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Human face recognition under pose variation with fusion geometric methods

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Abstract

In recent years, different methods have investigated in order to extract effective and important features in face recognition. Apparent features include the coordinates of face's comonents. Such as eyes, rings, tissues and different parts of the face and they are called apparent characteristics. Many limitations are imposed on the extraction of the features of the image. Main purpose of this research is to recognize human's face using combining fusion methods under different situations. Each image can be considered as a matrix and algebra operations and mathematical transformations are performed on it. Image are two - dimentional and image points are considered statistical data and statistical characteristics of the points are used to describe image. In this method, those characteristics are used that have enough ability for image description, information richness Local Phase Quantization (LPQ) and divide face image into several parts using Local Binary Pattern (LBP) and describe image features such as illumination. Changes, perturbations and blur which are important in face recognition. We choose an image and perform LBP once and LPQ. Features extracted form image are considered as a vector using combining two above methods. If vector extracted from image have high dimension, they be reduced because classes can be separated a classified in this way better. After preparing image bank, features are extracted from people image of image bank and their dimensions are reduced. Then, image components become more clear and detailed for face description. We investigate how to appear face ofter combining histograms. Simulation experiments illustrate that combining two above methods has better recognition rate that single method.

Keywords: Local Phase Quantization (LPQ), Local Binary Pattern (LBP), fusion

Introduction:

One of the matter sense human is sightedness sense that its contortion human's sense for face recognition. Face recognition under pose variation needed dynamic biometrical course. Biometrical system include original component for example (face, eyes, signature, hand, voice, finger, etc.) that face verification is one of the matter biometrical system [1, 2]

Entirely, face recognition technics are include this cases: geometrical method, statistical method, hybrid but no one at this methods for face recognition aren't completely and efficient. Therefore this paper present method for face recognition under composing geometric methods. Inter-subject variation is limited due to the physical similarity among individuals: head pose, presence or absence of structural components (bears, glasses, etc.) facial expression, lighting condition, age, etc. in recent year, methods for face recognition but upper difficult impediment to reach purpose.

Pose verification is one of the problems face recognition in to be accomplishment researches, to defeat this problem studying related work that accomplishment in post.

[Zhang, 2009] with measurement original distance points, exertion to find similarity between two face. For creation effective connection between different states 3D image, create setting 3D image, [Blanz, 2003] offered 3DMM model. This method, 2D image face conforming on 3D model, therefore faces modeling on 3D space. [Sanderson, 2006] with transfer images that are frontly on circulated image, try to resolve pose variation. [Lee et al, 2006] created space for specialty every condition face and analysis original component, then in efficiently space with transfer rotation face on image that take it in frontly, solved this problem. [Wrighton Hva, 2009] principal component analysis (PCA) for dimensionality reduction to find the vectors that best account for the distribution of face images within the entire image space [18]. EBGM: in the elastic bunch graph matching method, faces are represented as graph, with nodes positioned at fiducial points (such as the eyes, the tip of the nose, etc.), and edges labeled with 2D distance vectors. This methods often including complexity account that decrease speed on systems. In recent years researchers using methods that can face recognition with more precision. Original purpose this paper is face recognition under pose variation with composing geometrical methods. This paper is organized as follow. In section 3, 4 introduces the actual LBP, LPQ descriptors and in section 5, we discuss the discretization of composing this methods. Finally in section 6, we present concluding.

I. Methods

For enjoying of all licenses images and ability analysis, using fusion. Indeed fusion is diagnostic on pixels that have specifications like intensity, texture, neighborhood, etc. indeed purpose of image fusion, exact detecting for increase ability comment image and increase subtilty comment. For doing fusion composing, be diagnostic picture data, using geometrical correction, have every two image in similar features on system.

i. LBP(local binary pattern

The LBP operator is one of the base performing texture descriptors and it has been widely used in various applications. The matter important specialty LBP, resistance in front of changes monotonous illuminating, simplicity accounts. [3, 4, 5, 7, 8, 9, 10]

ii. Analysis images face LBP

The fit image face have two important specialty. First, have tolerably error changes in different classes, when do distinct different classes since each other. Second, speed processing, therefore LBP is a good description for analysis image face.

iii. Face description with LBP

One image face can be compound shape from descriptive tiny pattern knowing agency LBP. Can create a calculate local binary histogram in images face, in attention shape information, sharing images face by several local area, be offer that create local binary histograms.

