*Research Article*

# Gesture Based Alphanumeric Character Detection

**Bhakti Gaul and Prof. Prashant Mane**

Department of Computer Engineering  Zeal College of Engineering and Research

## Abstract

*Numerous techniques are projected by several researchers for written also as written character and numeral gratitude. Recognition is the method of exchange of written text into computer legible type. To achieve the most effective accuracy of any recognition system the choice of feature extraction and categorization technique is critical. The information concerning the character is collected by the options and as a result, classifiers categorize the character decidedly. For written characters there is a unit drawback love it differs from one author to another, even once the same person writes the same character variety of times there's a division in form, size, and position of the character. Newest analysis during this space has used frequent styles of the method, classifiers, and options to reduce the complexness of recognizing written text. During this paper, benefits and downsides of 2 diverse techniques of feature extraction and sorting are mentioned.*

*Keywords*: component HCR, Feature extraction method, HOG, PCA, Image classification techniques, CNN, NN

## Introduction

Handwritten Character Recognition (HCR) is that the capacity of a laptop to collect and translate specific handwritten input through several machine-driven method systems. HCR will be isolated into 3 steps particularly preprocessing, feature removal and classification (recognition). HCR is that the method of varying scanned pictures of written text into laptop procedure text like code. It's usually wont to improve the speed of operation, scale back mistakes or sound within the documents and reduce storeroom space required for paper documents. It is an easy methodology for quick recovery, simple search, save additional packed in knowledge. It's full of life pasture of analysis in pattern gratitude and image processing system. Feature source is a critical job in the character recognition system. Its main task is getting explicit data as of character to satisfy variation at intervals class pattern. HCR could be a difficult issue as a result of there's a divergence of identical characters thanks to the alteration of writing designs. The variation in writing designs makes the reputation task upsetting, resulting in not the rational output of the reputation of the character method.  HCR has several applications in mail sorting, bank  process, document reading, and postcode recognition. Off-line handwriting recognition could be a difficult analysis space towards exploring the newer techniques that will get better recognition correctness. The feature extraction stage is employed to remove redundancy from knowledge. There are three forms of option on which feature extraction

strategies for character recognition square measure primarily based: a) applied math options b) structural and c) transformation based options. The most arithmetical options that are used for character pictures are :
a) zoning- everywhere the image is split into many zones, b) projections and c) crossings and distances.

### B. Motivation

Organizations widely use documents to acquire information from customers. These documents are generally handwritten. Manually filling the same data into the computer is a common practice to handle that information.
Hence, the requirement of a special Sign language Recognition Software arises which will automatically recognize texts from the image of documents.

### C. Objectives

**1.** The main objective of Sign language is to improve the speed of operations.
**2.** To reduce error or noise in the documents and decrease the storage space needed for paper documents.
**3.** To identify characters. To remove redundancy from data.

## Review of Literature

This paper include, we extracted the gradient direction histogram (HOG) features of movements, then, a Support Vector Machines is used to train these feature

vectors, at analysis time, a judgment is taken using the formerly learned SVMs and matched the same gesture recognition rate in different light environments.[1]

This paper classifies the most appropriate NN for the design of a handwritten English character recognition system. [2]

In this paper, we evaluate the k-nearest neighbor (KNN), linear and quadratic discriminant analysis (LDA and QDA, respectively) for surrounded, online feature mixture which poses strong limitations on computing resources and timing. [3]

This paper proposed a different feature extraction technique to improve the recognition results of two alike shaped characters.[4]

We study the question of feature collections for strong visual object recognition, approving linear SVM based human detection as a test circumstance. [5]

**Proposed Methodology**

The recognition accuracy of the image depends on the kindness of the selected options and the sort of classifier used. Therefore, the range of feature taking out and classification techniques are often found within the literature. The earliest Optical Character Recognition systems weren't computers however the mechanical devices that can recognize characters area unit of terribly slow speed and low accuracy. In 1951, M. Sheppard fictitious a reading and robot GISMO which will be thought of because of the earliest work on trendy OCR [3]. GISMO will scan musical notations in addition to words on a written page one by one. However, it will solely recognize twenty-three characters. The machine has the potential to repeat a written page. J. Rainbow, in 1954, devised a machine that may scan uppercase written English characters, one per minute. The first OCR systems were destined thanks to errors and slow recognition speed. Therefore all through the '60s and '70s, not plentiful analysis efforts were placed on the subject. The only developments were placed on government agencies and enormous firms like banks, newspapers, and airlines, etc.

**A. Architecture**

In this Project Architecture Design, they are different modules like the user, user interface, Database,
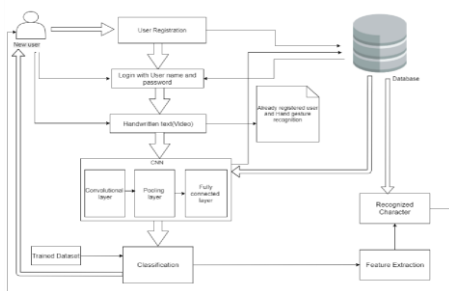


**Fig. 1.** Proposed System Architecture

Analysis Process, result Generation and Suggestion are implemented. The user has added the self-information and stores the SQLite dataset. Developer developed the Attractive User Interface and SQLite Database. Using the Analysis Process they implemented is classification Techniques.

**B. Algorithms explanation**

1. Convolution:-

Convolutional Neural Networks are a group of Deep Neural Networks that have verified very effectively in areas such as image recognition and sorting. For image recognition, CNN performs the following operations:

Convolution step purpose is to extract features from the input image. Convolution reservations the spatial association between pixels by learning image features using small squares of input data.

