A Novel Implementation on Local Binary Patterns and Its Application to Age Invariant Face Recognition

Savita Channagoudar*[1], Dr. Srikanta Murthy. K[2]
[1]Research Scholar, S. T. J. I. T, Ranebennur-581115, India
[2]Principal, N.C.E & T, Bengaluru - 562164, India
*Corresponding author Email: savitha.Chennegodar@gmail.com, [2]shree194@gmail.com

Abstract

Age invariant face recognition (AFIR) is important for wide range of applications based on recognition techniques used in security and secret data base, law of enforcement. It is very difficult to identify the human's age variations for to recognizing their face at certain continuous ages. So in order to solve the above issues, challenges and problems for face expressions, pose, we developed modified deep convolutional neural networks (DCNNs) for to identify the face variations based on age factor. The current research work presented in this paper on local binary patterns for to identify the face recognition of age invariant. The large amount of Indian databases collected for age invariant subjects to the facial aging. The presented results shows that recognition accuracy is more and execution of time for the age invariant was fast based on data set for the 36×36 and 24×24 image resolutions results were shown.

***Keywords**: age invariant, local patterns, Face detection, face recognition, facial expression analysis, local binary patterns (LBPs), and local features.*

1. Introduction

In the fast decades for face recognition identification used different local binary patterns based on the development of image processing and vision of computer. It is used to identify the image of the structures very effectively by each pixel and its pixels of neighboring will give the comparison. In this non parametric method based on the consideration of LBP properties and tolerance of continuous change in radiation for computational analysis. From the proposed LBP analysis only considered analysis of texture, and has identified simple yet strong near for the local structures [1]. It has been broadly abused in numerous applications, for example, face picture investigation, picture and video recovery condition displaying, visual examination, movement investigation biomedical and airborne picture investigation and remote detecting.

LBP-based facial picture examination has been one of the most well-known and fruitful applications as of late. Facial picture examination is a functioning exploration theme in PC vision, with a wide scope of significant applications, e.g., human–PC collaboration, biometric recognizable proof, reconnaissance and security, and PC liveliness. LBP has been misused for facial portrayal in various assignments, which incorporate face identification face recognition outward appearance investigation analysis (gender, race, age, and so forth.) characterization and other related applications.

The improvement of LBP methodology can be very much delineated in facial picture examination, and the majority of its ongoing varieties are proposed around there. Some concise studies on picture investigation or face examination, which use LBP, were given, however every one of these examinations talked about constrained papers of the writing, and numerous new related techniques have showed up in later years. In this paper, we present an exhaustive study of the LBP technique, including its ongoing varieties and LBP-based selection of features, just as the application to facial picture examination. As far as we could possibly know, this paper is the main overview that widely surveys LBP methodology and its application to facial picture examination, with in excess of 100 related works were verified.

2. Related work

Yang and Wang [1] proposed Hamming LBP to improve the discriminative ability of the original LBP. They reclassified non uniform patterns based on Hamming distance, instead of collecting them into a single bin as LBP *u*2 does. In the Hamming LBP, these non-uniform patterns are incorporated into existing uniform patterns by minimizing the Hamming distance between them; for example, the non-uniform pattern (10001110)2 is converted into the uniform one (10001111)2, since their Hamming distance is one. When several uniform patterns have the same Hamming distance with a non-uniform pattern, the one with the minimum Euclidian distance will be selected.

More recently, Guo *et al.* proposed a complete LBP (CLBP) [2], which, in our opinion, is quite similar with ELBP. In addition, CLBP includes both the sign and the GDs between a given central pixel and its neighbors in order to improve the discriminative power of the original LBP operator. Unlike the binary bit coding strategy used by ELBP, CLBP compares the absolute value of GD with the given central pixel again to generate an LBP-liked code.

In order to capture not only the microstructures but also the macrostructures, Li *et al.* [3], proposed a multi block LBP (MB-LBP), which, instead of comparing pixels, compares average intensities of neighboring sub regions. The original LBP can be regarded as a special case of the MB-LBP. Fig. 7 shows an example of MB-LBP, where each sub region consists of six pixels. The sub region can either be a rectangle or a square. The average intensities over the blocks can be computed efficiently by using summed-area table or integral image. A similar scheme is introduced in : Three-patch LBP (TP-LBP) and four-patch LBP (FP-LBP) are proposed to compare distances between the whole blocks (patches) concerned, instead of single pixel or average intensity in and any distance function can be used (e.g., L2-norm of their gray-level differences).

