IJCSI International Journal of Computer Science Issues, Volume 13, Issue 6, November 2016
ISSN (Print): 1694-0814 | ISSN (Online): 1694-0784
www.IJCSI.org https://doi.org/10.20943/01201606.160164

LBPV Based Partial Face Recognition

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Abstract

Biometrics has now received more attention. Face biometrics, useful for a person's authentication is a simple and non-intrusive method that recognizes the face. This Paper presents a new technique for partial face image recognition based on LBPV (local binary pattern variance). LBP tests the relation between the pixel and its neighbors, encoding this relation into a binary word. This allows detection of patterns/features. We stored the values in the feature matrix and compare these features of full face images with the features of Partial face images and then we count and store the compared values. Finally, Sort the matrix and find the minimum distance value from the sorted array and by this minimum distance value we got desired face recognition results compared to existing methodologies.

I. Introduction

Biometrics are now a days playing a major role in the world. Everyone is rushing towards the secure their personal things with their biological parts like eyes, face, finger, palm and iris. Biometrics is a word which is derived from the term Bio (body parts) and metrics (measuring values). It compares the input object/image with the existing image which is stored in the database. And identify the particular person or verify the person. Most new digital cameras have a face detection option for focusing faces automatically. Some companies have even gone further, like a well-known brand, which has just released a new functionality not only for detecting faces but also for detecting smiles by analyzing happiness using facial features like mouth, eye lines or lip separation, providing a new smile shutter feature which will only take pictures if persons smile.

A facial recognition system is a computer application capable of identifying or verifying a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features from the image and a facial database. In earlier algorithms, they extract the features of major landmarks or features of other parts which subjects to face like relative position, size and/or shape of the eyes, nose, cheekbones and jaw. With extracting this kind of features they compare with images which are there in the database to verify or identify the face which is having/matching these extracted features. In other cases, many algorithms determine the face by the extracting texture of skin. By this texture analysis, it gives unique lines, patterns and it finds the spots which are easy to judge/recognize the face of a particular image.

Face Recognition consider, recognizing people with the facial characteristics. Compared to other biometrics such as fingerprint, DNA or voice, face recognition is more natural, non-intrusive and can be used without the cooperation of the subject. Local Binary Pattern (LBP) features have performed very well in various applications, including texture classification and segmentation, image retrieval and surface inspection. The original LBP operator labels the pixels of an image by thresholding the 3-by-3 neighborhood of each pixel with the center pixel

value and considering the result as a binary number. And then we convert this obtained binary number into corresponding decimal value.

II. Review of Literature

Malini et.al. Proposed a recognition with high accurateness is still an intricate task even for adults due to expression, pose and illumination. Mainly, newborn's face may have an extreme variation within a number of days after birth.

Faizan Ahmad *et al.* reported the actual advantages of face based identification over other biometrics are uniqueness and acceptance. As human face is a dynamic object having high degree of variability in its appearance, that makes face detection a difficult problem in computer vision. In this, field accuracy and speed of identification is the main issue.

William Robson Schwartz et.al. studied a large and rich set of feature descriptors for face identification using partial least squares to perform multichannel feature weighting. The method is extend to a tree-based discriminative structure to reduce the time and evaluate probe samples. The method is evaluated on Facial Recognition Technology (FERET) and Face Recognition Grand Challenge (FRGC) data sets.

Meena et.al. Concepts shows texture is an important spatial feature useful for identifying objects or regions of interest in an image. Texture based face recognition is widely used in many applications. LBP method is most successful for face recognition. It is based on characterizing the local image texture by local texture patterns. The performance evaluation of Local Binary Pattern (LBP) and its modified models Multivariate Local Binary Pattern (MLBP), Center Symmetric Local Binary Pattern (CS-LBP) and Local Binary Pattern Variance (LBPV) are investigated. Facial features are extracted and compared using K-nearest neighbor classification algorithm. G-statistics distance measure is used for classification.

