

A Review on Face Detection and Recognition Techniques

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Abstract

Image databases and live video data is growing rapidly, their intelligent or automatic examining is becoming exceptionally more important. Human faces are one of very common and very particular objects that we need to try to detect in images. Face detection is very difficult task in image analysis which has each day many applications. We can illustrate the face detection problem as a computer vision task which involve in detecting one or several human faces in an image. Identification & Authentication has become major problems in present digital world. Face detection plays a significant role in identification & authentication. In this paper various existing face detection techniques are analyzed and discussed.

Keywords— *Face Detection, Face Recognition, Identity, Computer Vision.*

I. INTRODUCTION

With the rapid growth of computational powers and availability of present sensing, investigation and representation of equipment and technologies, computers are now becoming extra and more intelligent. Number of research projects and commercial products have illustrate the capability for a computer to communicate with human in a natural way by looking at people through cameras, listening to citizens with the help of microphones, and reacting to people in a friendly behavior [6]. One of the basic techniques that enables such natural human computer interaction (HCI) is face detection.

Face detection is the most important thing to the entire facial analysis algorithms, considering face alignment, face recognition, head pose tracking, face relighting, face modeling, face verification or face authentication, facial expression tracking or recognition, gender or age recognition, and many others. When computers can recognize face well which helps to understand the people's thoughts and intentions. By providing an arbitrary image, the aim of face detection is to find whether or not there are any faces in the image as if the image is present

then it will return the image location and extent of each face [7].

This may appears as a vital task for human beings, it is very tough task for computers, and has been one of the most studied research topics in the past few years. The difficulty consisted with face detection can be attributed to many different variations in scale, location, facial expression, occlusions, orientation (in-plane rotation), pose (out of-plane rotation), and lighting conditions.

In this paper we analyze some of the techniques and methods used to detect and recognize faces. The faces are taken from many sources for e.g. University student faces. These dataset are available free on website UCI repository. The UCI repository is open and free collection of tons of datasets used for various machine learning techniques.

A. Face Detection

Face detection illustrate the presence and location of a face in an image, by determining the face from all other patterns present in the scene. This needs appropriate face modeling and segmentation. The approach should also take into account the sources of variation of facial appearance like viewing geometry (pose), illumination (color, shadowing, and self-shadowing), the imaging process (resolution, focus, imaging noise, perspective effects), and other factors like Occlusion [8].

There are some other method also in which face detection are carried out by using the entire face [9], making occlusion difficult to handle. Face detection techniques classified on the basis of the image data used to aid in detection—color, geometric shape, or motion information [10]. The following figure illustrate the process of face detection in a still image or image sequence.

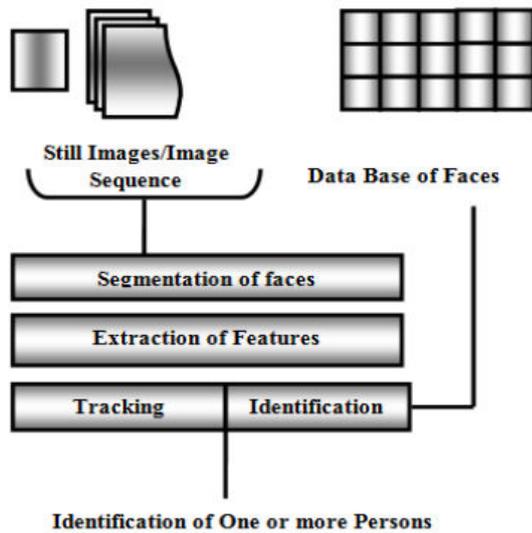


Fig.1. Face Detection Process

B. Face Recognition Problem

The main drawbacks of any facial recognition algorithms are

i. Illumination Problem

Illumination problem happens only when the same image with some conditions. So person need to keep with fix lighting condition, fixed the distance, same facial expression and also have the same view point. It can help to emerge extensively different when lighting condition is extensively different [11].

ii. Pose Problem

Face recognition with various facial poses that is known as pose problem. If face rotation made very huge changes in face appearance it decreases recognition rate. If any person try to match same image with various facial pose, it show the different result [11].

II. LITERATURE SURVEY

Vinay Rishiwal [1], focuses on developing a face recognition system using an extended PCA algorithm. The proposed algorithm uses the concept of PCA and represents an improved version of PCA to deal with the problem of

orientation and lightening conditions present in the original PCA. The preprocessing phase of the proposed algorithm emphasize the efficiency of he algorithm even when number of images per person or the orientation is very different.

Maneesh Upmanyu [2], proposes algorithm which makes no restrictive assumptions on the biometric data and is hence applicable to multiple biometrics. Such a protocol has significant advantages over existing biometric cryptosystems, which use a biometric to secure a secret key, which in turn is used for authentication. Author analyze the security of the protocol under various attack scenarios. Experimental results on four biometric datasets (face, iris, hand geometry, and fingerprint) show that carrying out the authentication in the encrypted domain does not affect the accuracy, while the encryption key acts as an additional layer of security.

Wilman W. W. Zou [3], proposes a novel approach to learn the relationship between the high-resolution image space and the VLR image space for face SR. Based on this new approach, two constraints, namely, new data and discriminative constraints, are designed for good visuality and face recognition applications under the VLR problem, respectively. Experimental results show that the proposed SR algorithm based on relationship learning outperforms the existing algorithms in public face databases.

