A Comparative Analysis of Robust Face Recognition Approaches

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Abstract- The face is our essential focal point of consideration in public activity assuming a vital job in passing identity and emotions. a number of faces can be recognize learned throughout our lifespan and recognize faces initially even following quite a while of separation. This expertise is very powerful notwithstanding of huge varieties in visual improvement because of evolving condition, aging and distractions, for example, whiskers, glasses or changes in hairdo. Human"s abilities are truly adept at perceiving and recalling faces in spite of the progression of time. Consequently, it"s basically advantageous if the present computer advancements progress toward becoming as hearty as people in face recognition. Face recognition is a computer coding innovation that decides the areas and sizes of human faces in a given image arrange. Essentially, it distinguishes just the facial features and disregards the rest like trees, building, and so forth. he objective of the proposed exploration is to examine various approaches used to detect human faces in a given image which is fast, simple, accurate and can be applies to various races existing throughout the world.

Keywords- Image Processing, Face Recognitio, Objection Detection, Knowledge based method, Feature-invariant methods .

I. INTRODUCTION

Face identification and acknowledgment is an extremely generous and normal method for human-machine association. But, building up this venture which is confronting discovery framework is extremely testing which work as adequately as people.

The face assumes a fundamental job in conveying personality of people. One of things that truly appreciate the viewer is the human capacity to perceive faces. People can perceive a large number of countenances and distinguish recognizable appearances in spite of substantial changes in the visual upgrade because of survey conditions, articulation, maturing, sex, and diversions, for example, glasses, or changes in hairdo.

When focuses on human capacity in Face Recognition (FR), it don't realize how faces are decoded by the human cerebrum. FR has been considered for more than two decades so as to influence a discernible development in this to appreciate field and it is as yet an active subject because of broad useful applications. Numerous ongoing occasions, for example, terrorist attacks, uncovered genuine shortcoming in most refined security frameworks.

Various government organizations are presently increasingly spurred to enhance security information frameworks dependent on body or social qualities, regularly called biometrics. Biometrics is an extremely appealing innovation, since it tends to be incorporated into any application requiring security or access control, successfully killing dangers related with less trend setting innovations that depend on what an individual have or know instead of whom an individual truly is.

Face identification and recognition depends on facial features acknowledgment and face location. So as to begin confront discovery and acknowledgment there is a need to first totally and precisely recognize the face features as like nose, mouth, eyes and the separation between the one another.

The objective of FD is to determine if there are any faces in the image and, if present, find the image face. While this shows up as a trifling undertaking for individuals, it is an exceptionally difficult assignment for PCs, and has been one of the best considered research themes in the previous couple of decades. Early endeavors in FD have displayed as right on time as the start of the 1970s, where basic heuristic procedures were utilized.

These systems are to a great extent inflexible since they expect perfect conditions, for example, plain foundation and frontal face. A portion of the components that make FD such a troublesome assignment is:

a. Face orientation: A face can show up in a wide range of poses. For example the face can show up in a frontal or a profile (i.e. sideways) position. Moreover a face can be turned in plane (e.g. it shows up under an edge of 45'), so the close profile face position can show up in the image. In this manner, a face shows up in various shapes in an image.

b. Face size: The size of the human face can fluctuate a great deal. Not exclusively do diverse people have distinctive sized faces; likewise faces nearer to the camera seem bigger than faces that are far from the camera.

c. Different facial expression: The presence of an individual who is laughing is entirely unexpected than the presence of an individual who is irate. In this manner outward appearances straightforwardly influence the presence of the face in the image.

d. Different facial feature: A few people wear glasses, some have a facial hair or a mustache, others have a scar. These kinds of features are called facial features. There are incalculable instances of facial features and they all change fit as a fiddle, size and shading.

e. Occlusion: Faces in images might be mostly blocked. For example an individual standing in front of another or an object that is set before the face. In this way just a part of the facial image is available in the image.

f. Lighting condition: Faces show up entirely unexpected when distinctive lighting conditions are utilized. For example when side lighting is utilized, a piece of the face is brilliant while the other part is extremely dim.

Given an image taken from a digital camera, if there is a need to know if there is a need to know whether there is any individual inside, where his/her face situates at, and who he/she is. Towards this objective, for the most part separate the FR system into three stages: Face Detection, Feature Extraction, and Face Recognition shown in Fig. 1.1.