Lingjun Zhaoet.al. reported feature extraction through local patches. They consider the intensity of the central pixel and its neighbors and then based on that they computed two components like Angular Difference (AD) and Radial Difference (RD). Based on this they developed RD-LBP and AD-LBP to represent the texture based image.

Laura Sanchez Lopez, in her final research project, she completely discussed how LBP is more helpful/effective in the detection of the face. She used PCA and SVM classification for the face detection. Caifeng Shan et.al. proposed discriminative LBP-Histogram (LBPH) bins for the task of facial expression recognition. Here they illustrated that the selected LBPH bins provide a compact and discriminative facial representation.

III. Proposed Model

3.1 Proposed Architecture

Here it has two cases, for the first case we capture face images from digital camera; we apply a face detector to detect the face using the function/object into gray scale than we resize it. Then we apply a pixel-wise LBP to extract the features from each pixel present in it. It gives the relation of the each pixel and its neighbors. In another case we input/capture partial face and here also we convert it into grayscale. After getting a gray scale image, in both the cases we assign a radius as 1 and filter size as 8(8 neighbors). After assigning these values we call a function LBP with these parameters along with the image and two flags sorting and mechanise.

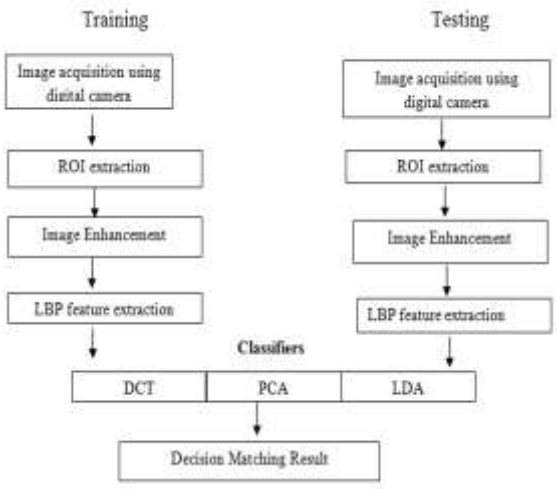

Fig.1. Shows Block diagram of proposed methodology

By applying an LBP for feature extraction, it gives a feature vector. For the LBP image we applied a histogram and in that, we noticed the peaks and we stored the corresponding peak values in the vector. Later we conclude the result by comparing query image with all the existing images in the database. The distance between the query image and existing image acts a measuring value for recognition a particular face.

3.2. Pre-processing Stage

There are two cases in the method, in first case, full face image is taken from the camera and then we apply the face detector to that with the use of vision Cascade Object Detector. Through this, we can detect the face in the taken image. It can detect only Frontal Face object so for the first case we store only front face for the further usage.

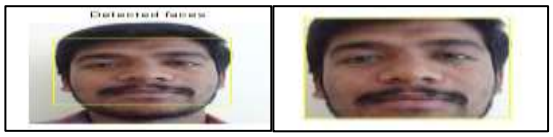

Fig. 2: Frontal face detection using Face detector object

In another case we take a partial image so we need not use this object to detect the face then we resize it to certain accept ratio, we convert that RGB into grey scale in both the cases because we can represent an image in two dimensions with two values like white and grey than represent in three or more colors. We can identify any objects in both RGB and grey scale colors. RGB is more complication to work on that but not in grey scale. Further, we take the image into feature extraction.

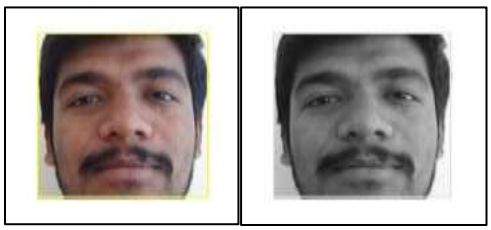

Fig.3: RGB to gray conversion

3.3. Feature Extraction

In feature extraction, we are used LBP (local binary pattern) to extract the feature of the face. In this we use pixel-wise LBP; it gives the relationship between a center pixel and its neighbors. It takes the intensity value of the center pixel and compares with their neighbors. If the neighbor pixel has the intensity value greater than the center pixel it makes it as 1. If it is less then it considers as 0. Later we convert the obtained binary values of 8 bit into decimal value and it updates the center pixel value with that. This is the mechanism of pixel-wise LBP.