Suppose a 5 x 5 image whose pixel values are simply 0 and 1 (note that for a grayscale image, pixel values range from 0 to 255, the matrix below is a special case where pixel values are only 0 and 1).



**Fig. 2**.    5 x 5 Image Matrix

Also, reflect another 3 x 3 matrix as shown below:



**Fig.3.**   3 x 3 Image Matrix

The Convolution of the 5 x 5 image and the 3 x 3 matrix can be computed as follows:



**Fig. 4.**    Image Matrix combine (5x5 &3x3)
**Image Convolved Feature**



**Image**                    **Convolved Feature**
**Fig, 5.**   Image Matrix Convolution Step

Initially, the images from train and tune folders are considered as an input image to the CNN algorithm to train the method and all the image undergoes convolution step to extract its features of them.

2. Non-Linearity (ReLU) Step:

ReLU is a component-wise operation (applied per pixel) and switches all negative pixel values in the feature map by zero.

3. Pooling Step:

Spatial pooling reduces the aspect of each feature map without affecting the most key information. Spatial Pooling is of different types:
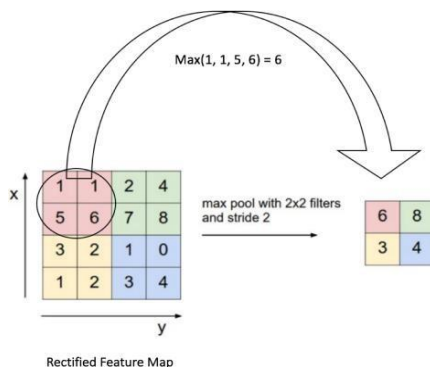
- Max
- Average
- Sum



**Fig. 6.** Max Spatial Pooling

2 x 2 window is a slide by 2 cells (also called 'stride') and the maximum value in each region is considered.

4. Fully Connected Layer Step:

Fully Connected layer uses the softmax activation function in the output layer. The fully connected layer implies that every neuron in previous layers is connected to every neuron on the next layer.

The output from convolution and pooling layers signify high-level features of an input image. The function of a fully connected layer is to use these features for sorting the input image into different classes based on the training dataset.

**Result and Discussions**

Experiments are done by a personal computer with a configuration: Intel (R) Core (TM) i3-6700HQ CPU @ 2.60GHz, 4GB memory, Windows 8, SQLite Database 3.11.2.0 and PyCharm 2019.2.

**Conclusions**

In this paper, we have a propensity to mention entirely different feature removal and image classification ways for classifying fuzzy and clangorous pictures. We tend to additionally explain the structure of the written character gratitude system. Briefly explained its phases, explanation, and approach. Finally, we discussed the blessing and drawbacks of organization ways like SVM, KNN, and NN.

**References**

[1] Kai-ping Feng, Fang Yuan, "Static hand gesture recognition based on HOG characters and support vector machines" Instrumentation and Measurement, Sensor Network and Automation, pp. 936-938, Dec. 2013.

[2] J. Pradeep, E. Srinivasan and S.Himavathi,"Neural Network Based Recognition System Integrating Feature Extraction and Classification for English Handwritten", International Journal of Engineering (IJE), Vol. 25, pp.99-106, May 2012.

[3] Andreas Starzacher, Bernhard Rinner, "Evaluating KNN, LDA and QDA classification for embedded online feature fusion" Intelligent Sensors, Sensor Networks and Information Processing, pp. 85-90, Dec. 2008.

[4] T. Wakabayashi, U. Pal, F. Kimura and Y. Miyake, "F-ratio Based Weighted Feature Extraction for Similar Shape Character Recognition", ICDAR, pp. 196-200, 2009.

[5] Dalal N. and Triggs B, "Histograms of Oriented Gradients for Human Detection," in Proceedings of IEEE Computer Society Conference on Computer Vision and Pattern Recognition , San Diego, pp. 886-893, 2005.

[6] Sukhpreet Kaur, Simpel Rani, "A survey on feature extraction and classification techniques for character recognition of Indian scripts", International Journal of Engineering Sciences, pp. 122-131, June 2016.

[7] N. K. Garge, Dr. L. Kaur and Dr. M. Jindal, "Recognition of Off - line Handwritten Hindi Text using SVM", International Journal of Image Processing (IJIP) , Vol. 7, 2013.

[8] Cha-Sup Jeong and Dong-Seok Jeong, "Handwritten digits recognition using Fourier descriptors and contour information" IEEE TENCON, Vol.2, pp.1283-1286, Dec. 1999.

[9] Mori, S., Suen, C. Y. and Kamamoto, K., "Historical review of OCR research and development", Proceedings of IEEE, Vol. 80, (1992), 1029-1058.

[10] Alceu de Britto, S., Sabourin, R., Bortolozzi, F. and Ching Suen, Y., "The recognition of handwritten numeral strings using a twostage HMM-based method", International Journal of Document Anal. Recognition, Vol. 5, (2003), 102-117.

[11] Ramteke, R. J. and Mehrotra, S. C., "Recognition of Handwritten Devnagari Numerals", International Journal of Computer Processing of Oriental Languages, Vol. 1, No. 2, (2008), 1-9.

[12] Pal, A., Singh, D., "Handwritten English CharacterRecognition Using Neural Network," International Journal of Computer Science & Communication, Vol.1, No. 2, (2010), 141-144.