FACE RECOGNITION USING DETECTION OF EYES

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Introduction

Recognition of human face is one of the key challenges in the research area. Face recognition and detection technology have improved their performance dramatically over past few years. Face recognition comes under biometric identification. This face recognition techniques have been used for various purposes such as for commercial and security applications. Complexity of noises and image background is challenging due to the face detection and recognition. In this research proposed method provides feature such as, detection of faces, detection of eye position and extraction of features from eyes. This works focus on a simple and computationally efficient approach for face recognition using digital image processing and machine learning techniques.

Objective

The main objective of this work is to identify the problem of recognition of faces. Then find out the solution for above problem and propose a method for Face recognition using detection of eyes. Finally evaluate the performance of the purpose of face recognition method.

Dataset

In order to demonstrate the performance of the proposed method, Caltech 101 dataset is used. There are 450 face images in this dataset, And this dataset have 27 or so unique people under conditions with different lighting, expressions and backgrounds. From this database 19 face classes are randomly selected and each class has eight training and eight testing images.

Methodology

The proposed approach consists of four stages

- Skin area detection
- Eye position detection
- Feature extraction from eyes
- Recognises faces

In this section, a Face recognition using detection of eyes algorithm is proposed. The block diagram of proposed method is illustrated in Figure 1.

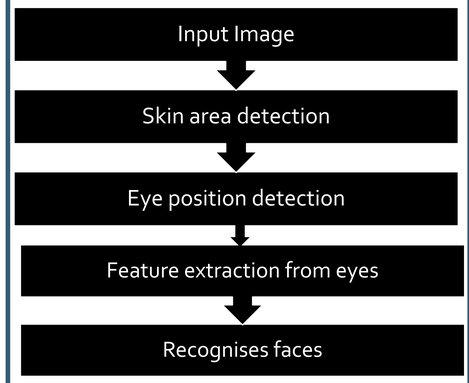

Figure 1: Diagram for Face Recognition using Detection of Eyes

Experimental Setup and Testing Results

Non-parametric histogram based model [1] is used to detect skin area, It is shown in Figure 2. In Figure 2, pixel those are closely related to the skin becomes white and all other are black. Then Hough transform [2] is applied in the detected skin areas to find circles in the correct radius range. Then pair of potential eye region is considered as eyes if it satisfies the following rules based on anthropological characteristics of human eyes.

- If we divide the human face into three equal parts horizontally, the eyes should be in the first portion.
- Two eye regions belong to the same line, same orientation and also they belong to the same radius and same vertical axis.
- Distance of the two eye regions' centers is greater than the addition of the two eye regions' radius.

Using the above rules, the proposed approach sometimes detects not only eyes, but also some other areas. To discard regions corresponding to the unwanted areas, a simple histogram analysis of the region is done for selecting eye regions since an eye region should exhibit two peaks while another region shows only one.

Eye position are detected using the above rules and are shown in Figures 3 after that from the eyes area, simply increase the x axis above and below same as increase the y axis left and right then cut the eye part from the face images which is prediction of eye position shown in Figure 4.

After identifying the region of eyes, this region is used for the feature extraction step. For each image Scale Invariant Transform (SIFT) is used to extract the features, which is shown in Figure 5, Then clustering using K-means algorithm to construct global codebook. Then, histograms which count the number of patches assigned to each clusters are represented as an image feature vector. Finally Support Vector Machine (SVM), Nearest neighbors (NN) and K nearest neighbors (KNN) are used to determine the category of test image. The testing results are shown in Table 1 below.

Classifier	SVM	KNN	NN
Accuracy	75	73	71

Table 1: Accuracy Results

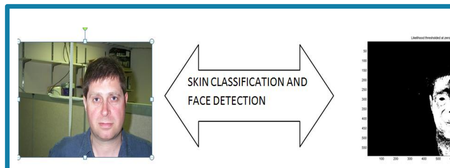

Figure 2: Face Detection using Non- parametric histogram based model

Figure 3: Eye position Detection

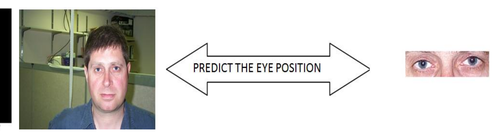

Figure 4: Eye position Detection

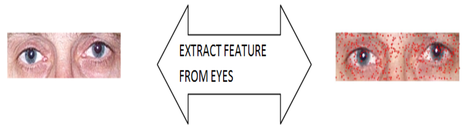

Figure 5: Feature extraction from eye position

Conclusion

This proposed method main technique is recognition of faces from the recognition of eyes.The Overall performance of the proposed method is 75%. Even though, this approach aims to solve the issues by integrating face recognition in the process, There is still much more room for improvement. Since, we are aiming to implement a modular approach to improve the performance until we will reach an acceptable detection.

Reference

[1].J.Brand and J.S.Mason, A comparative assessment of three approaches to pixel-level human skin-detection, Proceedings 15th International Conference on Pattern Recognition (ICPR-2000), pp. 1056-1059
[2].Mengjie Wu and et al, A method to Detect Circle based on Hough Transform ICISMME 2015, pp.2028-2031