Fehr [4] exploited the spherical harmonic transform to produce an orthogonal basis on the two-sphere, and then, compute the LBP features in the frequency domain. This method overcomes both the aforementioned problems. Paulhac *et al.* proposed another solution to apply LBP to 3-D. They used a number of circles to represent the sphere, adding the parameter *S*, thus the operator denotes *LBP*(*S*,*P R*) (see Fig. 9), and they also defined the uniform rule as in 2-D. This method causes the problem that different textures could have the same LBP description.

3. Objectives of the work

1. To apply deep learning FR technique, which leverages hierarchical architecture to stitch together pixels into invariant face representation, has dramatically will improve the state-of-the-art performance and foster successful real-world applications.
2. To apply a Face Prediction Model (FPM), which predicts human face aging or growth related image variation using Principle Component Analysis (PCA) and Artificial Neural Network (ANN) deep learning techniques. The FPM captures the facial

changes, which occur with human aging and predicts the facial image with a few years of gap with an acceptable accuracy of face matching improvement.

3. Test the performance with current algorithms efficiency in mind and computation time measurements for age invariant face recognition.

4. Proposed Methodology

The implanted methodology from the existing work considered for the set of input images are divided in to number of small regions. From this regions are extracted by LBP histograms, and local histograms are used for next processing in to a spatially enhanced feature vector of the dimensionality of O. it was observe that some of the variations are drastically increased the feature vector length, such as ELBP, VLBP.

It is accepted that the inferred LBP-based component vector provided an over complete information with excess data [78], which could be reduced to be increasingly smaller and discriminative. Moreover, when constructing continuous systems, it is likewise wanted to have LBP-based information with diminished feature length. For all the reasons, the issue of LBP highlight choice has as of late been tended to in numerous writings. We characterize these methods into two classes: the first method is to minimize the length of the feature based on some rules related to arrange the patterns in uniform, the second method highlight the feature selection to select different patterns. Both methods have few disadvantageous, the first method is clear the ability of the feature selection was limited, the next one feature selection was accuracy but offline training set and data more expensive.

Modified DCNN Developed algorithm

```
read dataset folder Information
for i=1 to Number of Folder
Fold=Get Folder Information
for j=1 to Number of Images
Img=imread(Img Imformation); read Image from Folder;
GrayImg=rgb2gray(Img);  Convert Rgb to Gray
GrayImg=imresize(GrayImg,[Rsize Csize]) ; Image Resizing
GrayImg=adapthisteq(GrayImg); Histogram equalization
LBPImg=LBP_feature(GrayImg); LBP feature extraction
Extract Feature of LBP Image
s2  = regionprops(LBPImg,'Eccentricity');
s3  = regionprops(LBPImg,'Orientation');
s4  =regionprops(LBPImg,'Perimeter');
s5  =regionprops(LBPImg,'Solidity');
Label= Create Label of Dataset Image
XTrain =Combine Feature create refine data
end
end
```

5. Results and discussion

The result of LBP started with the basic step of preprocessing for to remove the high lighting effects. Compared with any other previous preprocessing methods. It includes mainly with techniques of histogram equalization prosed by using LBP methods based on the availability of Indian dataset. The first step was to convert RGB to grey for face detection of color images. The extracted Y R G B and theta color images measurements done for the next process. The net step specified for to adjust the resize of the image arranged in proper scale factor. LBP histogram was used for to extract the facial expression for future extraction in age invariant face recognition.

Evaluation on reconstructed HR face using modified DCNN on 36 × 36 image resolution

Despite other two mappings methods, the proposed method can also reconstruct a high resolution face from the low resolution one. In this analysis, the aim to evaluate for the proposed method in terms of high resolution face reconstruction. Here, the performance of comparison done to the present method with the seven existing methods in Table -1 in terms of visual quality of reconstructed face images. The size of low resolution images used in this section is 36 × 36 pixels.

