LITERATURE SERVEY

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Team Id	PNT2022TMID395413
Project Name	Project – A Novel Method For Handwritten Digit Recognition System

INTRODUCTION:

The technique by which a computer system can recognize characters and other symbols written by hand in natural handwriting is called handwriting recognition system. Handwriting recognition is classified into offline handwriting recognition and online handwriting recognition

WORKING PRINCIPLE:

Normally handwritten recognition is divided into six phases which are image acquisition, pre-processing, segmentation, feature extraction, classification and post processing.

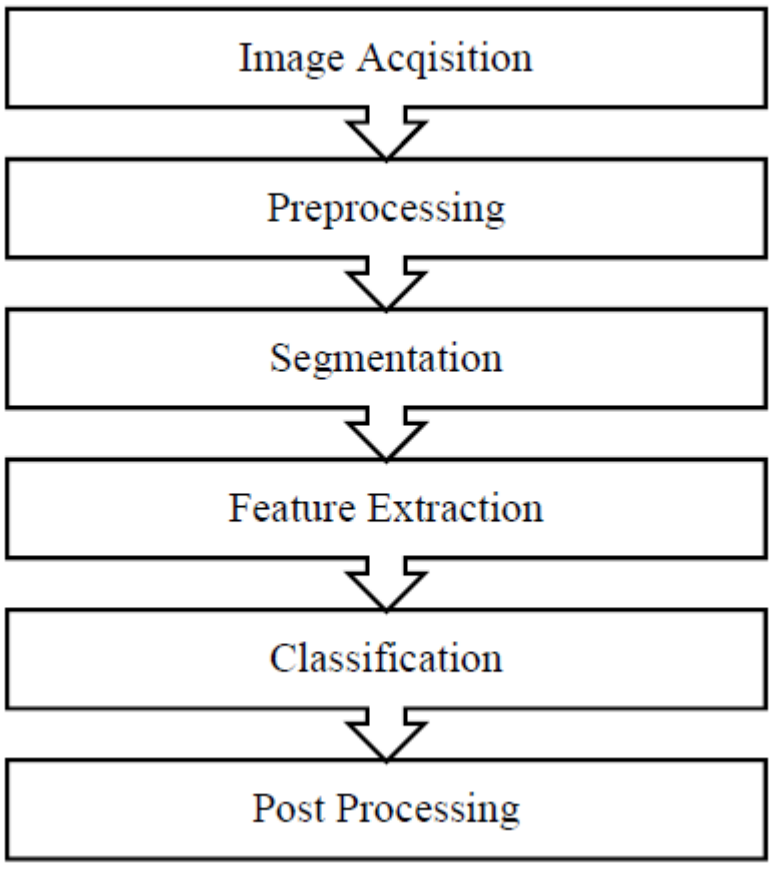

Image Acquisition:

Digitized/Digital Image is initially taken as input. The most common of these devices is the electronic tablet or digitizer. These devices use a pen that is digital nature. Input images for handwritten characters can also be taken by using other
methods such as scanners, photographs or by directly writing in the computer by using a stylus

Preprocessing:

Pre-processing is the basic phase of character recognition and it's crucial for good recognition rate. The main objective of pre-processing steps is to normalize strokes and remove variations that would otherwise complicate recognition and
reduce the recognition rate. These variations or distortions include the irregular size of text, missing points during pen movement collections, jitter present in text, left or right bend in handwriting and uneven distances of points from neighbouring positions. Pre-processing includes five common steps, namely, size normalization and centering, interpolating missing points, smoothing, slant correction and resampling of points.

Segmentation:

Segmentation is done by separation of the individual characters of an image. Generally document is processed in a hierarchical way. At first level lines are segmented using row histogram. From each row, words are extracted using column histogram and finally characters are extracted from words.

Feature Extraction:

The main aim of feature extraction phase is to extract that pattern which is most pertinent for classification. Feature extraction techniques like Principle Component Analysis (PCA), Linear Discriminant Analysis (LDA), Chain Code (CC), Scale Invariant Feature Extraction (SIFT), zoning, Gradient based features, Histogram might be applied to extract the features of individual characters. These features are used to train the system.

Classification:

When input image is presented to HCR system, its features are extracted and given as an input to the trained classifier like artificial neural network or support vector machine. Classifiers compare the input feature with stored pattern and
find out the best matching class for input.

Post Processing:

Post-processing refers to the procedure of correcting misclassified results by applying linguistic knowledge. Postprocessing is processing of the output from shape recognition. Language information can increase the accuracy obtained by pure shape recognition. For handwriting input, some shape recognizers yield a single string of characters, while others yield a number of alternatives for each character, often with a measure of confidence for each alternative.

COMPARISION BETWEEN DIFFERENT TECHNIQUES:

Method	Accuracy	Purpose
Hand printed symbol recognition	97%	Extract the geometrical, topological and local measurement
OCR for cursive Handwriting.	88.8%	To implement segmentation and recognition algorithms for cursive handwriting
Recognition of handwritten numerals based upon fuzzy model	98.4%	The aim is to utilize the fuzzy technique to recognize handwritten
Combining decision of multiple connectionist classifiers for Devanagari numeral Recognition	89.6%	To use a reliable and an efficient technique for classifying Numerals.
Binarisation and normalization	88.8%	Multi-layer network
Optimization of feature selection for recognition of Arabic characters	88%	To apply a method of selecting the features in an Optimized way.

FUTURE WORK:

The proposed recognition system is implemented on handwritten digits taken from MNIST database. Handwritten digit recognition system can be extended to a recognition system that can also able to recognize handwritten character and handwritten symbols. Future studies might consider on hardware implementation of recognition system.

CONCLUSION:

The paper discusses in detail all advances in the area of handwritten character recognition. The most accurate solution provided in this area directly or indirectly depends upon the quality as well as the nature of the material to be read.This thesis HOG-PSVM handwritten digit recognition system is presented. The images of handwritten digits are described in terms of 81 dimensions HOG feature descriptor.