Face Recognition System

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Abstract:- The face detection and recognition is one of the international research hotspotcurrently, Recognizing the faces in a cluster of moving people there we encounter two problems caused by motion, which are occlusion and change in the facial pose and illumination which are reduced by training the input data and inturn the accuracy of face recognition is improved ,we are using viola jones algorithm for face detection and principal component analysis (PCA) is used for feature extraction and face recognition in these project.

General Terms:- Viola jones algorithm, PCA, Feature extraction, Recognition

Keywords:- PCA, Haar features, cascade classifiers, adaboost algorithm, integral image.

1. INTRODUCTION

Most successful form of the human surveillance are facial recognition technology which is one of the fastest growing field in the human surveillance. Face recognition is gaining the importance in the security system to keeptrack on the person, our aim is to design the system which can detect the person in a cluster of moving people. In a video the people face appearance changes according to change in pose and illumination owing in motion. Many methods are proposed to overcome these problem (in recognizing faces of moving people by HISM). In The face recognition approach the faces stored in database is compared with the input data and the face with highest similarity with the input data is recognized. There are several approaches in the face recognition they are principal component analysis (PCA),template matching using correlation ,neural network, model matching, partitioned iterated function system(PIFS), wavelet and discrete cosine transform (DCT).

2. OVERVIEW OF THE SYSTEM

In This Chapter we will see how to detect the faces and extract the faces. The input of a face recognition system is always an image or video stream. The output is an identification or verification of the subject or subjects that appear in the image or video.Some approaches define a face recognition system as a three step process as shown in Figure 2. From this point of view, the Face Detection and Feature Extraction phases could run simultaneously.

Figure 2. overview of the system

2.1 Face detection

The fundamental principle used here is the Viola Jones algorithm.This approachhelps to detect the faces in each video frame.This method of detecting faces consists of four different stages as shown in Figure 2.1.
1. Haar like features
2. Integral image for rapid features detection
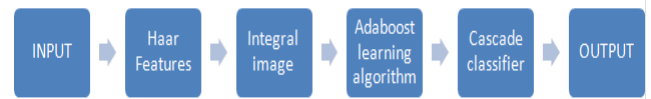3. AdaBoost learning method
4. Cascade classifier

Figure 2.1 Viola Jones algorithm

2.1.1 Haar like features

Haar features are used for the detection of any features present in the image.There are many haar features as shown in the below figure below in Figure 2.1.1, Haar like features are used to detect variation in the black and light portion of the image. This computation forms a single rectangle around the detected face. Based on the color shade near nose or forehead a contour is formed. Some commonly used Haar features are:
1. Two rectangle feature.
2. Three rectangle feature.
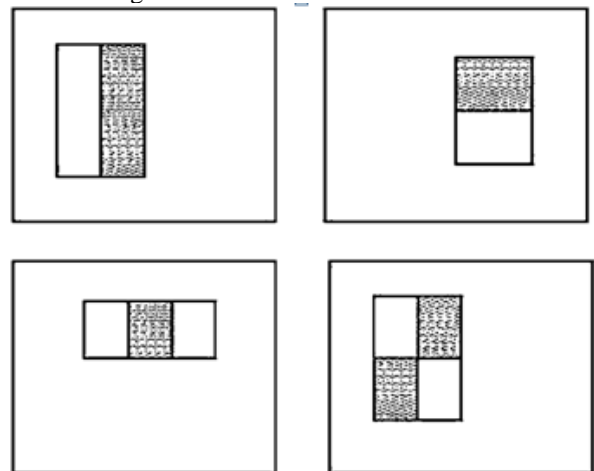3. Four rectangle feature.

Figure 2.1.1 Haar like features

2.1.2 Integral image

They are also known as summed area tables. Integral image is used to felicitate quick feature detection. The meaning of integral image is the outline of the pixel values in the original images. The integral image at location (x, y) contains the sum of the pixels above and to the left of (x, y).

2.1.3 Adaboost algorithm

AdaBoost algorithm helps to select small features from the face that facilitates fast and easy computation. Unlike other methods, AdaBoost algorithm gives desired region of the object discarding unnecessary background. The working model can in interpreted by using neural networks. AdaBoost learning process is fast and gives more number of desired data. This data can be classified into classifier.

