

# Gesture Based Alphanumeric Character Detection

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## 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;

## I. INTRODUCTION

### A. BACKGROUND

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.

## II. 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



### 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

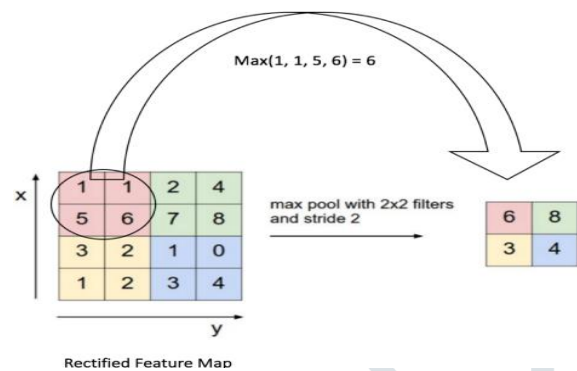


Fig. 6. Max Spatial Pooling

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.

## IV. PROPOSED SYSTEM ALGORITHM

CNN(Convolution neural network):

A convolutional neural network is one of the main categories to do images recognition, images classifications. CNN image classifications take an input image, process it

and classify it under certain categories. Computers see an input image as an array of pixels and it depends on the image resolution. Based on the image resolution, it will see  $h \times w \times d$  ( $h$  = Height,  $w$  = Width,  $d$  = Dimension).

KNN(Nearest neighbor):

KNN can be used for both classification and regression predictive problems. However, it is more widely

used in classification problems in the industry.

## MATHEMATICAL MODEL

$$S = \{s, e, X, Y, F, A\}$$

$S$  = Set Theory

$s$  = Start of the program

1. Register/Login into the system

$e$  = End of the from

$X$  = Input of the program (Input as video)

$Y$  = Output of program = Recognized character

$A$  = Success of program

$F$  = Failure of program = Prediction failure

First, user provide Video of handwritten character among dataset. System extracts features with help of Convolutional neural network.

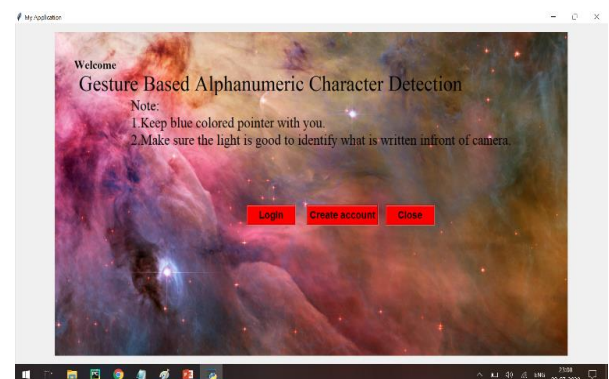
Let  $F$  be the set of features

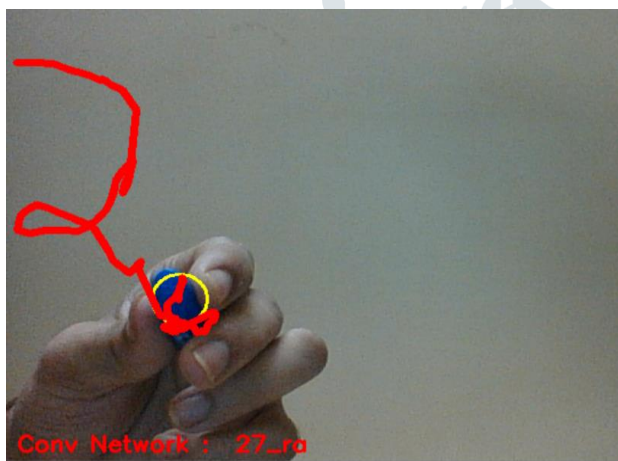
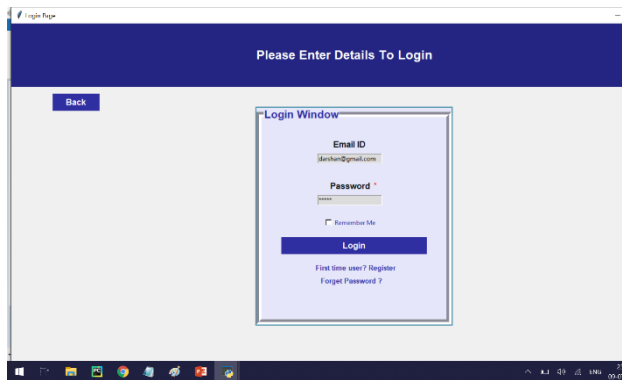
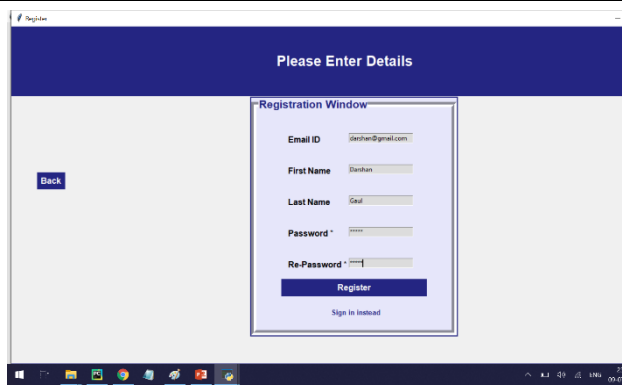
$$F = \{F_1, F_2, \dots, F_n\}$$

These features are compared with extracted features of training dataset images. The classifier classifies these features and determines which character given by the image.

## V. 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.





## VI. 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.

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