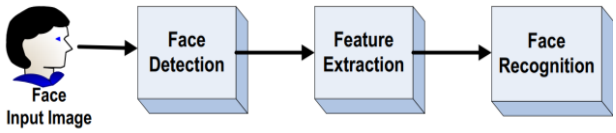

Fig. 1.1 Configuration of a general FR structure

II. METHODS USED FOR FACE DETECTION

The different techniques utilized for face location might be arranged in the accompanying classifications:-

A. Knowledge Based Method

It is rule-based method which encodes our knowledge of human faces.

Feature-invariant method- It is a method of algorithms that find invariant features of face despite its angle or position. These are the rule-based strategies which encode our insight into human faces. In it the framework endeavors to catch our insight into faces, and makes an interpretation of them into a lot of rules characterized by the computer. However it is anything but difficult to figure some basic rules. For example, a face typically has two symmetric eyes, and the eye territory is somewhat darker than the cheeks. Facial features can be the separation between the two eyes or the shading force contrast between the two eye region and the lower zone.

The significant issue which faces in this strategy is the trouble in building a fitting arrangement of rule for the framework to deal with. On the off chance that utilizes the arrangement of rules which are excessively broad, there can be numerous false positive outcomes. Then again, it can likewise happen that there will be numerous false positive outcomes if the rules are excessively detailed. This is the reason because of which we won't utilize this technique for the improvement of our undertaking. An answer for conquer this issue is to fabricate progressive learning based techniques. In any case, this methodology alone is extremely constrained.

B Feature-Invariant Methods

In include invariant technique attempts to locate some invariant features for face recognition. The thought behind this strategy is to beat the constraints of our natural information of faces. In this technique first attempt to discover eye-simple pixels, so utilizing this can expel undesirable pixels from the images. In the wake of playing out the segmentation procedure, they consider each eye-simple portion as a hopeful of one of the eyes. At that point, a lot of rule is executed to decide the potential match of eyes. At that point once the eyes are chosen, the algorithm endeavors to compute the face region and catches them inside a square shape. At that point the four vertexes of the face are resolved utilizing the arrangement of functions encouraged in the framework. Thus, the faces are standardized to a settled size and introduction. At that point, the face districts are checked utilizing a philosophy dependent on neural system back propagation.

III. LITERATURE REVIEW

Sr. No.	Paper Title	Author Name	Year of Publication	Techniques Used	Parameters Calculated
1	Face recognition through a chaotic neural network model	Carlos, Luis Fernando Martins, and Joao Luis Garcia Rosa.	2014	Linear Discriminant analysis (LDA), Principal Component Analysis (PCA), K-sets models and Neural Networks	Accuracy achieved: 73.63%
2	Fusing Gabor and LBP Feature Sets for KNN and	BilelAmeur, SabeurMasmoudi, AmiraGuidaraDerbel,	2016	Gabor wavelets, Local Binary Patterns (LBP), K Nearest Neighbor	Accuracy achieved: 94.16%

	SRC-based Face Recognition	Ahmed Ben Hamida		(KNN), Sparse Representation Classifier	
3	A New Hybrid Face Recognition Algorithm Based on Discrete Wavelet Transform and Direct LDA	Seyyed Amir ZiafatiBagherzadeh, Sarcheshmeh, ZiafatiBagherzadeh, and Khalilzadeh	2016	Discrete Wavelet Transform (DCT), Direct Linear Discriminant Analysis (DLDA), Support Vector Machine (SVM)	Accuracy achieved: 95%
4	Facial expression recognition using hybrid features and self-organizing maps	Faisal Farooq, Jalal Ahmed, and LihongZheng	2017	Principal Component Analysis (PCA),Independent Component Analysis, Self-Organization Maps (SOM)	Accuracy achieved: Cohn-Kanade: 96.81% AT&T: 96.55%
5	Robust Face Recognition Approaches Using PCA, ICA, LDA Based on DWT, and SVM algorithms	ZiedBannourLahaw, DhekraEssaidani, and HasseneSeddik	2018	Principal Component Analysis (PCA),Linear Discriminant Analysis (LDA), Independent Component Analysis, Support Vector Machine (SVM)	Accuracy achieved: DWT+PCA+SVM: 96% DWT+LDA+SVM: 96% DWT+ICA+SVM: 94.5%

