

A Review on Human Gender Classification Based on Face Feature Extraction

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Abstract- Biometrics is an advanced way of person identification as it create more direct and precise path with humans than password, since biometrics use significant physiological and behavioral features of a person. In various biometric applications, gender recognition from facial images plays an important role. Classification of gender of person by simply observing face is an easy task for human beings; but for machines it is a harder task. Now a days Automated recognition of gender from face has become an active part of research in image processing and analysis area. Many researchers have done a lot of work in image processing and gender classification. In this paper, there is a comparative and overview study of previous methods and studies of gender classification by extracting facial features is performed. In order to design a gender classification system, use of Particle Swarm Optimization techniques has been proved better for edge detection and for classification neural network performs effectively. As FPGA works parallel, proposed system will be designed on FPGA platform for feature extraction and MATLAB for classification.

Keywords – Facial features , FPGA, Gender classification, Optimization

I. INTRODUCTION

In this technology era, we are expecting each and every field automated. Use of technology improves authentication and identification. In case of identification biometry plays a vital role. Fingerprints, gait, iris, voice, lip movements, hand geometry, odor and face all of these psychological and behavioral characteristics of a person are called biometrics.

Face recognition can be performed without cooperation and knowledge of person being identified. However, recognizing a person becomes difficult because of variations in pose, illumination , occlusion, expression etc. By analyzing the face we get a lot of information such as age, gender, ethnicity, identity, expression, etc.

Gender differentiation by face is an easy task for human being but it is not that easy for computer or computerized systems. A computerized system which have Gender detection capability from face features have wide applications in various basic and advanced research fields such as human computer interface , telecommunication , security, defense and at highly sensitive areas like airports etc.

Many techniques have been used for classification purpose. Some of them deal with pixel and some of them deal with features. One small image contains thousands of pixels. So that techniques based on pixels are slow. While feature based processing is faster

Recent research has been carried out on face detection by using a color-based algorithm [7] where the segmentation of skin-colored regions becomes robust only when a proper color model is chosen. Several color models exist such as RGB, YCbCr, and HSV color models, and each has a specific work field and strength. Issues may get created like different illumination , angle , face position etc. so to classify gender by observing the facial features we need more effective method. In intended method, images are captured from video frames then facial features will be extracted using particle swarm optimization algorithm which will be classified using image classifier resulting in appropriate gender

II. LITERATURE REVIEW

Baback Moghaddam and M.H.Yang adopted Support vector machine (SVM) for the recognition of gender and RBF network ,FLD, Minimum Vicinity classifier have compared for gender recognition. FERET image face database is used for this purpose. Results showed that SVM classifier performs best.[1]

In 2005, **A. Jain, J. Huang, and S. Fang** et.al presented an approach using ICA and SVM. The experiment was done with different classifiers namely cosine classifier which find distance between two features lying on a hypersphere surface, linear discriminant classifiers that finds the projection of the input image maximizing the ratio between class scatter and within class scatter, and SVM which finds the maximal separating hyper plane between male and female features. The experiment was performed on 500 images from the FERET facial database which included 250 images of female and 250 images of male, and obtained an accuracy of 96% in ICA space.[2]

Lian, H.C., Lu, B.L defined novel method proposed for classifying the gender used Local Binary Pattern (LBP) for face feature extraction (Sun et al. 2006). (Lian and Lu 2006), also experimented with LBPs and achieved good results. (Baluja and Rowley 2007) presented a method, based on Adaboost for identifying the gender from a low resolution image.[3]

M. Nazir, M. Ishtaiq et al. used discrete cosine transform (DCT) to extract the facial features. The K-nearest neighbor (KNN) classifier was trained and tested by these features. Experiments were performed on the Stanford University Medical Students (SUMS) face database. The problem with their mentioned method is that it is not robust to occlusion changes.[4]

