning image. The document segmented into its sub components. Segmentation is an important stage, because the extent one can reach in separation of words, lines or characters directly affect the recognition rate of the recognition This process starts from an initial point in the scanned image of a document. Segment of an image is an area, which distinguishes one character from another and extracts individual attributes of each character such as width, height etc

The segmentation is carried out by following steps:-

a) Structural Layout : Separation of text image and white spaces is implemented

b) Line Segmentation : Plotting of bounding boxes for the text lines.

c) Word Segmentation : Drawing of bounding boxes for the word separation

d) Character Segmentation : Drawing bounding boxes around character.

In holistic method, the system seeks to recognize words as a whole, thus avoiding the need to segment into characters. Various hybrid techniques are also available to segment a character. One of these techniques is hit and deflect algorithm. It is used to find an optimal path for cropping a connected component. Another technique known as drop fall algorithm attempts to build a segmentation path by mimicking an object falling or rolling in between the two characters. connected component. We have derived a method for cropping the image, which segments the image into individual characters more efficiently. Which improves the accuracy in segmentation.

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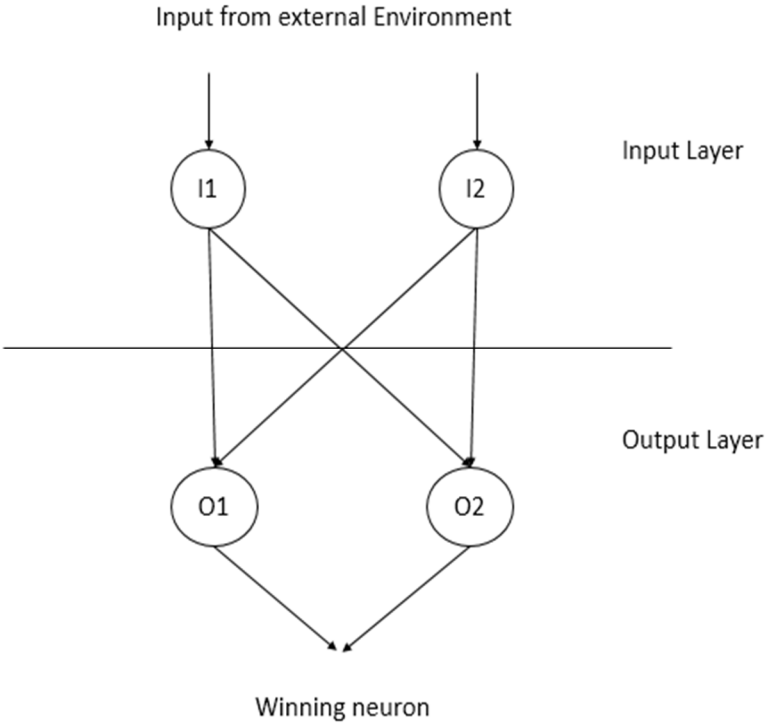
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A. Character Recognition

The character recognition is done by the proposed algorithm such as structure similar approach, Support Vector Machine, HU's moment, Zernike moments, Zoning and Neural Network. Recognition is the process of matching the segmented characters obtained in the previous phase with the data set used for training the network. When a character image matches with the data set image, successful recognition is announced. This can be achieved by using some recognition techniques.

B. Neural Network Technique

Neural networks have been employed for character recognition with varying degree of success. These networks are also employed for integrating the results of the classifiers by adjusting weights to obtain desired output. The structure of the Kohonen neural network contains only an input and output layer of neurons, without hidden layer. The input to the network is input neurons; each allocated a floating point number (normalized between the range of -1 and 1). When the pattern is presented to Kohonen neural network, one single output neuron is chosen as the output neuron. The structure of a typical Kohonen neural network is shown in Figure below. It shows a simple network with only two input neurons i.e. I 1 and I 2 and two output neurons i.e. O 1 and O 2 . The process of learning of Kohonen Network involves a series of steps which are as follows: Normalizing the Input, Calculating Each Neuron's Output, Mapping to Bipolar, Choosing the Winner, Learning process of Kohonen neural network, Learning Rate, Calculating the Error.



C. Structure Similarity Approach

A recently proposed class of quality metrics, known as structural similarity (SSIM), models perception implicitly by taking into account the fact that the HVS(human vision system) is adapted for extracting structural information (relative spatial covariance) from images [14] and specifically implemented both in the image space and the wavelet domain. The motivation behind the structural similarity approach for measuring image quality is that the HVS has evolved to do visual pattern recognition in order to be able to extract the structure or connectedness of natural images. Based on this observation, it makes sense that a useful perceptual quality metric would emphasize the structure of scenes over the lighting effects

D. Zoning

The character image of size 60×60 is further divided into 4 equal zones of size 30×30 each and also divided into 9 equal zones of size 15×15. For each zone zernike moments are calculated repeat the process for all images in sample set.

