Research Paper

Volume : 4 | Issue : 12 | December 2015 • ISSN No 2277 - 8179

An Efficient Fusion Strategy for Human Face Detection

Engineering

KEYWORDS : Localization, Segmentation, accuracy, classifier, artificial neural network, distance measure, Euclidean.

Rupali B. Pawar — Savitribai Phule Pune University, Indira College of Engineering and Management, Pune, Maharashtra, India

Sarika Deokate — Professor, Savitribai Phule Pune University, Indira College of Engineering and Management, Pune, Maharashtra, India

ABSTRACT

In this paper, Face recognition is done by using LPOG (local patterns of Gradients). Face Recognition is done through different techniques such as channel separation, Grey Scaling, Edge Detection, Face localization, cropping, and image-segmentation. In this process, input image is divided into blocks, here input image can be captured by webcam or also we can extract image from video. Input image will be of 24 bits and depending upon that blocks face is recognized using different techniques. Feature vectors are generated after going through this process. Comparison is done by using Classifier such as ANN and distance measure algorithm that is Euclidean. Accuracy will be improved by using fusion strategy of ANN and Euclidean. System has potential to improve accuracy.

1. Introduction

Nowadays face recognition or detection has become huge necessity in different fields. Face detection has become a thrilling strategy. Human face recognition has already established its acceptance as a superior biometric method for Identification and authentication purposes. It is touch less, highly automated and most natural since it coincides with the mode of recognition that as humans employ on our everyday affairs .It has emerged as a preferred alternative to traditional forms of identification, like card IDs, which are not embedded into one's physical characteristics. Research into several biometric modalities including face, fingerprint, iris, and retina recognition has produced varying degrees of success. The challenges are even more profound when one considers the large variations in the visual stimulus due to illumination conditions, viewing directions or poses, facial expressions, aging, and disguises such as facial hair, glasses, or cosmetics. In this connection, there are two major challenges: variations in illumination and pose. Such problems are quite unavoidable in applications such as outdoor access control and surveillance. Performance of visual face recognition is sensitive to variations in illumination conditions and usually degrades significantly when the lighting is dim or when it is not uniformly illuminating the face. [2] The changes caused by illumination on the same individual are often larger than the differences between individuals. Various algorithms (e.g. histogram equalization, dropping leading Eigen faces etc.) for compensating such variations have been studied with partial success. In this system , user is going to extract frames out of a input video , number of frames will be extracted whichever is good will be taken as input for comparison. [3]

In many fields there is use of face detection such as Biometric attendance using face, entertainment, information security, law enforcement, access control & video surveillance , when any crime has taken place and we have to identify the image of criminal we can use face detection method to recognize the image. System plays important role in different fields. Various methods have been proposed in this such as feature extraction, face localization, classification. Different techniques such as Monogenic Binary Coding MBC is used in [2].

2. Survey

LPOG (Local Patterns of Gradient) algorithm is used. LPOG uses BELBP. KNN classifier is used for comparison. [1] In this, local feature based face recognition methods such as Gabor features by LBP are used.MBC (monogenic binary coding) is used for face representation & detection. Gabor filtering methods are used. [2] Lucas-Kanade algorithm is used to handle illumination. A virtual frontal view can be reconstructed from a given non-frontal face image using MRF (Markov random field). [3] A block based bag of words method is proposed for robust face recognition. Local SVM is applied for histograms. [4] Fusion of POD & POEM based representations is used to get more compact and discriminative face descriptors. [5]

FACE algorithm is compared with SVM, incremental SVM, PCA, ICA, incremental LDA & hierarchical MLBP can be easily integrated. [6]

First, system propose based on Local Phase Quantization (LPQ) blur-robust face image descriptor and extend it to a multiscale framework (MLPQ) to increase its effectiveness. (Multiscale) Local Phase Quantization Histogram (LPQH) was proposed.[7] This system uses structured space error coding algorithm is used for face detection. LSF(local salient feature) is widely considered.[8] In this system MLBP(multiple scale local binary pattern) is considered for age , occlusion variant face detection.[9]The Local Binary Pattern (LBP) has been extensively known for image representation. AdaBoost learning is applied to select most effective uniform MB-LBP features and construct face classifiers.[10]

