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Age-Invariant Recognition for Classifying Human Faces by Fusion of Shape and Texture Features

[1]K. Sony Grace, [2]M.Raja Babu
[1]M. Tech. Student, Department of Computer Science , Aditya Engineering College, Surampalem, Peddapuram, East Godavari Dist., Andhra Pradesh, India
Sonygrace.koduri@gmail.com
[2]Associate Professor, Department of Information technology, Aditya Engineering College, Surampalem, Peddapuram, East Godavari Dist., Andhra Pradesh, India
rajababu.makineedi@aec.edu.in

ABSTRACT

Face recognition plays an important role in identifying a person from a set of test imagesused for personal identification, but an individual poses a serious problem in recognizing the facial images whenever age varies. So to overcome this problem, face recognition system is developed which is invariable of age. In support to that a paper was published by covering age contemplation. In the proposed system the problem was attended by fusion of phase congruency and local binary patterns. The advantages of the proposed system are, it improves the accuracy of recognizing the facial expressions in different pose and appearances, it works accurately without contemplation of age, and it can also work in Broad training set. Finally by implementing this we can recognize an individual without depending on age with resistance to pose variations and proper illuminations and gives a better computational efficiency.

1. Introduction

Human faces present essential data concerning gender-specific, maturity, in extension to identification. When a person cannot recognizes the other person then there is a chance of arising a problem due to numerous differences like Facial Expressions, Age advancements, etc. for this face recognition has been developed with proportions to age for solving the recognition of the facial images across aging[3]. Face recognition is a wayto verify thepersonalidentification depending on his/her characteristics. The aging of a person brings modification in facial appearances. The aging is a very complicated process which leans on many circumstances like patterns in genes, behavior, accent, inconclusive conditionsetc. After all faces endure creeping divergence due to aging, systematically we have to update the training set with more latest images of proposalswhich might be unavoidable for the success of face recognition systems. In this feature abstraction plays an acute role in elaborating the accuracy of the recognition process which can be done by taking a test image, then the face is represented and features are abstracted from this image and the features are correlated with the features of an images that are stored in the training set .then the classification is done by approaching the features of test image with the training database to identify whether the input image is matched or not matched image.

Thus in this paper we will try to examine Human Recognitionsystem for faces to remunerate the age disparity and to single out a person irrespective of his time of life. The age-invariant face recognition is chiefly obtained by using the innovations like Phase congruency (PC) & Local Binary Patterns (LBP)[1].

1.1 Related Work On Age Invariant Face Recognition

Li, Z, Park, U, Jain, A. contemplated a discerning model to abode face matching in the ubiquity of age variationsby sampling facial image plentiful inequitable reports can be extracted for additional investigation which contains a high dimensional feature space causes over fitting problem[3]. To overcome this discriminative model is developed which expressed in two modules: local-Feature Description and Multi-Feature Discriminate Analysis (MFDA). It is a combination of SIFT and MLBP. The most desired discriminate analysis proposal for recognizing faces is LDA. This can revealed by a variety of implementations based on LDA methods in face recognition. This improves the face matching accuracy in the presence of aging.

Ahonen. T, Hadid. A, Pietikainen. M,proposed a feature extraction method,called Local Binary Pattern (LBP)[1]. This describes the compositionand shape of an image. It can be stated by splitting an image into many number of individual regions from which the features are elicited. The primitive LBP operator was popularized. This operator works with the eight neighborpixel values, by taking center pixel as a threshold .It works accurately without contemplation of age and improves the accuracy of

recognizing the facial expressions in different pose and appearances and allows Very fast feature extraction.

Gayathri, M, Chandra, K has predicted thatvariation in age of an individual possess a contemplative predicamentwhere the system was failed to recognize deviations in facial features[2]. So, to overcome this face Representation is done based on the graphs for competent face recognition independent of age. Representing an image by graph is gained by age model andstated feature point extractions and descriptors is assembled by applying graph space and by taking feature points of face as vertices a graph is formulated. Feature points from the image can be extracted using local feature analysis technique this can be computed by using PCA.The vertices are described according to their feature descriptors which are extricated for each feature point of an image using local binary patternswhich labels the pixels of an image and then we constructgraph G by taking the determined feature points for the explored image. Graph G have been contested with the determined graphs in the data set and finds weather it is recognized or not. To match up graphs which adequately produces the changes of a face in shapes is provided by uncomplicated but authoritative matching technique and reduces the computational time.