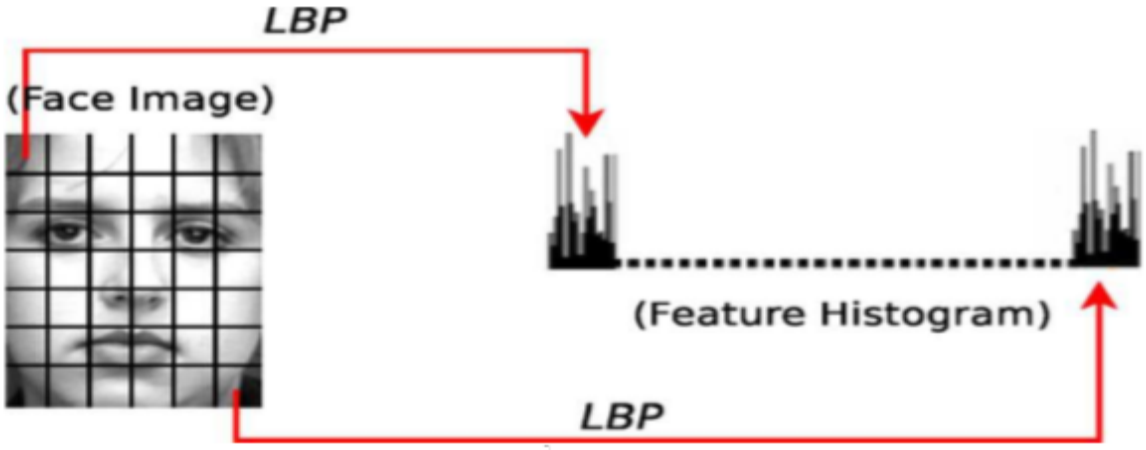

Fig 1. Description LBP image

Indeed sharing images face to networking of secondary area is optional state. At this experiments, local areas selected with different situation and sizes [23]. In addition to local area shouldn't four phases, for example can they to set like circle area.



Fig 2. Four best selection of local areas

The purpose of face recognition, be fixing situation and sizes human's face in digital images. [Hadid et al][19, 20] using LBP for face recognition, for description faces with lower quality, a local binary operator vicinity four part, LBP (4, 1) using for overlapping small area. They for comparison, done experimental for MIT-CM databases and offer method recognition 221 faces without proving errors. Indeed to done studies, LBP to do steady about change monotonous shapes.

iv. Pose variation face description with LBP:

The operator LBP assign a label to every pixel of an image by thresholding the 3*3-neighborhood of each pixel with the center pixel value and considering the result as binary number. Then the histogram of the labels can be used as a texture descriptor to be able to deal with textures and different scales, the

LBP operator was later extended to use neighborhoods of different sizes. Defining the local neighborhood as a set of sampling points.

v. Local description for analysis image face:

Create description face, result attention in section face analysis, showing resistance in front of changes illumination and situation in this method face image division in several block and since way LBP method, production specialties and joining internal a staff. A LBP decryption calculation all of the face conditions that labeled situation of small patterns conditions. For doper valence, for this method, to do produce a show that face image several internal none overlapping or overlapping block.

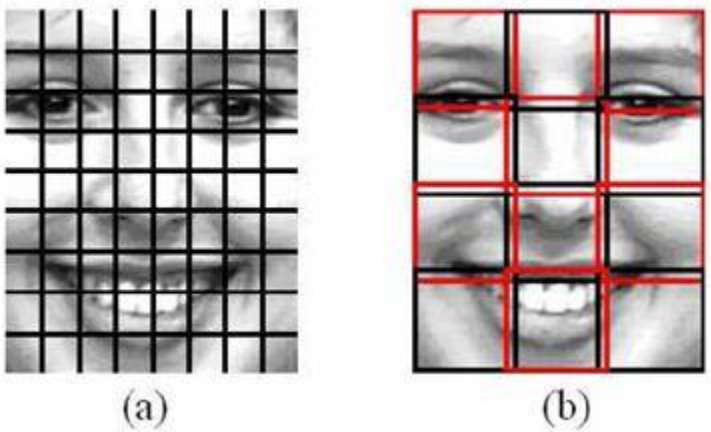

Fig 3. (a) Non overlapping block (9*8), (b) overlapping block (4*3) with overlapping size 10,LBP histogram, calculating LBP histogram in every block and joining in single histogram