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Algorithm

1) Train Set

a) Step 1: Input preprocessed handwritten numeral image.
b) Step 2: Divide the I/P image into 4 equal zone of size 30×30
c) Step 3: Find Zernike moment for each 4 zones
d) Step 4: Create table of moment for each zone i.e. tr1,tr2,tr3 and tr4.
e) Step 5: Store these values in table for tr1,tr2, tr3 and tr4.
f) Step 6: Repeat the steps 2 to 5 for each image
g) Step 7: Store table of moment for each image i.e. tr1, tr2, tr3 and tr4 separately.
h) Step 8: Calculate mean tr1,tr2,tr3 and tr4 represents a mean character for every 70 samples.
i) Step 9: tr1 i , tr2 i , tr3 i and tr4 i represents Zernike moment for i th character

2) Test set

a) Step 1: Input preprocessed handwritten numeral image.
b) Step 2: Divide the I/P image into 4 equal zone of size 30×3
c) Step 3: Find Zernike moment for each 4 zones
d) Step 4: Create table of moment for each zone i.e. ts1, ts2, ts3 and ts4.
e) Step 5: Store these values in table for ts1, ts2, ts3 and ts4.
f) Step 6: Repeat the steps 2 to 5 for each image
g) Step 7: Store table of moment for each image i.e. ts1, ts2, ts3 and ts4 separately.
h) Step 8: ts1 i , ts2 i , ts3 i and ts4 i represents Zernike moment for i th character

3) Recognition

a) Step 1: Load input tr1 i ,tr2 i , tr3 i and tr4 i from train set
b) Step 2: Load input ts1 i ,ts2 i , ts3 i and ts4 i from test set.
c) Step 3: Calculate Euclidian distance between tr1 and ts1, tr2 and ts2, tr3 and ts3 and tr4 and ts4
d) Step 4: Repeat the steps 2 and 3 for each image in test set.
e) Step 5: Store 4 minimum values and 4 indexes for all 4 zones
f) Step 6: If for all 4 zones have similar index then character recognized.
g) Step 7: If from all 4 zones at least three indexes do not have similar index or all four indexes are

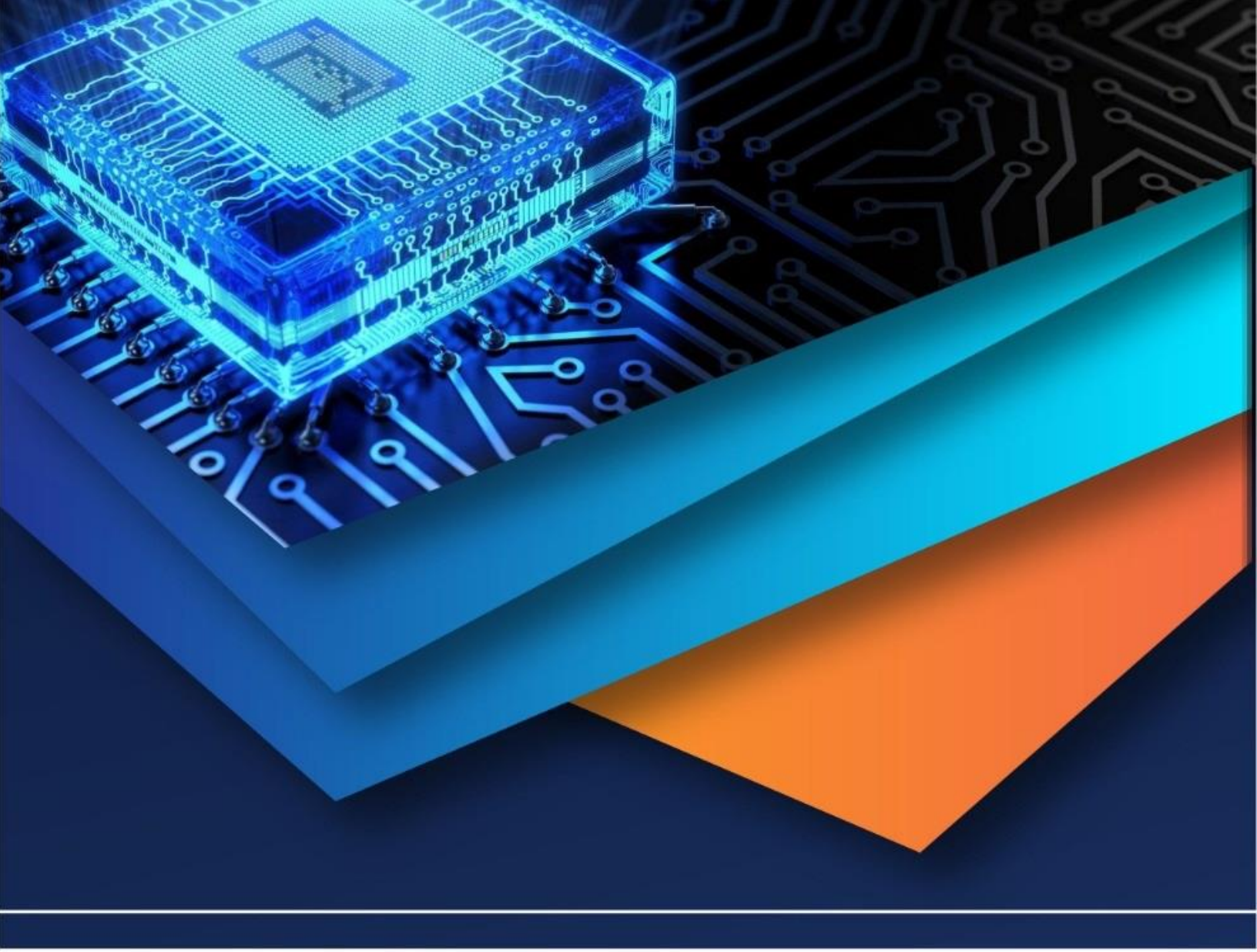
IV. CONCLUSION

This paper throws a glance on all the existing Modi script character recognition systems for effective analysis. Different methods have been proposed to recognize the Modi script with each having varying efficiencies. By use of these various methods we can recognize modi characters by which many Modi documents can be unfold the history of Maratha dynasty and other important information. A variety of systems have been proposed for Modi Script but a single comprehensive all inclusive working system is still a future proposition. This presents a opportunity for researchers in Modi Script Character Recognition.

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