SinghR, Vatsa M, Noore A, Singh, has proposed algorithm for transformation of age to handle the facial aging problemwhich is a challenge in recognition process[5]. The recommended algorithm annals the arcade and complete image acquisition in concern to polar coordinate and minimizes the deviations in facial features generated due to aging by selecting the maximum co-relation points from the corner points and then implement the global conversion proceed by the local registered image to minimize the global variations which extremely enhance theaccomplishment of evidences in identification phases.

Park, U, Tong, Y, Jain, A presented A 3D Aging Model which was developed to overcome the Face recognition accuracy which is usually limited by some factors such as attitude, idioms and existence of life[4]. The face recognition performance is improved by using this technique and it can be used to satisfy the age variations. The modeling technique for agingtransforms3D face models to the given 2D face aging database in which aging patterns of shape and texture is used separately.Agingpattern for texture is acquired by aligning the primary image to image plane in front of nodal points by applying PCA we have to calculate conversion matrix and the projected texture of 3D image and it is compared with gallery image. Resultant outputs can be viewed and analyzed at much greater speeds and Changes can be made instantaneously and views can be set up quickly

So we propose a new system for extracting PC features of face image to eliminate address hair loss, difference between identical twins, simulation only in narrow training set, so the system fails when new aging pattern is given and the accuracy of system was degraded

3. Proposed shape and texture features

We propose a new technique for recognizing the faces by combining phase congruency and local binary patterns for extracting the features of an image. In this technique, we develop ageinvariable recognition system by combining shape and texture features for detecting the human faces.

3.1 Phase Congruency (PC)

The proposed pc feature of image isdepleted to avert brightness variationsby taking the phase component of the images. In this the image was cleft into cramped alternate images and the principal component approach was enforced to each of the auxiliary images.PCA is an analytical method and the purpose of PCA is to minimize the highdimensionality of data to essential dimensionality[3]. It is a successful technique for image recognition.Principal component analysis (PCA) is used for determine patterns,expressing data in such a way to describe main features about similarities and differences.

Theutmost frequently worn method is PCA (Principle Component analysis) while working with feature extraction. The training image conveyed in terms of Eigen Face coefficients and visualized on the face space in PCA. Face can be identified as one of the image in training set , test image is visualized on the face space based on the dissimilarities between weights of all the training set images. This series of actions works greatly whentest imageis compared with various person images in the training set.

In case of this age recognitionEigen vectors should be in the direction of the variations in between the images. The age reflections seen on the face may alter from person to person and are unique. Thus the Eigen space createdis conducted at eachindividual level. The Eigenfaces created for every person is done according to ageseparated images on the training and testing phase.

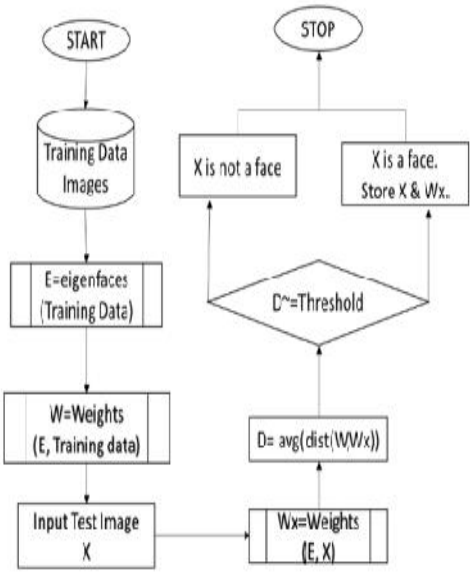

Fig.1: Flow Chart for Face Recognition

This flow chart is used to illustrate the face recognition process by calculating the Eigen faces and there equivalent weightsof an individual and match areconsidered by taking leastpossible Euclidiandistance.

Generation of TrainingSet

We are using the method where all images are participated as training set andObtain face images (training faces) .The face images must be of same sizeand then we have to convert all images from RGB to Gray. All the vectors of the training Set is going to be stored. Toreduce the errors in the background we are going to apply mean and standard Deviation on the trained dataset variables. Each face image of the training set should normalize specified dimensions of an image. We are going to apply normalization process and reshape function to reduce the features of an image from High dimensional features space to low dimensional feature space.whenever an image is captured it may contain several noises such as shade and high contrast may exist in an image which can be reduced by applying a masking technique for noise reduction. The average image has been calculated and then extracted from each original image

Calculation of Eigen faces

The Eigen face algorithm needs the ComponentAnalysis (PCA) for condensing the dimensionality of an image to find the vectorsand then compute the Eigen faces of the covariance matrix by using the formula AA^T. Each eigenvector can be seen as an image because of the same dimensionality as of the original images[4]. The eigenvectors of this covariance matrix are therefore called Eigen faces. Apply normalization and histogram equalization on the respective Eigen faces which is going to appear.