Carlos, Luis Fernando Martins, and Joao Luis Garcia Rosa, 2014.[1] K-sets models are connectionist strategies dependent on neuron populaces, considered through EEG examinations of the mammalian olfactory framework. These models present an organically more conceivable structure and execution than other neural systems models. K-sets have been utilized in different machine-learning issues, with potential application on example acknowledgment however exhibiting novel chaotic ideas for signal processing. The attributes of the K-sets models and their application in a face acknowledgment task are displayed in this examination work. This strategy was tried utilizing Yale Face Database B and the outcomes demonstrate that it outperforms prominent acknowledgment techniques.

Bilel Ameur, Sabeur Masmoudi, Amira Guidara Derbel, and Ahmed Ben Hamida, 2016 [2] in this work, proficient techniques for face acknowledgment is produced in an uncontrolled situation where intertwine Gabor wavelets and Local Binary Patterns (LBP) is utilized for the element extraction. At that point, the measurement decrease procedure is used to diminish the example vectors. Mix of both K Nearest Neighbor(KNN) and Sparse Representation Classifier is utilized for face acknowledgment. This method was tested on LFW database and the best result is obtained with a recognition rate = 94.16 per cent.

Seyyed Amir Zia fatiBa gherza deh, Sarcheshmeh ,Zia fatiBa gherzadeh, and Khalilzadeh, 2016 [3] This work built up a direct LDA (DLDA) based algorithm to spare the conceivable helpful data. In this examination work, another hybrid FR algorithm utilizing discrete wavelet transform (DWT) with third-dimension of Haar filter, DLDA strategy for dimensionality decrease, and a help vector machine with second-order polynomial portion is utilized. The got recognition results demonstrate that this methodology altogether outflanks recognition utilizing proposed algorithm. For the ORL face database, the arrived at the midpoint of recognition exactness is over 95%.

Faisal Farooq, Jalal Ahmed, and LihongZheng, 2017 [4] a new technique is produced to perceive human outward appearance by nourishing hybrid features to Self-sorting out maps (SOM). This work exhibits another approach to investigate, represents to and perceive human outward appearances from a video grouping. This work involves of following parts: face discovery, facial component extraction and order. Right off the bat, faces are distinguished dependent on skin shading subsequent to expelling foundation and noise impacts from raw video successions. At that point each face image is adjusted utilizing vertex cover age and the 1D transformation features are separated to use the nearby data for every facial image. The new features are prepared and tried utilizing SOM after diminishing the element of features and doing free segment examination, .This technique was tried on Cohn-Kanade and AT&T datasets of outward appearance recordings accomplishes unrivaled recognition execution of 96.81% and 96.55% over cutting edge strategies.

Zied Bannour Lahaw, Dhekra Essaidani, and Hassene Seddik, 2018 [5] So as to utilize the most imperative data in the face representation, this work utilized the idea of 2D-DWT for the image compression as a pre-processing

for highlight extraction. Actually, the DWT is performed at various scales and introductions so it is sensitive to solid lighting conditions and facial details. In view of the DWT focal points, the LL sub-band of the prepared image is utilized as information image for highlight extraction process dependent on ICA, PCA, LDA and SVM algorithms.This technique was tested on AT&T database.

IV. PROBLEM DESCRIPTION

This research explores the capabilities, strengths, and weaknesses of a new proposed technique based in feature-based approach for detecting face which will pave the way for using fast statistical approaches for FR. FR is one of the most successful applications of image analysis and understanding. This field is expected to improve many fields especially in security systems that can be applied in many places such as agencies and governments, etc. and provide the user ability to judge if the detected face person image is the same one stored in database. Numerous ongoing events, for example, terrorist attacks, uncovered genuine shortcoming in most refined security frameworks. Different government offices are presently progressively spurred to enhance security information frameworks dependent on body or behavioral characteristics, regularly called biometrics. FR is an important issue in such security systems. However, different environment conditions such as detecting faces with different poses, different lightning conditions, complex backgrounds and detecting faces with glasses, tend to significantly affect system FR performances and leads to an inability to recognize faces correctly.

