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Current Issues in Face Recognition

Manminder Singh
AP, CSE Department, SLIET, Sangrur, 148106, India

Abstract-*Face recognition system must to robust to recognize identity despite of many variations in appearance. Actually face is a 3D object that may be illuminated by a variety of light sources and surrounded by the complex background details. When 3D face is projected to 2D image, details could vary tremendously. In field of face recognition 3D pose problem, illumination problem, foreground and background segmentation are some of the pertinent issues in the field of computer vision as a whole. There may be inter-personal variations due to racial factors, identity, or genetics while intra-personal variations may be due to deformations, expression, aging, facial hair, and cosmetics. Face recognition system should be capable enough to handle these variations.*

Keywords- *Face recognition systems, illumination and pose problem, image-acquisition problem, security concerns, holistic and non-holistic methods*

I. INTRODUCTION

A face recognition system has to associate an identity or name for each face by matching it to a large database of individuals. The output of the face detection and recognition should be accurate. Simultaneously, the system must be robust to typical image-acquisition problems such as noise, video-camera distortion and image resolution.Thus, face recognition system should be capable of dealing with a multi-dimensional detection and recognition problem. Processing involved is the other issue in face recognition and it should be efficient with respect to run-time and storage space.

II. EXISTING FACE RECOGNITION SYSTEMS

Human face recognition is an important task for computer vision with numerous potential applications in various fields such as biometric system for video surveillance, human computer interaction, face recognition, law enforcement, facial image database management, security applications and identification, [1]. Human vision system is capable of easily recognizing a number of faces learned throughout our life and can identify such faces even after years of separation despite of large variations due to changing conditions, aging and distractions like beard, glasses or even change in hairstyle. Numerous applications in various fields have propelled face recognition technology into spotlight. Face recognition technology contains analysing various facial characters, storing them into database and using them for identification purpose. Now a day's face recognition systems perform well with facial images that are captured under uniform and controlled conditions. Presently face recognition is a challenging task and up to date as there is no technique that provides a robust solution under the varying conditions, situations and different applications that face recognition system may encounter [2].

In the last two decades automatic face recognition had been extensively studied due to its numerous application domains including access control for various systems, visual surveillance, government issued documents for identity purposes like driver license and passport[3]. The influence of some features like moustaches, glasses, beard, environment factors and the fact there are variations in human face as colour, age and size make the face recognition task a hard and complicated one. Since, the problem exists for last many years and because of face recognition importance lot of work has been done recently for solving it. The most popular and successful face recognition approaches use template matching, geometric methods, Viola-Jones method and neural networksetc. The categorization of different face recognition is not easy and different criteria are used in literature [4]. Various face recognition methods can be grouped into four categories: a) knowledge based methods; b) feature invariant methods; c) template matching methods and d) appearance-based approaches [5].

Another popular classification scheme for face recognition systems is the holistic/non-holistic methods [6], [7]. Inholistic methods the face is recognized in the image using overall information which means the face as a whole. Holisticmethods are mostly known as appearance-based approaches. Non-holistic approaches arebased on identifying the particular features of the face such as eyes, nose, etc. and their relations to make thefinal decision. Some recent methods also known as hybrid methods try to combine the advantages of bothholistic/non-holistic approaches. As there are many hundreds of 2 dimensional face recognition algorithms along with huge variety of approaches, it would be impossible to make an exhaustive enumeration of allsuch publications related to 2D face recognition. Brunelli et al. and Nefianauthors have used correlation-based face recognition approaches [8], [9]. The facial image is represented as a bi-dimensional array of intensity values and compared with a singletemplate which represents the whole face in correlation-based approaches for recognizing

the face. In 1090's it was the starting of the appearance based methods for face recognitionwhen Turk and Pendlandauthors implemented the Eigenfaces approach [10], [11] and it is the most popularface recognition method.

Different statistical approaches had appeared that improve the results of Eigenfaces under certain constraints.One method implements Linear Discriminant Analysis (LDA) to perform dimensionality reduction while preservingas much of the class discriminatory information as possible [12]. LDA method group images of same class andseparates images of different class. Other existing face recognition methods are Kernel PCA [13] and Independent Component Analysis [14]which exploit higher order statistics, or a two dimensional extension of the Principal Component Analysis (PCA) [15]. Principle Component Analysis(PCA) can be defining as a technique or method for dimensionality reduction which is used for image recognition and compression. The basicconcept behind Principal Component Analysis is to describe variation of a set of multivariate data in terms of linearly independentvariables thatare particular linear combination of the original variables.

