Face Recognition System based on face models and LBP

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Abstract— **Recognizing a face has become an important concern in many applications is and wide open and it covers amongst other security such as law enforcement, airport security, access control, driver's licenses, passports, homeland defense, customs, immigration and scene analysis, security systems, credit card verification and criminal identification. The proposed work consists of four different modules. They are face model creation, region extraction, feature extraction and classification. The performance of the system is found to be satisfactory. The accuracy rate of the system is 80%, false positive rate is 20% and the time consumption for recognising an image is 180 seconds.**

Index Terms—**Face recognition, face model, region extraction, classification**

I. INTRODUCTION

Recognizing a face has become an important concern in many applications is and wide open and it covers amongst other security such as law enforcement, airport security, access control, driver's licenses, passports, homeland defense, customs, immigration and scene analysis, security systems, credit card verification and criminal identification. For example, the facility to model a face application and make a distinction it from a stored face models would make it possible to enormously improve criminal identification. Even the ability to simply detect faces, as opposed to recognizing them can be important.

Detecting face image from color film development can be very useful, while the effect of many improvement and noise reduction techniques depends on the image content. Recognizing a face based on its attributes is an easy task for a human to perform; it is nearly automatic, and requires little mental effort. Humans can recognize face even when the matching image is distorted, such as a person wearing glasses, and humans can perform the task fairly easy.

A computer, on the other hand, has no innate ability to recognize a face or facial features, and must be programmed with an algorithm to do so. Even the best algorithms available today are not even close to perfect, and rely a lot on statistically probability.

Once the machine has been trained to identify an assured face, it can then glance at any image of a face, calculate a set of features on it and compare it to every face image which has been trained to identify. It will then work out a set of probabilities for each trained face image and compared with testing image for a match. If none of the faces are matched, then no match will be returned.

Face recognition must address several difficult problems, such as pose, illumination and expression, background imaged head size, and head orientation. This difficulty arises from the fact that faces must be represented in a way to distinguish a particular face from all other faces. The advancement in various new algorithms maps the characteristics of a humans face into multidimensional face space. Machine can conduct facial database searches and perform one-to-one or one-to-many verification with accuracy. The machine can distinguish the same person with different appearance with or without glasses, seasonal changes in skin color and change of hair style. Generally, there are three phases for face recognition. They are face representation, face detection and face identification

II. RELATED WORK

Humans perceive gender not only based on the face, but also on the surrounding context such as hair, clothing and skin tone [15, 6], gait [14] and the whole body [6, 1]. Below, we review relevant work on gender prediction from facial images only. The problem of gender classification based on human faces has been extensively studied in the literature [12, 3].There are two popular methods.

The first one is [12] where a Support Vector Machine (SVM) is utilized for gender classification based on thumbnail face images. The second was presented in.[3] who applied the Adaboost algorithm for gender prediction. Recently, due to the popularity of Local Binary Patterns (LBP) in face recognition applications [2], the authors used LBP histogram features for gender feature representation, and the Adaboost algorithm to learn the best local features for classification.

Experiments were performed to predict age, gender and ethnicity from face images. A similar approach was proposed in [15]. Other local descriptors have also been adopted for gender classification. Wang et al.proposed a novel gender recognition method using Scale Invariant Feature Transform (SIFT) descriptors and shape contexts.

Once again, Adaboost was used to select features from face images and form a strong classifier. The work proposed in [10] does face-based gender classification on consumer images acquired from a multi-ethnic face database. To overcome the non-uniformity of pose, expression, and illumination changes, they proposed the usage of Active Shape Models (ASM) to normalize facial texture. The work concluded that the consideration of ethnic factors can help improve gender classification accuracy in a multiethnic environment.

Manuscript received Feb, 2013.
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ISSN: 2278 – 1323

A systematic overview on the topic of gender classification from face images can be found in [14]. Among all the descriptors that encode gender information such as LBP [7], SIFT [5], the LBP has shown good discrimination capability while maintaining simplicity [14].

III. PROPOSED WORK

Psychophysical studies in saccadic eye movements indicate that local appearance is important for classification. People can recognize objects when they seek regions where discriminating information is located. LBP features computed over the whole face represent only the micro patterns without any information about their locations.

Keeping the information about the spatial relationship is very important for facial expression recognition. The approach presented in this paper utilizes this finding by dividing face images into sub blocks and comparing the similarities between these sub-blocks. The face image is divided into 64 sub-blocks for feature extraction. This is a proven method for accurate facial expression recognition. This representation captures local texture and global shape of face images.

The proposed work consists of four different modules. They are face model creation, region extraction, feature extraction and classification. The proposed algorithm involves the following operations

A. Face Model creation

In this module first get all the images from the training folder. In training folder, each person has only one image. From that images we create 12 expression model and 8 lighting model 5 rotating model separately and combination of these three conditions. The above procedure is also conducted in the test image also.

B. Region Extraction

In this module from the created face model 25 landmarks are marked and the regions are extracted. The above procedure is carried out in the test image also.

C. Feature Extraction

Apply the Local Binary Pattern and the features are extracted from the image.