V. CONCLUSION

Human face identification and recognition assume imperative jobs in numerous applications, for example, video surveillance and face image database management. In our undertaking, studied and examined work on both face recognition and identification strategies and best algorithms for them. Face detection is used in many places now a day's particularly the websites facilitating images like picassa, photo bucket and facebook. The naturally labeling highlight adds another measurement to sharing pictures among the general population who are in the image and furthermore gives the plan to other individuals about who the individual is in the image. In proposed examination work presented a comparative analysis of a quite basic yet exceptionally compelling face identification algorithms based on previous work and survey of literature.

REFERENCES

[1]. Carlos, Luis Fernando Martins, and Joao Luis Garcia Rosa, "Face recognition through a chaotic neural network model" , In 2014 International Joint Conference on Neural Networks (IJCNN), pp. 859-863. IEEE, 2014.

[2]. BilelAmeur, SabeurMasmoudi, AmiraGuidaraDerbel, and Ahmed Ben Hamida, “Fusing Gabor and LBP Feature Sets for KNN and SRC-based FaceRecognition”, 2nd International Conference on Advanced Technologiesfor Signal and Image Processing – ATSIP, pp. 453-458, March 2016.

[3]. Seyyed Amir Ziafati Bagherzadeh, Sarcheshmeh,Ziafati Bagherzadeh, and Khalil zadeh, “A New Hybrid Face Recognition Algorithm Based on Discrete Wavelet Transform and Direct LDA”,IEEE1st International Iranian Conference on BiomedicalEngineering (ICBME), Amirkabir University of Technology, Tehran, Iran, November 2016.

[4]. Faisal Farooq, Jalal Ahmed, and LihongZheng, “ Facial expression recognition using hybrid features andself-organizing maps”, Proceedings of the IEEE International Conference on Multimedia and Expo (ICME) , pp. 409-414, July 2017.

[5]. Zied Bannou rLahaw, Dhekra Essaidani, and Hassene Seddik, “Robust Face Recognition Approaches Using PCA, ICA, LDA Based on DWT, and SVM algorithms”, IEEE 41st International Conference on Telecommunications and Signal Processing (TSP), 00. 413-

[6]. X. Geng, Z. Zhou and K. Smith-Miles, "Individual Stable Space: An Approach to Face Recognition Under Uncontrolled Conditions," in IEEE Transactions on Neural Networks, vol. 19, no. 8, pp. 1354-1368, Aug. 2008.

[7]. Y. Wang and J. Su, "Symmetry description and face recognition using face symmetry based on local binary pattern feature," Proceedings of the 32nd Chinese Control Conference, Xi'an, 2013, pp. 3955-3960.

[8]. I. M. de Diego, C. Conde, Á. Serrano and E. Cabello, "Combination of kernels applied to face verification," 2009 16th IEEE International Conference on Image Processing (ICIP), Cairo, 2009, pp. 1241-1244.

[9]. Li Yuan, Zhi-Chun Mu and Xiao-Na Xu, "Multimodal recognition based on face and ear," 2007 International Conference on Wavelet Analysis and Pattern Recognition, Beijing, 2007, pp. 1203-1207.

[10]. Cheng Zhong, Zhenan Sun and Tieniu Tan, "Learning efficient codes for 3D face recognition," 2008 15th IEEE International Conference on Image Processing, San Diego, CA, 2008, pp. 1928-1931.

[11]. H. Du, S. Wang, J. Zhao and N. Xu, "Two-dimensional neighborhood preserving embedding for face recognition," 2010 2nd IEEE International Conference on Information Management and Engineering, Chengdu, 2010, pp. 500-504.

[12]. Guo-Hui He, Bin Zhu and Jun-Ying Gan, "Pose-varied face recognition based on 3-D face model," 2008 International Conference on Machine Learning and Cybernetics, Kunming, 2008, pp. 2987-2992.

[13]. Charoenpong Theekapun, Shogo Tokai and Hiroyuki Hase, "Facial expression recognition from a side view face by using face plane," 2007 International Conference on Wavelet Analysis and Pattern Recognition, Beijing, 2007, pp. 1096-1101.