III. ISSUES IN FACE RECOGNITION

Varying illumination and pose conditions are the main issues in face recognition which highly affects the accuracy rates of face recognition system. The face of same person appears to be different under varying illumination and pose conditions. Most of the research in the field of face recognition is focused on the frontal face, while very little research work had been done in this field based upon varying illumination and pose conditions. It is very hard to prove reliability of face recognition system in varying illumination and pose conditions [16][17][18]. Higher face recognition rates had been reported under varying illumination conditions with CMU PIE dataset [19].

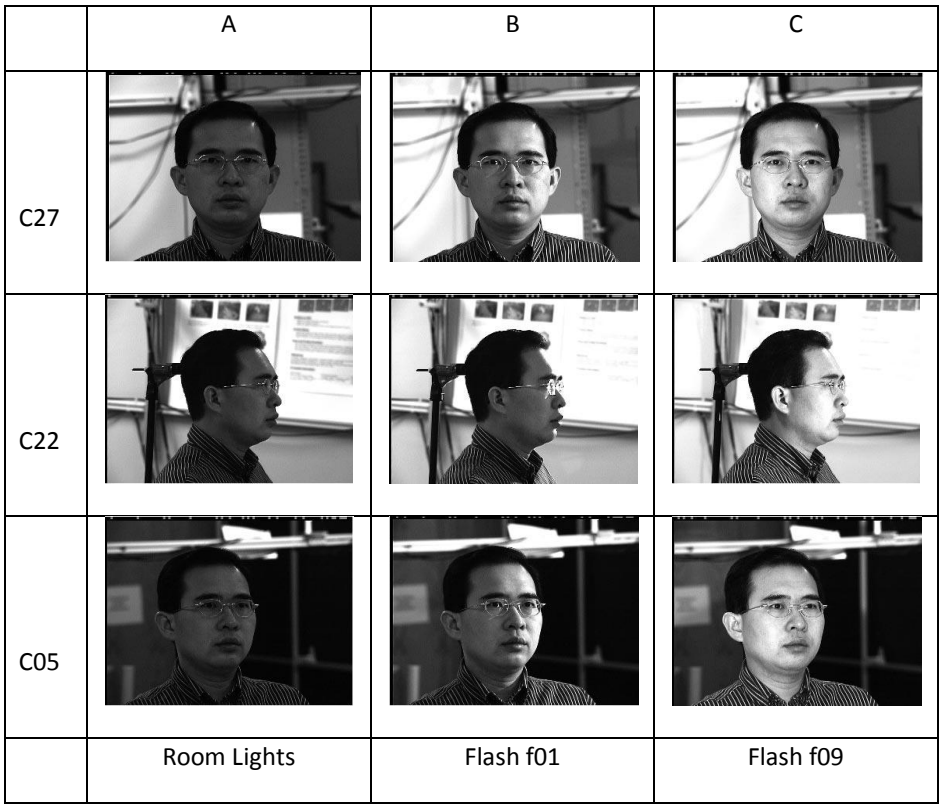

Figure1: Varying Pose and Illumination conditions with the room lights on in CMU PIE dataset.

Facebook has been working for creation of a tool almost as accurate as the human brain that is when it compared by saying whether the two photographs show same person regardless of changing lighting conditions and camera angles [20]. Facebook is not the only technical company which is interested in facial recognition. Another patent published by Apple company shows that how the Cupertino company had investigated the possibility of using the facial recognition as a security measure for unlocking its devices: identifying yourself to iPhone could one day be as easy as taking a quick selfie.Google Company has also invested heavily in the field of face recognition. And much of Google's interest in facial recognition revolves around the different possibilities offered by image search, to find more intelligent ways to sort through the hundreds

of photos/images that exist online. Presently Google Company's deepest dive into facial recognition is its Google Glass headsets.NameTag's idea was simple enough that is whenever we are going to start a new conversation with the stranger, Google Glass headset takes a photo of them and then uses this to check the person's online profile.

Privacy is the other issue in face recognition. There are many problemsrelated to privacy concern in field of face recognition. Privacy concern is an issue with each and every form of data mining as lot of data is available online and the most of information related to online data absorbed by companies must be anonymised. Privacy concern in case of facial recognition is precisely opposite of the above said anonymised data. As the facial recognition takes place in public places most of the times, the concern person even doesn't know all about it that he is being captured under camera [20]. Now a day smart hidden cameras are easily available in the market at very reasonable rates.

Security is also the issue of concern for face recognition technology. This links to the subject of security that for many companies and organizations is the ultimate application for facial recognition. Most facial recognition research has been funded by governments interested in its potential for streamlining surveillance.