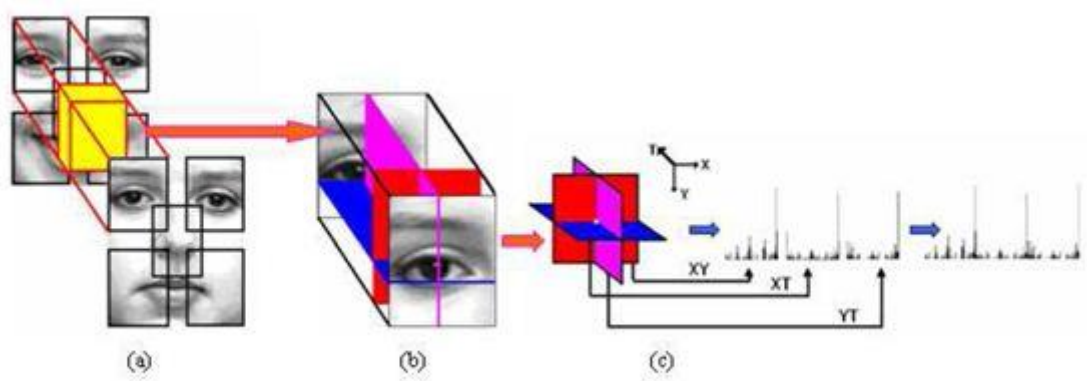

Fig 4.features in every block area,(a) block areas, (b)features LBP of three orthogonal area, (c)composing together feature for every block area of external shape and motion

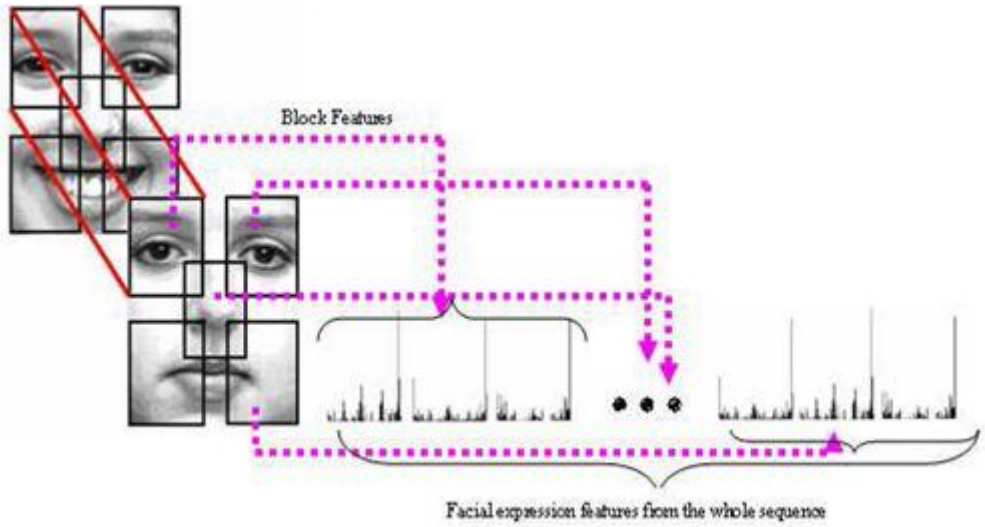

Fig 5. Show face states

II. The analysis LPQ histogram for face verification

In face recognition, thee faces have different condition of illumination or do experiment concentrate errors in different frames. For decrease this problems, can using increase quality standards for weak frame. LPQ operator using on image face then be extraction histograms from local area images and save in LDA space and create face area description. [Zhang et al][29] Propounded Gabor local and general phase pattern histogram for face recognition, in recent [Ojamsou et al] introduced LPQ, this algorithm comparison LBP, have a better benefit in texture and face recognition classes.

