



## Devanagari Character Recognition Using Neural Network

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**Abstract**— In this paper we have used a novel approach to recognize handwritten character in devanagari .various algorithm like Gabor transform are used for feature extraction and other techniques are used to perform image normalization segmentation and removing noise.we have used probabilistic neural network as a classifier which gives accuracy of 80 % accuracy while recognizing.

**Keywords**— data collection, extracting feature, image normalization, neural network

### I. INTRODUCTION

This paper analysis and evaluated different challenges and approaches related to devanagari handwritten character .The script taken here into consideration is Devanagari which is also script for hindi,Marathi,Sanskrit language about more than 450 people use these script

### II. DEVANAGARI SCRIPT

It is a standardized script since 19 th century,it consist of 33 consonant and 11 vowels.the modifiers are another constituent symbols which makes recognition of Devanagari script more challenging. Other factors are

- Writing speed
- Pen width
- Writing of person

### III. BLOCK DIAGRAM OF DEVANAGARI HCR

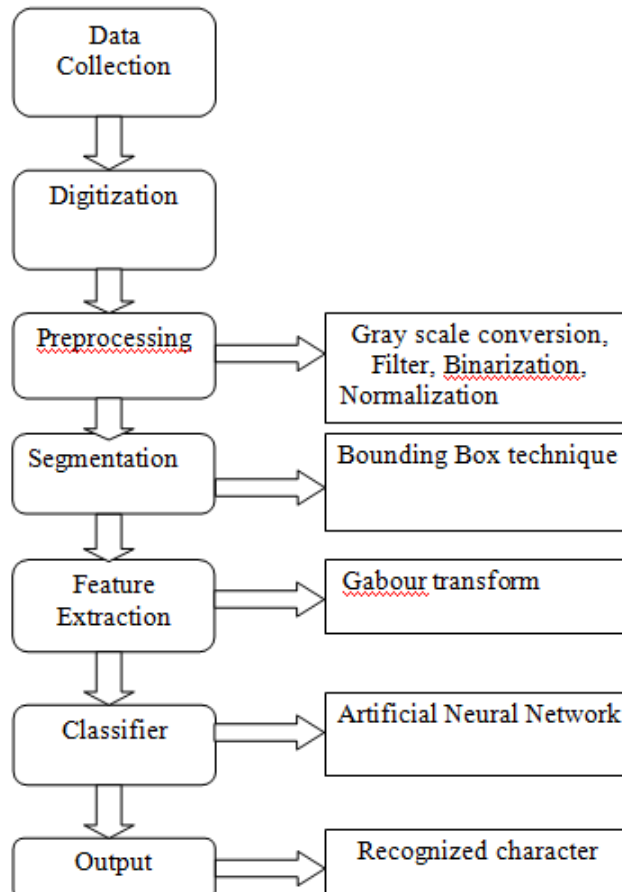


Figure 1

**3.1 Data collection:** handwritten samples of data for various character are acquired on paper from different people.

**3.2 Digitization** –data sample are scanned using devices such as scanner which is of 300 dpi, which converts data on paper to bitmap image [1].

**3.3 Preprocessing-** it is heart of HCR system it cleans the image and removes discontinuity, distortion and get image in recognizable form. it consist of

- Binarization
- Inversion
- Noise reduction
- Normalization

**3.3.1 Binarization-**the image are stored which are nothing but RGB images. these images are then converted to white and black image with a threshold value of 0.5.

**3.3.2 Inversion-** The binary image consist of black foreground as font and white as background since number of foreground pixel are less as compared to background we inverse it as a result calculation decreases.

**3.3.3 Noise reduction-** noise is nothing but error in the image. it can be removed using different filters to smoothen the image.

**3.3.4 Normalization-** it is a process of converting image of random size to a standard size.

**3.4 Segmentation-** segmentation is breaking isolating word character by character

- (a) Interline space is checked.
- (b) if interline space is there then image is segmented across the gap.
- (c) character are considered as individual object.
- (d) feature of each character are extracted



Figure 2 Segmentation of character

**3.5 Feature extraction** – It extract discriminant information and recognize structure from an image of character .it is brain of HCR system. After using GABOR transform we get feature extraction as

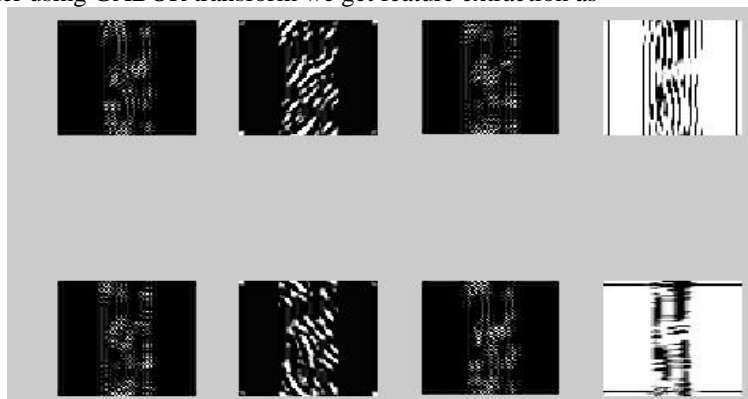


Figure3 Feature extraction of characters

### 3.6 classification

The extracted feature are given to the classifier which is Probabilistic neural network. In this the operation are organized into multilayered feedforward network with 4 layers.

- Input layer
- Hidden layer
- Pattern layer/Summation layer
- Output layer

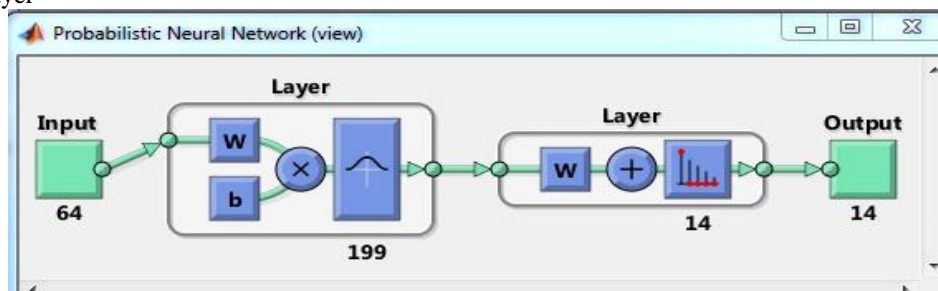


Figure 4 output of PNN

#### **IV. CONCLUSION AND FUTURE WORK**

. A lot of research work exists in the survey for Devanagari Handwritten recognition.. In this paper, we have projected various aspects of each phase of offline Devanagari character recognition process that have been used. Researchers have used many character set for research. The following key challenges are more to be carried out by researchers by increasing number of holes and strokes and mixed words.

#### **REFERENCES**

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