D. Classification

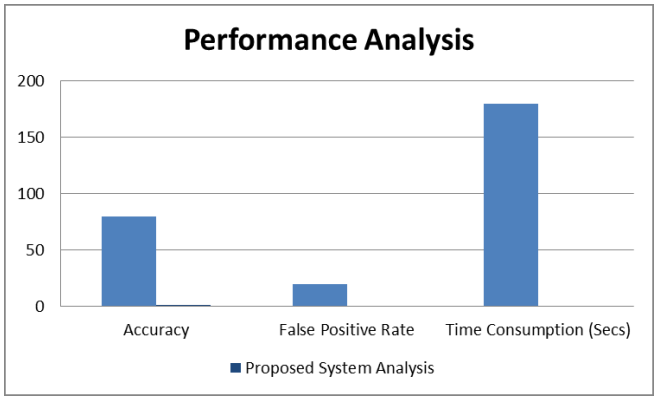
In this module the extracted features from both training and testing images are classified based on the weighted pattern.

The proposed method works well in recognizing faces in a large database with 80& accuracy rate and it has been proved in experimental analysis.

IV. PERFORMANCE ANALYSIS

The performance of the system is analysed with respect to three different performance metrics. They are detection accuracy, false positive rate and time consumption. Detection accuracy is the rate of accuracy of the system, in detecting faces relevant to the query image. false positive rate is the rate of false recognition of images with respect to the query image. Time consumption is the time needed for arriving at the result.

Detection accuracy is measured by the count of correctly recognized images out of total count of images. False positive rate is calculated by the count of images that were wrongly recognized as the relevant image. Time consumption is computed by the difference of time at which the face is recognized from the time at which the query image is passed.



Thus, on analysis the performance of the system is found to be satisfactory. The accuracy rate of the system is 80%, false positive rate is 20% and the time consumption for recognising an image is 180 seconds.

V. CONCLUSION

In this paper, a system for face recognition is proposed. This work relies on four different modules and they are face model creation, region extraction, feature extraction and classification. This system works with an accuracy of 80%.

A. Figures and Tables

REFERENCES

[1] J.C. McCall, M.M. Trivedi, Pose invariant affect analysis using thin-plate splines, in: ICPR '04: Proceedings of the Pattern Recognition, IEEE Computer Society, Washington, DC, USA, 2004, pp. 958–964.
[2] C. Chan, J. Kittler, K. Messer, Multi-scale local binary pattern histograms for face recognition, in: The 2nd International Conference on Biometrics, ICIP 2010, pp. 809–818.
[3] P. Ekman, W.V. Friesen, Pictures of Facial Affect, Consulting Psychologists Press, 1976.
[4] S. Gong, P.W. McOwan, C. Shan, Dynamic facial expression recognition using a bayesian temporal manifold model, in: BMVC, vol. 1, 2006, pp. 297–306.
[5] R. Gross, I. Matthews, J. Cohn, T. Kanade, S. Baker, Multi-pie, Image and Vision Computing 28 (2010) 807–813 (Best of Automatic Face and Gesture Recognition 2008).
[6] Y. Hu, Z. Zeng, L. Yin, X. Wei, J. Tu, T. Huang, Multi-view facial expression recognition, FG2008, in: 8th International Conference on Automatic Face and Gesture Recognition 2008, ICPR 2008, 2008.
[7] Y. Hu, Z. Zeng, L. Yin, X. Wei, J. Tu, T. Huang, A study of non-frontal-view facial expressions recognition, in: 19th International Conference on Pattern Recognition 2008, ICPR 2008, 2008, pp. 1–4.

ISSN: 2278 – 1323

[8] T. Kanade, Y. Tian, J.F. Cohn, Comprehensive database for facial expression analysis, in: FG '00: Proceedings of the Fourth IEEE International Conference on Automatic Face and Gesture Recognition 2000, Washington, DC, USA, IEEE Computer Society, 2000, p. 46.

[9] S. Liao, W. Fan, A.C.S. Chung, D.Y. Yeung, Facial expression recognition using advanced local binary patterns, tsallis entropies and global appearance features, in: ICIP, 2006, pp. 665–668.

[10] S. Liao, X. Zhu, Z. Lei, L. Zhang, S. Li, Learning multi-scale block local binary patterns for face recognition, in: International Conference on Biometrics, ICB07, 2007, pp. 828–837.

[11] G. Littlewort, M.S. Bartlett, I. Fasel, J. Susskind, J. Movellan, Dynamics of facial expression extracted automatically from video, Journal of Image and Vision Computing, 2004, pp. 615–625.

[12] X. Liu, J. Rittscher, T. Chen, Optimal pose for face recognition, in: CVPR '06: Proceedings of the 2006 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, IEEE Computer Society, Washington, DC, USA, 2006, pp. 1439–1446.

[13] M.J. Lyons, J. Budynek, S. Akamatsu, Automatic classification of single facial images, IEEE Transactions on Pattern Analysis and Machine Intelligence 21(1999) 1357–1362.

[14] M.J. Lyons, R. Campbell, A. Plante, M. Coleman, M. Kamachi, S. Akamatsu, The noh mask effect vertical viewpoint dependence of facial expression perception, Proceedings of the Royal Society, Biological Sciences 267 (2000) 2239–2245.

[15] A. Mehrabian, Silent Messages, Wadsworth Publishing Company, Inc., Belmont, CA, 1971.

[16] A. Mignault, A. Chaudhuri, The many faces of a neutral face: head tilt and perception of dominance and emotion, Journal of Nonverbal Behavior 27 (2003) 111–132.

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ISSN: 2278 – 1323