Evaluation on reconstructed HR face using modified DCNN 24 × 24 image resolution

Despite other two mappings methods, the proposed method can also reconstruct a high resolution face from the low resolution one. In this analysis, the aim to evaluate for the proposed method in terms of high resolution face reconstruction. Here, the performance of comparison done to the present method with the seven existing methods in Table -2 in terms of visual quality of reconstructed face images. The size of low resolution images used in this section is 24 × 24 pixels.

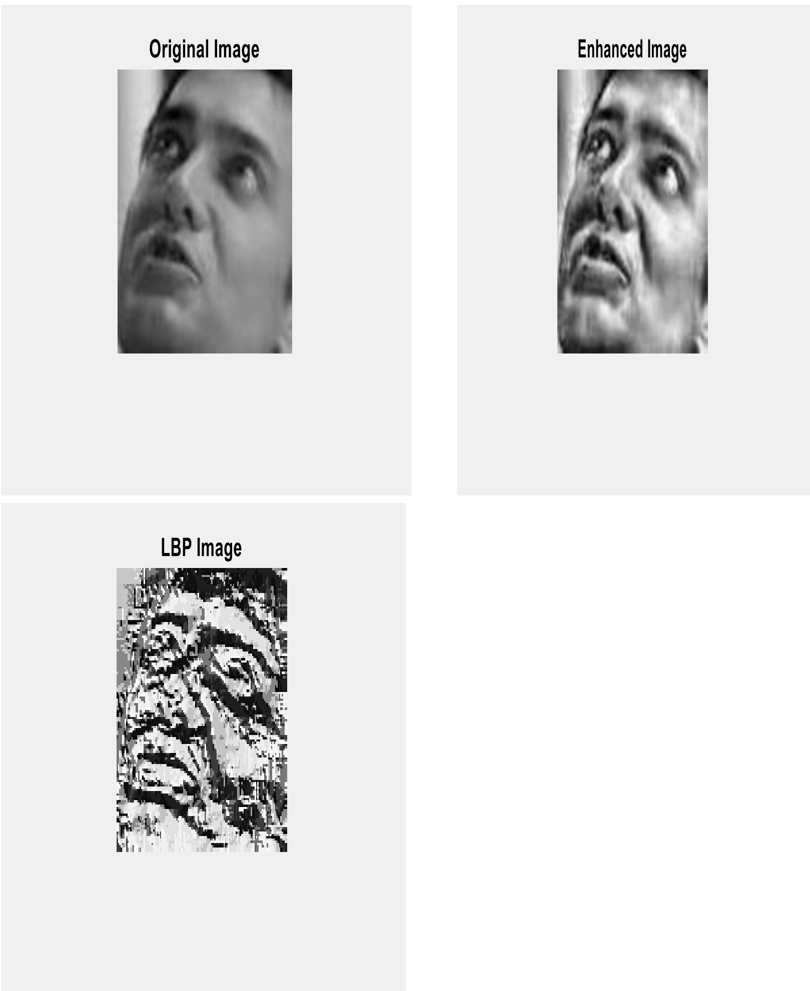

Figure 1. Original image processed by the LBP operator