(1) Calculate average face by taking the sum of all columned images by total
Number of images

(2) Calculate the**difference between training set images** and the average face (P by T), where P is the number of pixels and T is the total number of images.

(3) The **covariance matrix E**with concerned Eigen vectors can be calculated which gives the Eigen faces.

-P is usually big, when we calculate the (P by P) matrix .Instead of directly calculating the eigenvectors of E, we can calculate the eigenvalues and the corresponding eigenvectors of a much smaller dimensional matrix (T by T).

Calculating Weights of Image

Calculate the weight of the input image with the differentiation image. We differentiate between training sets and input image. The updated weight of the image will be obtained. All images that are stored in the training set are projected to find a set of weights that describes each vector.

3.2 Local Binary Patterns (LBP)

The features of an image can be extracted by using a method called Local Binary Pattern (LBP)[1]. The important property of LBP is its invariability against monotonic grey level changes and it describes the environment of a constituent.The shape and texture features of a digital image can be described with the help of Local Binary Patterns (LBP). This can be done by splitting an image into limited size of individualparts from which the features are extorted.

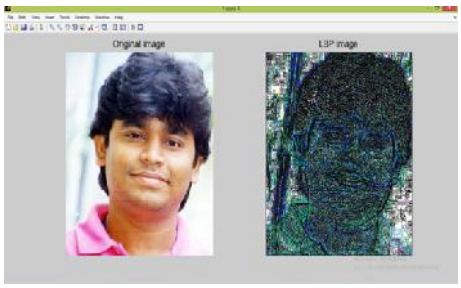

Fig.2: Pixel wise LBP image

The primitive LBP operator was introduced as a dynamic means for declaration of texture. This operator accomplish with the eight bystander pixel components, taking the middle pixel value as threshold and then it correlate the neighbor pixel values with the central pixel value. Conceding that the nearest picture value is greater than middlepicture value it is represented as 1 otherwise it is represented as 0.It takes the result in binary number and converts it to decimal number

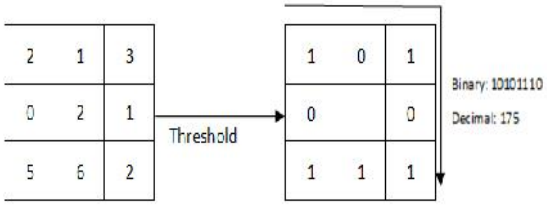

Fig.3: Feature Extraction using LBP

The input face image can be represented in the form of pixel wise LBP image. Eigen faces and the weight factors of each image is calculated and then we have to Apply normalization on the differential weight vector to find the minimum and maximum values of Euclidean distance based on the summation operation on the Euclidean distance value we get the equivalent image including age variant vector. To classify an image which is taken as an input, it depends on the prolongation of the test image to obtain the comparable set of weights. Bycorrelating the densities of the input figures with the determined weights of the training set images, we can identify the input face is recognised or not.

4. Simulation Results

Recognition accuracy is obtained by fusion of PCA & LBP. Consider images separately and build a training set such that each specific image should present in it.

a) Input Image

Abduct the modeleven if the image doesn't present in the training set. Here, training set containsa set of images and consider an image with some changes inexpressions of individualimages as of database image as an input. So, input images with some variations are taken.

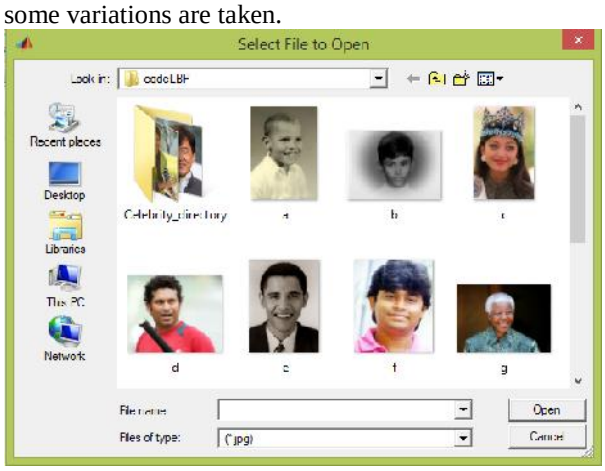

Fig.4: Input image from test images

B) Training Set Images

Consider some images $I_1, I_2 \ldots\ldots I_m$ and store them in trainingdatabase and we have to consider all the images into unique size matrix.