i. Discussion and conclusion

In LPQ method we testing FERET and BANCA data base with using of LPQ's protocol. BANCA data base include 52 individual and divide group 1 (G1) and group 2 (G2) that group 1 include 26 man and group 2 include 26 woman. Every individual to have a share in different situation and different camera in 12 meeting. Using of 7 different tentative figuration: comparative control test (MC), pool test (p), great test (G), weighting error (WER) for test group's data G1, G2 in R=1:

$$(1)\ WER(R) = \frac{P_{FR}+R\times P_{FA}}{1+R}$$

Completely, we having 3 parameter for better operation ours method: the first is all of the operator because a little operator cannot to show enough information for face recognition. Second parameter, a number of areas K that to be many small areas, increase time and reduce reality information. A little great areas, increase wasting space information.

ii. **Conclusion:** face recognition in unlimited area being cause different amazements and changes face for an automatic system is very difficult. This section, offer a distinct face descriptor based on be production information from face image. This descriptor include transfer information locally phase face with using LPQ operator and inter LDA space. Face recognition to be do comparison similarity probe and

gallery descriptors with using normalization test, in time that test on BANCA data base in MC, P, G is better than other methods. Composing this method's histograms and the show several way have better operation other than methods.

III. Composing LBP and LPQ

Based on upper information, composing LBP, LPQ in comparison with which of LBP and LPQ have a better operation, they to be divide small rectangle area that haven't overlapping and to be decipher local histogram and conversion to a specialty expansion histogram and be earn space and frequency information.

i. Face refacing with using LBP and LPQ:

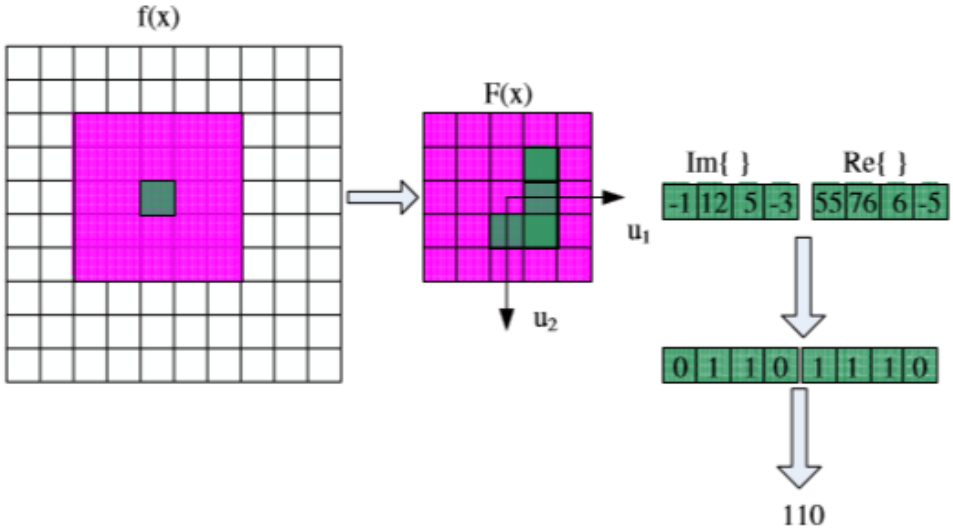

Fig 6.calculating LPQ histogram

Therefore our refacing for commendation LBP and LPQ, include this follow:

1. Deride face to several local block
2. Decipher local histograms LBP, changing those by LBP histograms
3. Decipher local histogram LPQ, changing those by LPQ histograms
4. Composing LBP and LPQ

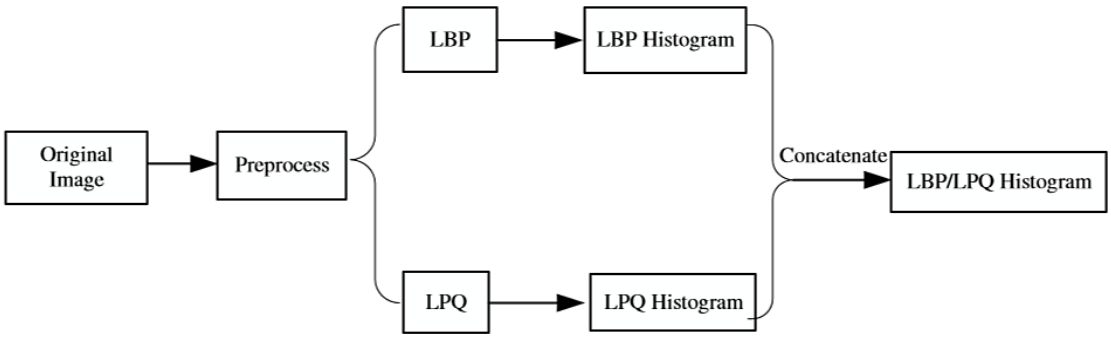

Fig 7. Composing histograms algorithm

We do experiment in five different figure, AR data base include 4000 colored pictures of 126 individual that front facing face have a states and different illumination condition. Indeed graph LBP/LPQ, we have a better recognition conclusion.