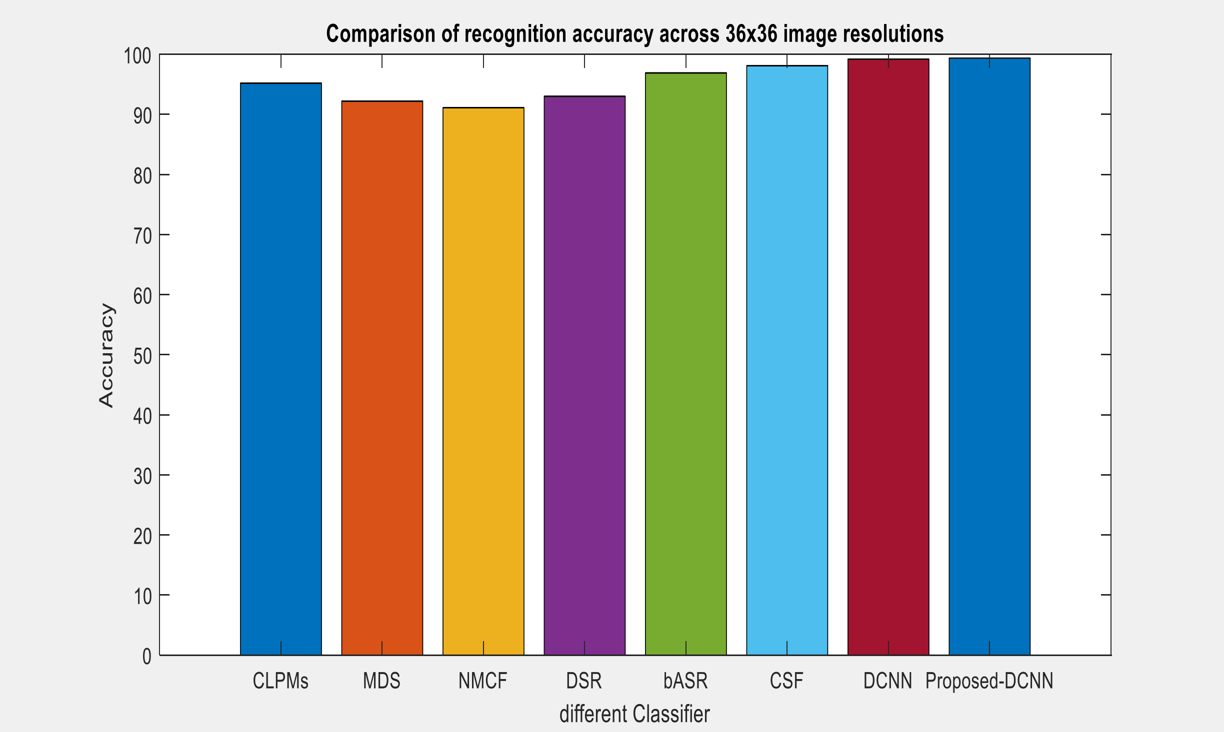

Figure 2. Comparison of proposed method to existing methods

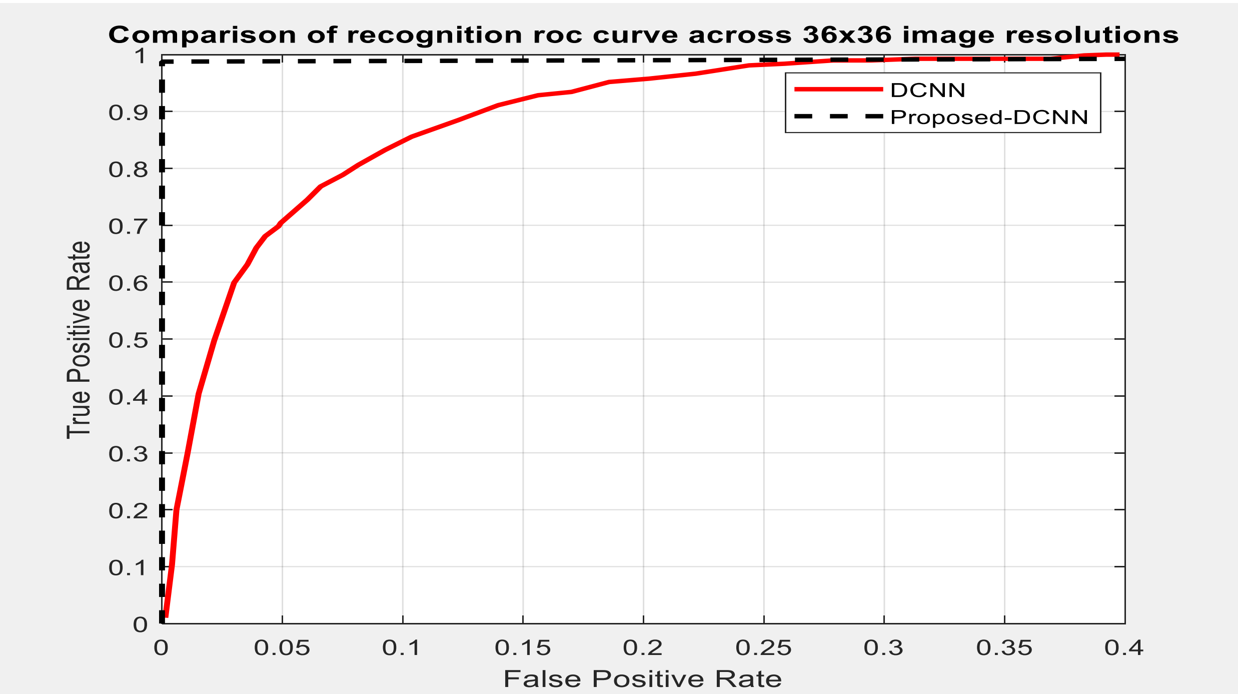

Figure 3. Comparison table of recognition accuracy across 36x36 image resolutions with existing work

The results of the graph shows that the current LBP method with proposed DCNN methods considered for 36×36 on different image resolutions like low and high face recognition work were identified. Compared to existing methods the proposed modified DCNN experimental analysis results are high accuracy on LFW data set for high resolution face recognition, their performance drops.

Table –I Comparison