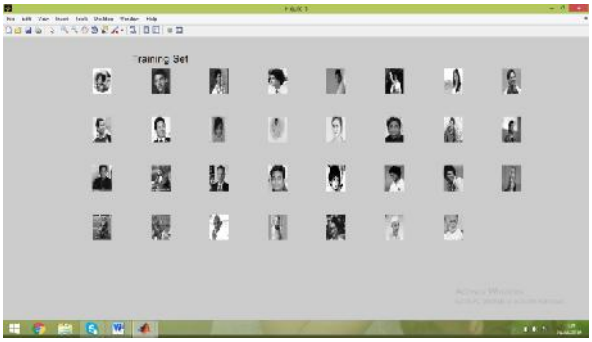

Fig.5: Training Set

C) Face Recognition By Fusion Of PCA & LBP

Especially we have to take input images which are different from training set images. Even slight variations in facial images are not recognized by PCA because it is directly applied to total image so the recognition rate is poor by using PCA. So, a small deviation in face images causes changes in picture element values and eventually feature values also changed. So, detecting facial visage becomes difficult under varying expressions. So fusion of PCA & LBP techniques are used to improve the accuracy in recognizing the images by calculating pixel wise LBP imageand the countenance of image are derived to make the recognition of human faces autonomousof age deviations.

Eventually, realized that even slight differences in the facial images will not change the features of an image.

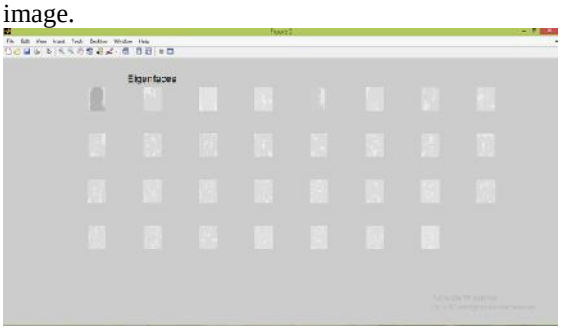

Fig.6: Eigen faces for training set image.

D)Age-Invariant Recognition

weights of an input image and training set images taken in different pose and appearancesare calculated by considering the shape and texture features of an image we will obtain the equivalent image by correlating the weight of the input image with the training set images we will get the accurate image if it is present in the database otherwise it displays image is not there in training database

Fig.7: input image and the obtained equivalent image

5. Conclusion

In this paper, we presentrecognition of human faces independent of age by fusion of appearances and patternfeatures. It is a technique used for identifying persons in a set of test images by combining the techniques of phase congruency and local binary patterns without depending on age with resistance to pose variations and proper illuminations and gives a better computational efficiency to achieve satisfactory results while considerably minimizecomputational costs. Thus, our project is preferable for Facial aging Problems.

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6. References

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AUTHORS PROFILE

K. SonyGrace received the B. Tech Degree in Computer Science and Engineering from Regency Institute of Technology permanently affiliated to Pondicherry University, Yanam, India. Presently working for M.Tech Degree in Computer Science at Aditya Engineering College, affiliated to J.N.T.U.Kakinada,Andhra Pradesh,India.

M. RajaBabu received the B.Tech degree from MVGR College Of Engineering, Vizianagaram in 2003. He completed M.Tech in Information Technology from NCET,Vijayawada in 2010. He is having nearly 10 years of teaching experience. He worked as an Assistant Professor in RGM Engineering College, Nandyal in CSE Dept. from September 2005 to May 2008 and worked as an Assistant Professor in GIET Engineering College, Rajahmundry in CSE Dept. from June 2009 to November 2010. He is currently working as Associate Professor, Dept of IT, Aditya Engineering College, Kakinada, Andhra Pradesh, India. His research interest includes Image Processing, Information Retrieval and Pattern Recognition. He is a life member of Computer Society of India (CSI) and Indian Science Congress Association (ISCA). He has published research papers in various National, Inter National conferences, proceedings and Journals.