3. Proposed Methodology

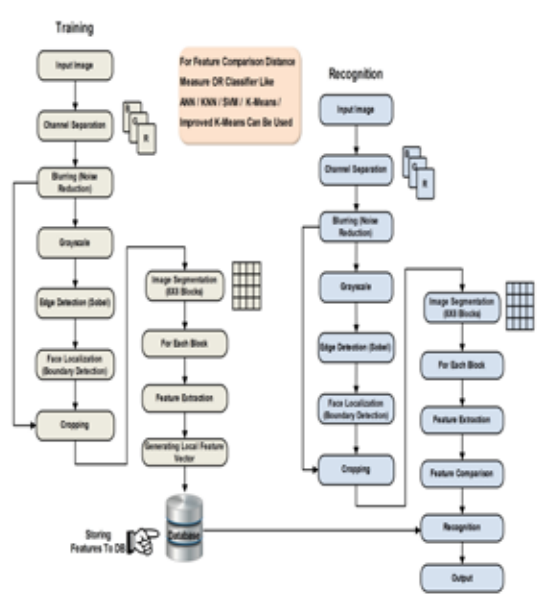

Fig. System Architecture of Face recognition

In the proposed system can take input through video or through the image, if through video then frame i.e. image will be taken as input. That input image will go under channel separation i.e. when an input image is extracted from RGB Values and all the pixels are in the form of black and white that means system have obtained gradient image. Next step will be of noise reduction that is whatever unwanted material is there that will be removed for example if any image is blurred that will be made little sharper or visible for recognition. This will be done by LPQ (Local phase Quantization) that is the blurred tolerant descriptor. This will improve the resolution of the input image or Grey Scaling is done on that particular image. After this step that image will go under Edge Detection phase Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. Next step is Face localization in which the distance between the lips and nose, nose and eyes this distance is measured and accordingly image is compared. Sometimes hairless skin region dominates. In short, in this phase boundary of the face is marked and accordingly compared. Further, Cropping takes place of the image i.e. leaving ears and hairs region only face is cropped for extracting features. Further image is segmented according to concept of BELBP the face is divided into blocks for further process for e.g. block of 8X8. For each block the feature is extracted and histogram is generated out of it. From this feature extracted feature vector is generated from which detailed information can be derived. After Feature vector is obtained comparison is obtained from it. By using classifier system can classify the image, over here used classifier are ANN (artificial neural network) and distance measure algorithm Euclidean.

4. Performance Evaluation

Many classifiers can used for classification such as CART, QDA, SVM, NBC, LDA, KNN and ANN. But ANN and SVM are showing results very accurate and slight difference is seen between both the classifiers.

	Accuracy	Specificity	Sensitivity
ANN	97.70%	97.25%	98.28%
SVM	96.60%	96.25%	97.20%

So, for the face classification, ANN is showing more accuracy than SVM. So ANN is used for classification.

5. Related Work

In process we are processing the image in following way that is Channel separation, grey scaling, edge detection, face localization, cropping and image segmentation.

a) In edge detection there are three to four steps for execution:

i) Filtering: cutting down noise
ii) Enhancement: amplify the difference between edges and non-edges.
iii) Detection: use a threshold operation
iv) Localization: geometry of edges beyond pixels

Sobel Edge Detection method is used.

b) Localization with Laplacian:

An equivalent measure of the second derivative in 2D is the Laplacian.

$$\nabla^2 f(x,y) = \frac{\partial^2}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}$$

Using the same arguments we used to compute the gradient filters we can derive a Laplacian filter to be

$$\Delta^2 = \begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

6. Applications:

This system is efficient to be used for crime detection, Biometric attendance, access control and video surveillance.

7. Conclusion:

This system to be used for different applications of face detection with increased accuracy due to use of ANN classifier and distance measure algorithm Euclidean. Results will be accurate and fast.

REFERENCE

[1] Huu-Tuan Nguyen and Alice Caplier "Local Patterns of Gradients for Face Recognition" VOL. 10, NO. 8, AUGUST 2015 [2] M. Yang, L. Zhang, S. C.-K. Shiu, and D. Zhang, "Monogenic binary coding: An efficient local feature extraction approach to face recognition," IEEE Trans. Inf. Forensics Security, vol. 7, no. 6, pp. 1738–1751, Dec. 2012. [3] H. T. Ho and R. Chellappa, "Pose-invariant face recognition using Markov random fields," IEEE Trans. Image Process., vol. 22, no. 4, pp. 1573–1584, Apr. 2013. [4] Z. Li, J. Imai, and M. Kaneko, "Robust face recognition using block-based bag of words," in Proc. 20th ICPR, Aug. 2010, pp. 1285–1288. [5]N.-S. Vu, "Exploring patterns of gradient orientations and magnitudes for face recognition," IEEE Trans. Inf. Forensics Security, vol. 8, no. 2, pp. 295–304, Feb. 2013. [6] Maria De Marsico, Member, IEEE, Michele Nappi IEEE "Robust Face Recognition for Uncontrolled Pose and Illumination Changes" IEEE TRANSACTIONS SYSTEMS, VOL. 43, NO. 1, JANUARY 2013 [7] C. H. Chan, M. A. Tahir, J. Kittler, and M. Pietikäinen, "Multiscale local phase quantization for robust component-based face recognition using kernel fusion of multiple descriptors," IEEE Trans. Pattern Anal. Mach. Intell., vol. 35, no. 5, pp. 1164–1177, May 2013. [8] X.-X. Li, D.-Q. Dai, X.-F. Zhang, and C.-X. Ren, "Structured sparse error coding for face recognition with occlusion," IEEE Trans. Image Process., vol. 22, no. 5, pp. 1889–1900, May 2013. [9] A. Sharma, M. A. Haj, J. Choi, D. W. Jacobs, "Robust pose invariant face recognition using coupled latent space discriminant analysis," Compute. Vis. Image Understand., [10] S. Liao, X. Zhu, Z. Lei, L. Zhang, and S. Z. Li, "Learning multiscale block local binary patterns for face recognition," in Advances in Biometrics. Berlin, Germany: Springer-Verlag, 2007, pp. 828–837.