Anushri Jaswante. Asif Ullah Khan. Bhupesh Gour In this paper, author presented a novel method to gender classification using a new simple feature extraction which extracts geometric features such as distance between eyebrow to eye, eyebrow to nose top, nose top to mouth, eye to mouth, left eye to right eye, width of nose, width of mouth. First to extract these features by using Viola Jones algorithm and then apply Artificial Neural Network. The threshold value set for male and female. If the calculated value is 1 then output is Male otherwise female. Paper presents the results with hundred male and hundred female images.[5]

Sajid Ali Khan, Muhammad Nazir, Naveed RIAZ in this system FERET and SUMS database are used as input . DCT is used for global feature extraction. It yields a high accuracy rate with a low computational cost. And LBP is used for local feature extraction. Then these extracted local and global features are optimized by PSO (Particle Swarm Optimization)and BA (Bee Algorithm) .Finally they ensemble different classifiers (more than one) to get a high accuracy rate. These classifiers are SVM, back propagation NNs (BPNNs), and K-nearest neighbor(KNN). These classifiers are then optimized through the GA.[6]

Prashanth Kumar G and Shashidhara M In this paper there is an algorithm for face detection in an image using skin color segmentation and region properties. Proposed procedure is based on skin color segmentation and human face features (knowledge-based approach). They have used RGB, YCbCr, and HSV color models for skin color segmentation. These color models with thresholds, help to remove non skin region from an image. Each segmented skin regions are tested to know whether region is human face or not.[7]

Hon-Yin Leung, Lee-Ming Cheng, Xiang Yu Li This paper describes the implementation of face recognition system using a Field Programmable Gate Array (FPGA) and a computer. The proposed design uses the feature-based method to recognize a face. During the face recognition process, the FPGA first captures a video frame and then extracts the locations of facial feature points from a face. These data are then transmitted to the computer through the serial data link (RS232). The computer then calculates dissimilarity scores for each face template stored in the database and finds the best match. the overall recognition rate of system is high (about 89 %). Experimental results show that feature point extraction system is accurate and fast.[8]

Eman Fares Al Mashagba In this paper, author has described a robust method that uses global geometry-based features to classify gender and identify age and human beings from video sequences. The features are extracted based on face detection using skin color segmentation and the computed geometric features of the face ellipse region. These geometric features are then used to form the face vector trajectories, which are inputted to a time delay neural network and are trained using the Broyden–Fletcher–Goldfarb–Shanno (BFGS) function. In addition, the proposed method establishes the real-time system to be used in applications with a simple computation for feature extraction.[9]

III . PREVIOUS METHODS

In any pattern classification solution two key points are feature extraction and pattern recognition. In case of feature extraction, the most simple method is to use gray-scale or color pixel vectors as features [1]. Another kind of methods are PCA, ICA and LDA, which project faces into a low-dimensional space and then recognize them. This kind of method has been shown not very robust to variations of face orientation. The third kind of methods is using texture information like complexion [13]. The last kind of methods is combining the facial feature detection with

wavelet transform to extract the local facial feature for classification [14,15], such as the analysis of facial wrinkles and shapes.

Traditional pattern classifiers such as k-nearest-neighbor, Fisher linear discriminant, neural network and SVMs are often employed to gender classification.[decision tree] SVMs seem to be superior to all other classifiers [3].Neural Network (NN) is a massively parallel distributed processor, which is able to store the knowledge obtained by experience and can further use this knowledge. NN is similar to brain, since knowledge is obtained by a learning process and knowledge is stored in interneuron connections[17] Support vector machine is a learning algorithm for pattern classification. a linear SVM uses a systematic approach to find a linear function with the lowest capacity. For linearly non separable data, SVMs can nonlinearly map the input to a high-dimensional feature space where a linear hyper plane can be found. It has been observed that accuracy of SVM is better than all other classifiers for low resolution images[18]

Table- 1 Comparison overview of previously used different methods.[16]

Method	Classification rate %			
	24*24	36*36	48*48	Average
LBP+SVM	76.92	79.07	82.06	79.35
Neural network	84.21	85.89	82.90	84.33
SVM	82.62	86.54	84.02	84.39
Threshold Adaboost	81.50	84.58	83.93	83.34
Average	81.31	84.02	83.23	82.85

IV. PROPOSED SYSTEM

Here, in this system there will be use of swarm optimization technique for feature extraction of obtained face image. And Neural Network implementation for recognition and classification of gender.