At first, we gave a radius as one and filter size (filter size means a number of neighbors for a center pixel it can be a 4 or 8). Here we gave 8 neighbors to generate a radial filter for our feature extraction. If the image is rotated, the surrounding pixels in each neighborhood will move correspondingly along the perimeter of the circle, thus resulting in a different LBP value, except for patterns with only 1 and 0 s. In order to remove rotation effect, a rotation-invariant LBP is proposed.

With this, we can get a feature extraction matrix with the extracted image of the input image. And we take the histogram of the LBP image which we got. First, we find the peaks in the histogram and we take the values of corresponding peaks and store it into the matrix. For further usage, we deal with these peak values shows in Fig.4.

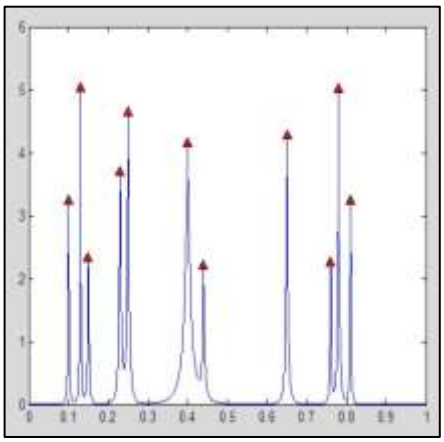

Fig.4: Peaks in histogram

IV. Experimental Results and Analysis

A. Dataset

We have collected totally 100 images of our own college students from DoS in computer science department, Manasagagothri, Mysore. We did experimentation on AR benchmark dataset. We have taken the images under partial visibility Conditions such as illumination, rotation, angles *etc*. both Full Face and Partial face with different lightening conditions. Class one contain single person images, class two contain two person images, class three contains three person images and so on. And Original image, Resulted LBP image, Histogram of regular LBP and Rotation Invariants are shown in Fig. 5 and 6.

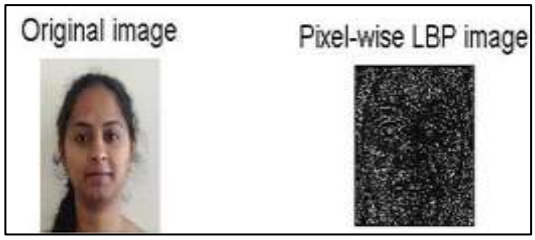

Fig. 5: Original image and LBP image

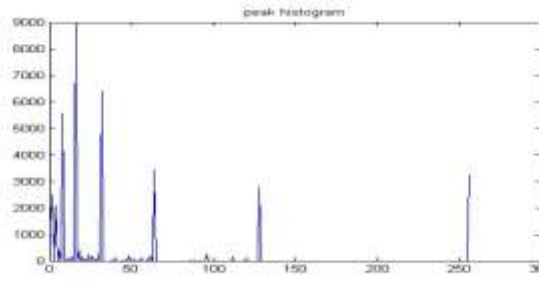

Fig.6. Histogram of regular LBP and Rotation Invariant

B. Experimentation

In this section, we used some conventional feature extraction methods in LBP itself like Efficient LBP, Extended LBP. To evaluate our proposed method, we applied a pixel-wise LBP to extract the features from each pixel present in it. It gives the relation of the each pixel and its neighbors. In another case we input/capture partial face and converted it into gray scale. In this work, we used radius as one and we took 8 neighbors. Lastly, our proposed methodology gives the accuracy rates of the proposed method with DCT, PCA, LDA and combination of three classifiers and we got good recognition accuracy compared with other methodologies.