Yogesh Maniktala [4], Biometrics are automated methods of recognizing a person based on a physiological or behavioral characteristic. Among the features measured are: face, fingerprints, hand geometry, handwriting, iris etc. Biometrics is becoming the foundation of an extensive array of highly secure identification and personal verification solutions. As the required level of security rises, the need for highly secure identification and personal verification is also growing. In this paper, we propose an algorithm for robust face recognition.

B. NAGARJUN SINGH [5], presents and analyzes the performance of Principle Component Analysis (PCA) based technique for face recognition. Author consider recognition of human faces with two facial expressions: single and differential. The images that are captured previously constitute the training set. From these images Eigen faces are calculated. The image that is going to be recognized through our system is mapped to the same Eigen spaces.

TABLE 1. Shows comparison between various existing approaches and its limitation

Ref. No.	Method Used	Data source	Approach	Strength	Limitation
1	Improved PCA Algorithm	FERET database	Paper focuses on developing a face recognition system using an extended PCA algorithm. The proposed algorithm uses the concept of PCA and represents an improved version of PCA to deal with the problem of orientation and lightening conditions present in the original PCA.	Proposed algorithm emphasize the efficiency of the algorithm even when number of images per person or the orientation is very different	Need to develop for real - time recognition including moving objects and changing illumination conditions.
2	SVM method	Biometric datasets	Proposed approach makes no restrictive assumptions on the biometric data and is hence applicable to multiple biometrics	Analyze the security of the protocol under various attack scenarios	Need to includes secure enrollment protocols and encryption methods to reduce computations
3	SR method	public face databases	Propose a novel approach to learn the relationship between the high-resolution image space and the VLR image space for face SR.	A discriminative constraint was designed and integrated with the new data constraint, and DSR was proposed	Need to improve visual quality and recognition performance.
4	PCA method	social network data	The proposed system will provide a robust technique for detecting and recognizing human faces	The proposed system enable computers to emulate the human vision system	Need to improve some other facial characteristics that help us to recognize human faces
5	PCA method	JAFFE database	Propose paper presents and analyzes the performance of Principle Component Analysis (PCA) based technique for face recognition	Training set and test images need to be taken in good, comfortable illumination settings and need to be frontal faces with minimal head tilt	Need to demonstrate different facial expressions for more result

III. CONCLUSION

Face recognition is a most challenging issue in the area of image analysis and computer vision that has received many attention over the last few decades because of its many applications present in various domains. Research has been conducted in this area for the past few years or so, and though enormous progress has been made, encouraging results have been received and current face recognition systems have reached a certain intensity of maturity when operating under constrained conditions; however, they are far from achieving the ideal of being able to perform adequately in all the different situations that are commonly encountered by applications concerned with these techniques in practical life.

This paper has made an attempt to review a significant number of papers to deal with the present development in face recognition field. Present study illustrates that face recognition algorithm can be enhanced using hybrid methods for better performance

REFERENCES

- [1] Vinay Rishiwal and Ashutosh Gupta, "Improved PCA Algorithm for Face Recognition", Special section for proceeding of International e-Conference on Computer Engineering (IeCCE) 2012.
- [2] Maneesh Upmanyu, Anoop M. Namboodiri, Kannan Srinathan, and C. V. Jawahar, "Blind Authentication: A Secure Crypto-Biometric Verification Protocol", IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY, VOL. 5, NO. 2, JUNE 2010.
- [3] Wilman W. W. Zou, "Very Low Resolution Face Recognition Problem", IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 21, NO. 1, JANUARY 2012.
- [4] Yogesh Maniktala, Durgesh Srivastava and Basant Sah, "A Robust Technique of Face Recognition", International Journal of Advanced Research in Computer Science and Software Engineering 6(6), June- 2016, pp. 782-785.
- [5] B. NAGARJUN SINGH and P. PRADEEP, "PCA Based Face Recognition and Facial Expression Identification System", International Journal of Advanced Technology and Innovative Research Volume.07, IssueNo.06, July-2015, Pages: 0857-0860.
- [6] Cha Zhang and Zhengyou Zhang, "A Survey of Recent Advances in Face Detection", IEEE Trans. on PAMI, 24(1):34-58, 2002.
- [7] M.-H. Yang, D. J. Kriegman, and N. Ahuja. Detecting faces in images: A survey. IEEE Trans. on PAMI, 24(1):34-58, 2002.
- [8] Ragini Choudhury Verma, Cordelia Schmid, and Krystian Mikolajczyk, "Face Detection and Tracking in a Video by Propagating Detection Probabilities", IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 25, NO. 10, OCTOBER 2003.
- [9] H.A. Rowley, S. Baluja, and T. Kanade, "Neural Networks Based Face Detection", IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 20, no. 1, pp. 22-38, Jan. 1998.
- [10] J. Yang and A. Waibel, "Tracking Human Faces in Real Time", Technical Report CMU-CS-95-210, School of Computer Science, Carnegie Mellon Univ., Pittsburgh, Pa., 1995.
- [11] "Multibiometric Cryptosystems Based on Feature-Level Fusion" Abhishek Nagar, Student Member, IEEE, Karthik Nandakumar, Member, IEEE, and Anil K. Jain, Fellow, IEEE, IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY, VOL. 7, NO. 1, FEBRUARY 2012.