A Novel Technique for Face Recognition

Dr. Anitha S
Department of Biomedical engineering
ACSCE
Banglore, India

Hemanth Kumar G
Department of Biomedical engineering
ACSCE
Banglore, India

Meghana R
Department of Biomedical engineering
ACSCE
Banglore, India

Sushma P
Department of Biomedical engineering
ACSCE
Banglore, India

***Abstract*-- Face detection is becoming one of the most interesting topics in the computer vision literature. The survey is conducted to analyze the face recognition techniques and timeline view on different methods to handle general face recognition problems. Image processing techniques focuses on two major tasks such as Improvement of pictorial information for human interpretation and processing of image data for storage, transmission and representation for autonomous machine perception. Image processing and face recognition systems both are large fields. In this paper, the survey is made based on a comparison of the recent advances in face detection using various image processing techniques such as Hidden Markov Model(HMM), template matching algorithms. These techniques improve quality, removes noise, versatile in nature, and preserves original data precision of the image.**

Keywords—Hidden markov model, versatile, data precision..

I. INTRODUCTION

With the rapid growth of computational powers and accessibility of modern intellect, analysis and rendering tools and technologies, computers are becoming more and more intellectual. Face detection is the step stone to all facial analysis algorithms, including face alignment, face modeling, face relighting, face recognition, face verification/authentication, head pose tracking, facial expression tracking/recognition, gender/age recognition, etc. Image processing techniques in face recognition are used to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications.[1]

Image processing is a relatively mature field compared to computer vision systems like face recognition. Image processing comprises of things like convolutions in frequency, temporal or spatial domains with the aid of the 2D Discrete Fourier Transforms (DFT) or Fast Fourier Transform (FFT). Such operations help remove certain structures in a particular frequency range from the image.[1,2] Such as edge detectors are high-pass filters that suppress low-frequency structures and enhance high-frequency structures such as edges. Gaussian filters, on the other hand, are low-pass filters and remove high frequency structures, usually noise, to smooth out images.

The problem with handcrafted features is that a lot of knowledge concerning the problem at hand is required. Deep learning on the other hand doesn't require handcrafting features because both features and classifier functions are learnt from training data, hence making deep learning a very powerful tool for solving complex mapping problems. Face recognition compared to image processing is far more complex and there are several techniques in use today as listed below. Note: some methods are very old but the intuition behind them might come in handy.

II. METHODOLOGY

A. Hidden Markov Model (HMM)

In HMM-based face recognition system[3], in which a scanning strategy is employed to simulate a human-like saccadic sequence, computed on the basis of the concept of saliency. The approach converts a face image into an attention based “scan path,” that is, a sequence composed of two types of information: Where information, the coordinates of the salient region in the face, and What information, local features detected in there. At the core of the scanning mechanism is the calculation of saliency. This calculation should be cheap enough that it can be applied to the whole image without significantly increasing time and space requirements, and it should be informative. With this approach, a cheap and parallel search for salient features will drive a serial and detailed analysis. The main advantage of the HMMs is that the models for each person are build independently. So every time we want to add a new person to the collection we just have to add a new model without modifying the other models.

B. Template Matching Algorithm

It is a statistical approach that distills an image into values and compares the values with templates to eliminate variances. It relies on the input image in the presence of light and the geometric location of different angles. The photometric transformation is implemented on the source image, does not take into account photometric changes, i.e. changes in the pixel. The main restriction in this approach is that multiple registered images of the same person is required. Since it recognizes the new image by checking that it is spanned in a linear subspace of the multiple gallery images, it cannot handle the new images of a different person which is not included in the gallery set.

Face recognition techniques can be divided into three categories

- Technique that operate on intensity image.
- Technique that deal with video sequences.

• Technique that requires other sensory data such as 3D information or infra-red imagery.

Obviously, face recognition method has received a great deal of attention in various applications in the field of image analysis and computer vision due to several advantages it has over other biometric methods. This advantages include low cost equipment for capturing, face can be done without explicit action on the part of user, its non-intrusive characteristics. A. Face recognition based on intensity Face recognition method based on intensity of images can be divided into two:

(i) Feature-based approach
(ii) Holistic –based approach
(iii) Holistic-based approach .

Feature-based approach Feature-based approach process the input image to identify and extract distinctive facial features such as eyes, mouth, nose etc and then compute the geometric relationship among those facial points, thus reducing the input facial image to a vector of geometric feature . Feature based approach is sub-divided into:

1) Geometric feature based matching

Geometric feature matching techniques are based on the computation of a set of geometrical feature from the picture of a face. The entire configuration can be described a vector. This vector represents the position and the size of main facial features like the nose, eyes, eyebrows, mouth, chin and the outline of the face. The advantage of this technique is that it overcome problem of occlusion. The disadvantage is does not provide a high degree of accuracy. Another disadvantage is that it does not require considerable computational time.

2) Elastic bunch graph

This technique is based on dynamic link structures. A graph for an individual face is generated using a set of fiducial points on the face, each fiducial point is a node of a full connected graph and is labeled with the Gabor filters' response. Each arch is labeled with the distance between correspondent fiducially points. A representative set of such graph is combined into a stack-like structure called face bunch graph. The recognition of a new face image is done by comparing its image graph to those of all the known face images and the one with highest similarities values are selected as closed matching.

3) Advantages

- In feature-based techniques, the feature points precede the analysis done for matching the image to that of a known individual.
- The feature-based technique can be made invariant to size, orientation and lighting.
- It has compactness of representation of the face images and high speed matching

4) Disadvantages

- Feature-based techniques lack discrimination ability
- It is difficult to automatic detect feature in this approach.

Holistic-based approach Holistic based approaches attempt to identify faces using representation i.e descriptions based on the entire image rather than on local features of the face.

Holistic based approach is divided into:
• Statistical approach and
• Artificial Intelligent approach.

5) Statistical approach

This is the simplest approach of holistic in which the image is represented as a 2D array of intensity values and recognition is done by direct correlation comparisons between the input face and all other faces in the database. Example of this includes Principal Component Analysis (PCA), Eigen faces and fisher face, LDA etc The Eigenface method is one of the generally used algorithms for face recognition. The eigenface technique is based on the Principal Component Analysis (PCA) also known as Karhunen-Loeve tranform. This method is successfully used to perform dimensionality reduction. Principal Component Analysis is used by face recognition and detection. The advantage of this technique is that it is easy and efficient as the PCA reduces the dimension size of an image in a short period of time. Another advantage is that it has high correlation between the training data and the recognition data. The disadvantage of this technique is that its accuracy depends solely on a number of factors amongst them is the lighting as this decreases the accuracy.

STEPS IN IMAGE PROCESSING

- Image acquisition
- Image enhancement
- Image restoration
- Morphological processing
- Segmentation
- Object recognition
- Representation & Description

IV. CONCLUSION

In this paper, techniques that are used to construct face recognition system have been highlighted. The challenges of these techniques have been discussed, which gives a clear picture how two techniques are displayed.

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