Sl.No	Classifiers (Combination)	Recognition Results
1	DCT	71.5
2	PCA	77
3	LDA	65
4	DCT+LDA	68.25
5	PCA+DCT	74.25
6	PCA+LDA	71

Table.1. Shows Recognition result with classifiers combination

Above Table shows that, Classifiers recognition rate along with combination of different classifiers such as DCT, PCA and LDA. Here, Conventional classifier-PCA gives good accuracy compare to another two classifiers like DCT , LDA and combination of three classifiers also has given low accuracy compare to PCA.

V. Conclusion and Future Work

In this Work, a new methodology is proposed to recognize a partial face. Here, we extracted the features of a face using Local Binary Pattern; By applying this we got the Feature Matrix. Using the Feature Matrix we plot a Histogram and in that we find the peaks and later we compare actual peak values with the obtained peak values. Later we match with the labels to recognize a face. At present we extracted the LBP features, later process we had try with feature extraction methods in LBP itself like Efficient LBP, Extended LBP.

In Future, We could try with the other classifiers and fuse the different classifiers. Finally, we would deal with radius as 2 and with 16 neighbors.

References

[1]. William Robson Schwartz,Face Identification Using Large Feature Sets,2012

[2]. S. Malini, R. Gayathri,LBPV for Newborn Personal Recognition System,2013

[3]. K.Meena, Dr.A.Suruliandi,Local binary patterns and its variants for face recognition,2011

[4]. Ladislav Lenc and pavel Kral,Feature to Feature Matching for LBP Based face Recognition

[5] Huang,D shan,C.Ardvilian,M.Wang,Y.chen,local binary pattern and its application to facial analysis 2011

[6]. T. Ahonen, A. Hadid, M. Peitikainen, Face recognition with local binary patterns, 2007

[7]. Laura Sánchez López, Local Binary Patterns applied to Face Detection and Recognition,2010

[8]. Loris Nanni, Sheryl Brahnam and Alessandra Lumini, combining different local binary patterns to boost performance,2010

[9]. Md. Abdur Rahim, Md. Najmul Hossain, Tanzillah Wahid & Md. Shafiul Azam, Face Recognition using Local Binary Patterns, 2013

[10].Li Lju, Lingjhun Zhao, Yunil Long,Gangyao Kuang, Paul Fieguth, Extended Local Binary Pattern for Texture Classification, 2012

[11].Sarbjith Singh, Amirtpal Kaur, Taqdir, A Face Recognition System Technique using Local Binary Pattern,2015

[12].Ladislav Lenc, and Pavel Kr´al1,Feature to Feature Matching for LBP Based Face Recognition

[13].Yann Rodriguz,Face Detection and Verification using Local Binary Patterns,2006

[14].Di Huang, Caifeng Shan, Mohsen Ardebilian, Yunhong Wang, and Liming Chen Local Binary Patterns and Its Application to Facial Image Analysis: A Survey,

[15].Caifeng Shan, Shaogang Gong, Peter W. McOwan, Facial Expression Recogniton Based On Local Binary Pattern: A Comprehensive Study,2009.

[16].William Robson Schwartz, Huimin Guo, Jonghyun Choi, Larry S. Davis, Face Identification Using Large Feature Sets,2012.

[17].Vandana Singh, Vinodh Shookeen, Bhupendra Singh Comparison Of Feature Extraction Algorithms For Gender Classification From Face Images, 2013.

[18].Amit V. Manapure, Nitin Mishra "A New Approach to Partial Face Recognition" , 2015

[19].Shengcai Liao, Anil K. Jain, *Fellow, IEEE* and Stan Z. Li, *Fellow, IEEE* "Partial Face Recognition: Alignment-Free Approach"

[20]. Ms.Drashti H. Bhatt, Mr.Kirit R. Rathod, Mr.Shardul J. Agravat. A Study of Local Binary Pattern Method for Facial Expression Detection, ,2014.

[21].Brian O'Connor and Kaushik Roy Facial Recognition using Modified Local Binary Pattern and Random Forest,2013.

[22] Image-based Face Detection and Recognition: "State of the Art",Faizan Ahmad, Aaima Najam, Zeeshan Ahmed,2013.