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Projection Method for Devanagari Character Recognition

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Abstract: *In this paper we will discuss a new approach character recognition which is by-far the most natural method for feature extraction is principal component analysis (PCA) . There are several mechanism proposed in the direction of Marathi character recognition which includes design of feature vectors, classifier, cascading of the classifiers, new preprocessing techniques and so on. Off late the recent trends has shown that K-NN produces best results in the direction of character recognition.*

1. INTRODUCTION

Optical Character recognition is a part of optical character recognition where the scanned document is fed to the processing software as an image input and the software produces ascii or utf format editable output. The character recognition have drawn tremendous amount of attention over past decade or so. When a document is scanned, the document is converted into image format with noises like scanning noise. The recognition engine must filter this and recognize each character. Technically there are other challenges, specifically in separating the characters which is called segmentation and neutralizing the stroke and skew of writing.

A sample Marathi document image with various Marathi characters. The Character recognition deals with identifying each independent characters in this image. The character recognition from the images is not a new domain and has been studied for a long now. But the challenge in Indian devnagari or Dravidian character set recognition is quite challenging than the challenge in recognizing English character set. The challenge is that the Indian script characters are marked with turns and skews specific to characters, the style of writing is of wide range and number of actual classes are quite high. Also there exists certain similarity amongst the characters in the alphabet which elevates the risk of false recognition.

2. PRINCIPAL COMPONENT ANALYSIS (PCA)

We can use PCA to compute and study the Eigenvectors of the different pictures and then to express each image with its principal components (Eigenvectors).

It is a way of identifying patterns in data, and expressing the data in such a way as to highlight their similarities and differences. First of all, we had to create the data set. The aim is to choose a good number of pictures and a good resolution of these in order to have the best recognition with the smallest database. Then, the next step is to subtract the mean from each of the data dimensions. The mean subtracted is simply the average across each dimension. The step three is to calculate the covariance matrix of the database. We could not calculate the covariance matrix of the first matrix, because it was too huge. So we had to find a way to find out the principal eigenvectors without calculating the big covariance matrix. The method consists in choosing a new covariance matrix. Our covariance matrix for A was called C and C is defined by:

$C = A^* A'$

The Eigenvectors and the Eigenvalues of C are the principal components of our data set.[1-4]

3. K NEAREST NEIGHBOR

Nearest neighbor classifiers are based on learning by analogy, that is by comparing a given test class with training class which are similar to it. Each class represents a point in an n-dimensional space. In this way, all of the training class are stored in an n-dimensional pattern space. When given an unknown

class, a k-nearest neighbor (k-NN)classifier searches the pattern space for the k training class which are closest to the unknown class. These k training class are the k-nearest neighbors of the unknown class [22].

"Closeness" is defined in terms of a distance metric, such as Euclidean distance. The Euclidean distance between two points or class $X_1 = (x_{11}, x_{12}, \ldots x_{1n})$ and $X_2 = (x_{21}, x_{22}, \ldots, x_{2n})$ obtained from equation 1.

$$dist(X_1, X_2) = \sqrt{\sum (x_{1i} - x_{2i})^2} \quad (1)$$

The basic steps of the k-NN algorithm are ;

To compute the distances between the new sample and all previous samples

To sort the distances in increasing order and select the k samples with the smallest distance values.[5-7]

4. FEATURE SCOPE

In this system we have only considered the static gesture, but in real time we need to extract the gesture form the video or moving scene. Therefore the system needs to be upgraded to support dynamic gesture. This system can be further upgraded to give order and control robots. It can also be very helpful for the physically impaired persons. All the above methods can be further enhanced for binary and color images.

Some more applications are that this proposed system can be used gaming. Instead of using the mouse or keyboard, we can use some pre-defined hand gesture to play any game. Also, this system can be used to operate any electronic devices by just keeping a sensor which recognizes the hand gestures. Another application is that this can be used for security and authorization by keeping any particular hand gesture as the password.

5. RESULTS

Here we have extracted feature of dataset.

Value of K	Number	Character
3	75	82
5	81	83
7	85	87

6. CONCLUSION

A KKN give better result on numbers, single characters means characters without modifiers.

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