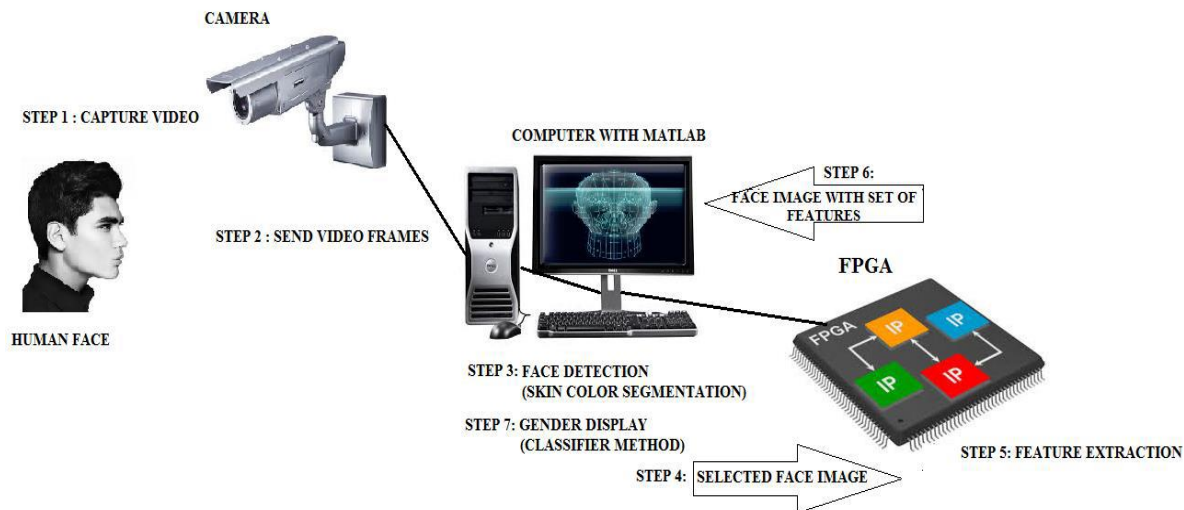


Figure 1.. Expected changes to be made in traditionl system

V. ABBREVIATIONS

Abbreviation	Full Form
BA	Bee Algorithm
BFGS	Broyden–Fletcher–Goldfarb–Shanno
DCT	Discrete Cosine Transform
FERET	The Face Recognition Technology
FPGA	Field Programmable Gate Array

GA	Genetic Algorithm
ICA	Independent Component Analysis
NN	Neural Network
KNN	K Nearest Neighbor
PCA	Principle Component Analysis
LBP	Local Binary Pattern
SUMS	Stanford University Medical Students
SVM	Support Vector Machine

VI. CONCLUSION

Respective paper takes a review of various methods and classifiers used for Gender Classification using Facial Features automatically or using machine. The work of various researchers' is attempted in brief. Use of Optimization technique will improve the quality and use of FPGA platform will lead into an ASIC design.