SNO	Algorithm	Accuracy
1	'CLPMs'	95.2
2	'MDS'	92.2
3	'NMCF'	91.1
4	'DSR'	93
5	'bASR'	96.9
6	'CSF'	98.1
7	'DCNN'	99.2
8	'Proposed-DCNN'	99.375

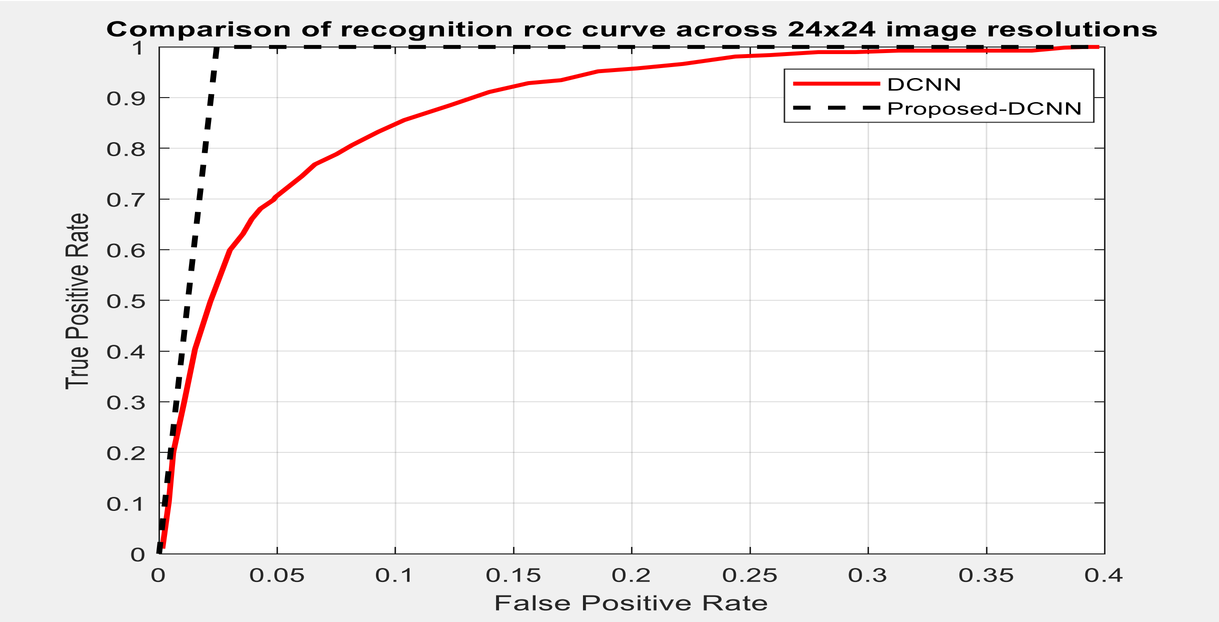

Figure 4.Comparison table of recognition accuracy across 24x24 image resolutions with existing work

The results of the graph shows that the current LBP method with proposed DCNN methods considered for 24×24 on different image resolutions like low and high face recognition work were identified. Compared to existing methods the proposed modified DCNN experimental analysis results are high accuracy on LFW data set for high resolution face recognition, their performance drops.