IV. CONCLUSION

Various issues in the field of face recognition have been covered in this review paper along with the various existing face recognition methods. In field of face recognition 3D pose problem, illumination problem, foreground and background segmentation are some of the pertinent issues in the field of computer vision as a whole. There may be inter-personal variations due to racial factors, identity, or genetics while intra-personal variations may be due to deformations, expression, aging, facial hair, and cosmetics. The face recognition system must be robust to typical image-acquisition problems such as noise, video-camera distortion and image resolution. Processing involved is the other issue along with the privacy and security in face recognition and it should be efficient with respect to run-time and storage space.

REFERENCES

[1] Rein-Lien Hsu, Abdel-Mottaleb, M. ; Jain, A.K., "Face detection in color images", IEEE Transactions on Pattern Analysis and MachineIntelligence, May 2002, Volume: 24 , Issue: 5, Page(s): 696 – 706
[2] TheodorosPapatheodorou and Daniel Rueckert, "3D Face Recognition", Published on: 2007-07-01.
[3] Jain, A.K.; Klare, B.; Park, U.," Face recognition: Some challenges in forensics", IEEE International Conference on Automatic Face &Gesture Recognition and Workshops (FG 2011), Digital Object Identifier: 10.1109/FG.2011.5771338, Publication Year: 2011 , Page(s): 726 –733
[4] Antonio Rama Calvo, FrancescTarres Ruiz, JurgenRurainsky, Peter Eisert,"2D-3D Mixed Face Recognition Schemes" Published on: 2008-06-01.
[5] M.-H. Yang, D. J. Kriegman, and N. Ahuja. Detecting faces in images: A survey. IEEE Trans. on PAMI, 24(1):34–58, 2002.
[6] W. Zhao, R. Chellappa, P. J. Phillips, and A. Rosenfeld, "Face Recognition: A Literature Survey" ACM Computing Surveys, Vol.35, No4,December 2003
[7] W. Zhao, and R.Chellapa, "Face Processing: Advanced modeling and methods", Academic Press, 2006
[8] R. Brunelli and T. Poggio, "Face Recognition: Features vs Templates" IEEE Trans. Pattern Analysis and Machine Intelligence, vol.15, no.10, pp 1042-1053. Oct 1993
[9] A.V. Nefian. "Statistical Approaches To Face Recognition". Qualifying Examination Report. Georgia Institute of Technology. Dec 1996
[10] M. A. Turk, A. P. Pentland, "Face recognition using eigenfaces", Proc. of the IEEE Comp. Soc. Conf. on CVPR, pp. 586-591, Hawaii 1991
[11] A. P. Pentland, B. Moghaddam, T. Starner and M. Turk, "View-based and modular eigenspaces for face recognition", Proceedings of theIEEE Computer Society Conference on Computer Vision and Pattern Recognition, pp. 84-91,1994.
[12] R.N. Belhumeur, J.P. Hespanha, D.J. Kriegman, "Eigenfaces vs Fisherfaces: Recognition Using Class Specific Linear Projection" in IEEETransacations Pattern Analysis and Machine Intelligence, vol 19, N. 7, July 1997
[13] K. I. Kim, K. Jung, H.J. Kim, "Face Recognition Using Kernel Principal Component Analysis", IEEE Signal Processing Letters, Vol.9, No.2, February 2002
[14] M. S. Bartlett, H. M. Lades, and T. J. Sejnowski, "Independent component representations for face recognition," in Proc. SPIE Symp.Electon. Imaging: Science Technology—Human Vision and Electronic Imaging III, vol. 3299, T. Rogowitz and B. Pappas, Eds., San Jose, CA,1998, pp. 528–539.
[15] J. Yang, D. Zhang, A.F. Frangi, and J.Yang, "Two-Dimensional PCA: A New Approach to Appearance-based Face Representation andRecognition", in IEEE Trans. on Pattern Analysis and Machine Intelligence, Jan. 2004
[16] D. Blackburn, M. Bone, and P. J. Philips. Facial recognition vendor test 2000: evaluation report, 2000.
[17] R. Gross, J. Shi, and J. Cohn. Quo vadis face recognition? In Third Workshop on Empirical Evaluation Methods in

Computer Vision, 2001.
[18] P. J. Phillips, P. Grother, J. Ross, D. Blackburn, E. Tabassi, and M. Bone. Face recognition vendor test 2002: Evaluation report, March 2003.
[19] T. Sim, S. Baker, and M. Bsat. The CMU pose, illumination, and expression database. IEEE Transactions on Pattern Analysis and Machine Intelligence, 25(12):1615-1618, 2003.
[20] *www.theguardian.com › Technology › Artificial intelligence (AI)*