2.1.4 Cascade classifier

The Viola and Jones face detection algorithm eliminates face candidatesquickly using a cascade of stages. The cascade eliminates candidates by making stricter requirements in each stage with later stages being much more difficult for a candidate to pass. Candidates exit the cascade if they pass all stages or fail any stage. A face is detected if a candidate passes all stages.

Principal Component Analysis (or Karhunen-Loeve expansion) is a suitablestrategy for face recognition because it identifies variability between human faces, which may not be immediately obvious. Principal Component Analysis (hereafter PCA) does not attempt to categorise faces using familiar geometrical differences, such as nose length or eyebrow width. Instead, a set of

3. CONCLUSION

The outcome of the project is to capture the image frames from the video and determine the pose variations of the human faces and show the Recognition rate of the video-based face recognition algorithms.

3.1 Advantages

1. Can identify terrorists, criminals, etc.
2. Can find missing children.
3. Prevents voter fraud.
4. Targets shoppers.

3.2 Disadvantages

1. Is not always accurate.
2. Hindered by glasses, masks, long hair etc.
3. Must ask users to have a neutral face when pictures are being taken.
4. Considered an invasion of privacy to be watched.

3.3 Applications

1. Law enforcement and justice solutions
Today's law enforcement agencies are looking for innovative technologies to help them stay one step ahead of the world's ever-advancing criminals.
2. Identification solutions
With regards to primary identification documents, (Passports, Driver's licenses, and ID Cards), the use of face

2.2 Feature extraction

A feature extraction algorithm extracts features from the data. It createsthose new features based on transformations or combinations of the original data. In other words, it transforms or combines the data in order to select a proper subspace in the original feature space. On the other hand, a feature selection algorithm selects the best subset of the input feature set. It discards non-relevant features. Feature selection is often performed after feature extraction.

Figure 2.2. Feature extraction process

2.3 Face recognition

Face recognition is an evolving area, changing and improving constantly.Face recognition technology can be used in wide range of applications. Computers that detect and recognize faces could be applied to a wide varietyof practical applications including criminal identification etc. Face recognitionis used in many places nowadays,verifying websites and social networkingsites.

2.3.1 Principal component analysis

human faces is analysed using PCA to determine which 'variables' account for the variance of faces. In face recognition, these variables are called eigenfaces because when plotted they display an eerie resemblance to human faces.

recognition for identification programs has several advantages over other biometric technologies.

- Leverage your existing identification infrastructure.This includes, using existing photo databases and the existing enrollmenttechnology (e.g. cameras and capture stations).
- Increase the public's cooperation by using a process (taking a pictureof one's face) that is already accepted.
- Integrate with terrorist watch lists, including regional, national,and international "most-wanted" databases.

3. Homeland defence

- Since the terrorist events of September 11, 2001, the world haspaid much more attention to the idea of Homeland Defense, andboth governments and private industries alike are committed to thecause of national defense.
- This includes everything from preventing terrorists from boardingaircraft, to protecting critical infrastructure from attack or tampering(e.g. dams, bridges, water resevoirs, energy plants, etc.), to theidentification of known terrorists.

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4. RESULT

The outcome of the project is to effectively detect and recognize the faces in the video sequence and to achieve challenges like noise reduction, illumination and low resolution as shown in Figure 4.
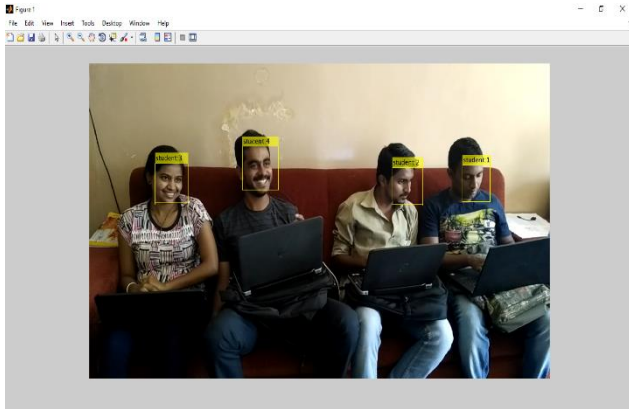

Figure 4. Result

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