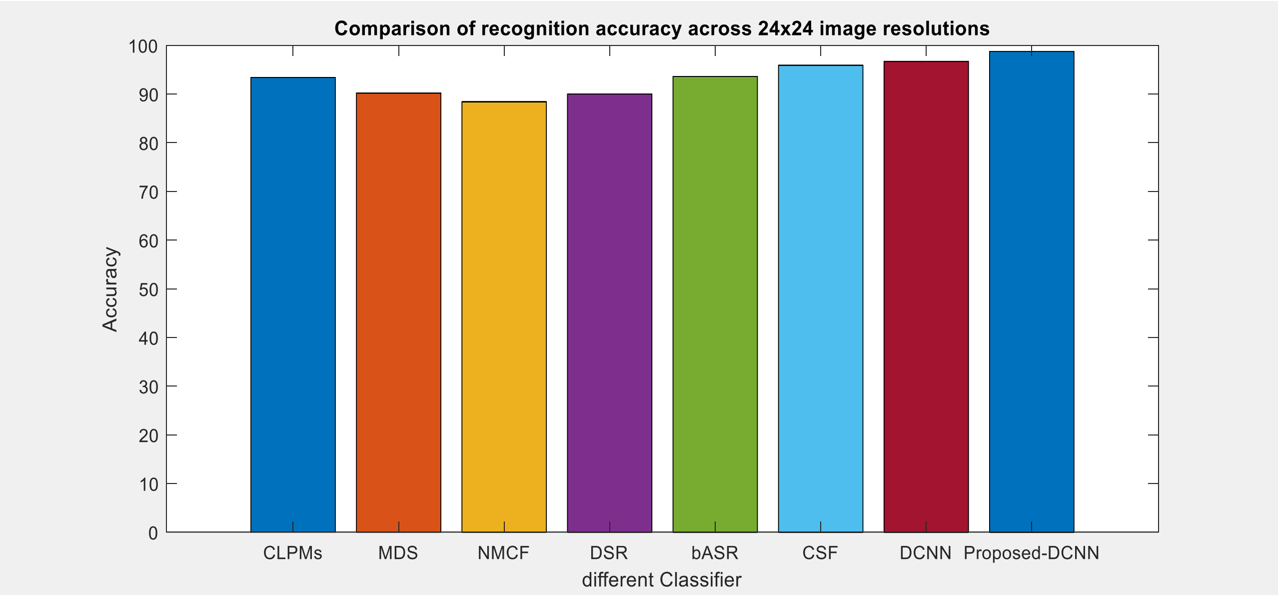

Figure 5 .comparison table of recognition accuracy across 24x24 image resolutions with existing work

Table –II Comparison

SNO	Algorithm	Accuracy
1	'CLPMs'	93.4
2	'MDS'	90.2
3	'NMCF'	88.4
4	'DSR'	90
5	'bASR'	93.6
6	'CSF'	95.9
7	'DCNN'	96.7
8	'Proposed-DCNN'	98.75

6. Conclusion

In this paper, the presented a novel two mappings approach for the recognition of low resolution face images using modified deep convolutional neural networks. The main aim of the method is to use two DCNNs to transform low resolution probe and high resolution gallery face images into a common space where the distances between all faces belong to the same individual are closer than distances between faces belong to different persons. The evaluated of proposed method in 7 experiments on CLPMS, MDS, NMCF, DSR, BASR, CSF, DCNN .Comparisons of the current method with 7 state-of-the-art methods which are grouped in two approaches are summarized in Table I and Table II.

As the most typical and important application of LBP, facial image analysis and extraction provides a very good age invariant face recognition of the use, development, and performance of LBP. From this comprehensive overview, following conclusions can be drawn: 1) local- or component-oriented LBP approaches are effective representations for facial image analysis, as they encode the information of facial configuration while providing patterns of local structure; and 2) using the local- or component-oriented facial representations using LBP method, feature selection is selectively important for many tasks in facial image analysis, since this facial description methods greatly increases the feature length.

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