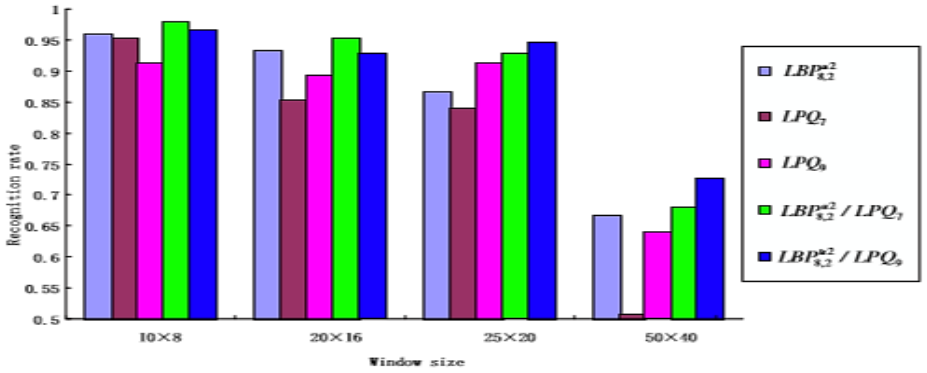

Fig 8. Average of classes balance in every figuration with 50*40 pixel

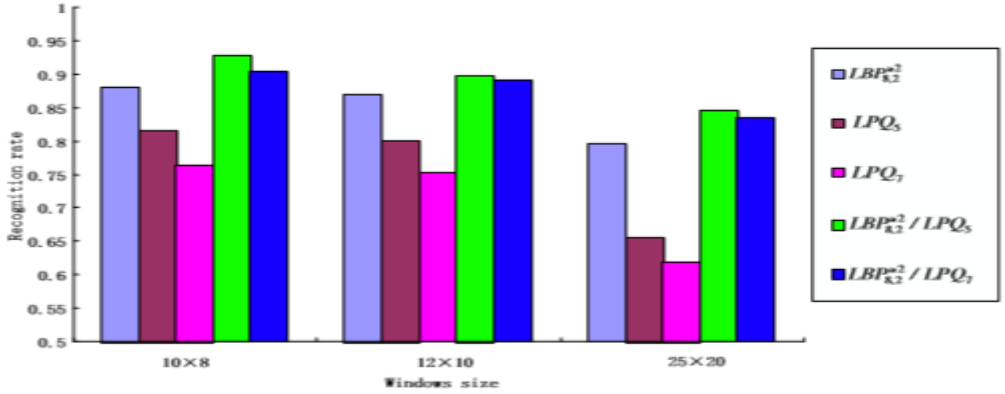

Fig 9 : the Value of classes in different figuration

If picture's face divided to small area and copulation weight vector for every this area, the weights show local information.

Table 1. Calculating conclusions of different algorithms

Method	Rec.rate on YALE	Rec.rate on AR
LBP	0.960	0.880
LPQ	0.953	0.816
LBP/LPQ	0.980	0.927

Original purpose composing methods, composing different benefits of eye models in a system until do prevalence proportional limitation of every them for improvement this algorithms offered ways, to try for composing methods, decrease data area for pattern comparing or decrease the time of comparing. This paper, show composing method for to revealed eye that is benefit for wrapper area. For this work, in state of revealed face, of color specialty and revealed eye corns and then using to estimating pupil and Kalman filter.



Fig 9.result of tracing with Kalman's filter in different frames



Fig 10.result of tracing a man with composing method

VI. Conclusion

In this section we present a new method with use LBP, LPQ operator for face recognition. In this method information be coding in frequency and space area. Experiment of YALE, AR data base show that composing LPQ, LBP algorithms is very benefit. At follow this section, present fusion method for tracing human's eye in different area. Therefore in this method have a good performance and a little accounts.

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