REFERENCES

- [1] B. Moghaddam and M.H. Yang, "Gender Classification with Support Vector Machines," Proc. Int'l Conf. Automatic Face and Gesture Recognition, pp. 306311, Mar. 2000.
- [2] Jain, J. Huang, and S. Fang., " Gender identification using frontal facial images".In IEEE International Conference on Multimedia and Expo, ICME 2005.volume 2005, pages 1082–1085, 2005
- [3] Lian, H.C., Lu, B.L.: Multi-View Gender Classification Using Local Binary Patterns and Support Vector Machines. In: Proc. 3rd Int. Symposia. on Neural Networks, Chengdu,China, pp. 202–209 (2006).
- [4] M. Nazir, M. Ishtaiq, A. Batool, A. Ja_ar, M. Mirza, \Feature selection for e_cient gender classi_cation", Proceedings of the 11th WSEAS International Conference, pp. 70{75, 2010.
- [5] Anushri Jaswante. Asif Ullah Khan. Bhupesh Gour. (2013). Gender Classification Technique Based on Facial Features using Neural Network. International Journal of Computer Science and Information Technologies, 839-843
- [6] Sajid Ali Khan, Muhammad Nazir, Naveed RIAZ. (2013). Optimized Features Selection for Gender Classification using Optimization Algorithms. Turkish Journal of Electrical Engineering and Computer Sciences, 1479 - 1494. <http://dx.doi.org/10.3906/elk-1203-51>
- [7] Prashanth Kumar G and Shashidhara M (2014) Skin Color Segmentation for Detecting Human Face Region in Image International Conference on Communication and Signal Processing, April 3-5, 2014, India
- [8] Hon-Yin Leung • Lee-Ming Cheng • Xiang Yu Li (2015) A FPGA implementation of facial feature extraction J Real-Time Image Proc (2015) 10:135–149DOI 10.1007/s11554-012-0263-8
- [9] Eman Fares Al Mashagba Computer Sciences Department Real-Time Gender Classification (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 7, No. 3, 2016.
- [10] Nitin Tarar , Vikas Kamra (2015). A Practical Ant Colony Optimization Technique basedImage Edge Detection. International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 8, August 2015
- [11] Ramesha K, K B Raja, Venugopal K R And L M Patnaik. (2010). Feature Extraction Based Face Recognition, Gender and Age Classification. International Journal on Computer Science and Engineering, 14-23.
- [12] Hwei-Jen Lin, Shu-Yi Wang, Shwu-Huey Yen, and Yang-Ta Kao Department of Computer Science and Information Engineering Tamkang University, Taipei, Taiwan, China (2005) Face Detection Based on Skin Color Segmentation and Neural Network IEEE.
- [13] Iga, R.: Gender and Age Estimation System from Face Images. In: SICE Annual Conference in Fukui. August 4-6(2003) 756-761.
- [14] Hosoi, S., Takikawa, E., Kawade M.: Ethnicity Estimation with Facial Images. In:Sixth IEEE International Conference on Automatic Face and Gesture Recognition May 17-19, 2004 Seoul, Korea (2004) 195-200.
- [15] Lian, H. C., Lu, B. L.: Gender Recognition Using a Min-Max Modular Support Vector Machine. In: Proc. ICNC'05-FSKD'05, LNCS 3611 (2005) 433-436.
- [16] Roope Raisamo, Erno M?kinen, "Evaluation of Gender Classification Methods with Automatically Detected and Aligned Faces", IEEE Transactions on Pattern Analysis & Machine Intelligence, vol. 30, no. , pp. 541-547, March 2008, doi:10.1109/TPAMI.2007.70800.
- [17] Miloš Oravec (2014).Feature extraction and classification by machine learning methods for biometric recognition of face and iris. Institute of Computer Science and Mathematics, Faculty of Electrical Engineering and Information Technology, Slovak
- [18] Preeti Rai and Pritee Khanna(2012). Gender Classification Techniques: A Review D.C. Wyld et al. (Eds.): Advances in Computer Science, Eng. & Appl., AISC 166, pp. 51–59.springerlink.com © Springer-Verlag Berlin Heidelberg 2012
- [19] Muhammad Naeem Ahmed Khan, Sheraz Ahmed Qureshi and Naveed Riaz(2013).Gender Classification with Decision Trees International Journal of Signal Processing, Image Processing and Pattern Recognition Vol. 6, No. 1, February, 2013