

# REAL TIME FACE RECOGNITION SYSTEM USING LBP ALGORITHM

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## ABSTRACT

The growing researches in face processing are primarily based on the basis that the data approximately a user's identity, nation, and cause may be extracted from pics and computers can react consequently in recognizing the individual and authenticating to apply a specific service. The face of a individual conveys plenty of statistics about identification and emotional kingdom of the character. In the classification, the face image is compared with the images from the database. In our research work, we empirically evaluate face recognition, which considers both shape, and texture information to represent face images based on Local Binary Patterns for person independent face recognition. The first step is to divide the feace area into small sections from which Local Binary Patterns (LBP) and histograms are extracted and combined into a single feature vector. This feature vector forms an efficient representation of the face and is used to draw similarities between images. LBP has become a very popular as well as successful method for the applications of face recognition due to its discriminative power and computational simplicity. For the real time operations, LBP based methods and research were excellent with high recognition rate as well as greater accuracy.

**Keywords:** Face Recognition, Image Processing, LBP Algorithm, Real Time Applications, Real Time System.

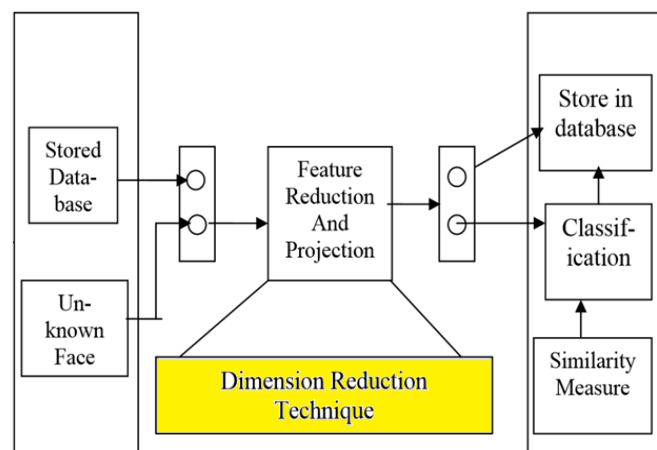
## I. INTRODUCTION

Face recognition has been the most popular topic for this era researches. Not only the computer science researchers but also researchers from all other fields are also showing a great interest in face recognition. This is due to the reason that it has a wide range of applications in our surroundings. Face recognition can b applied to our surroundings to make our security and surveillance better as well as less complex. It will be easy for us to maintain security without the cooperation of each person present near to us. We just need to recognize the person through the face recognition techniques and we will be able to know whether he/she should be authenticated to use a particular service or not.

The most common example of face recognition now a days in our surrounding is the biometric system applied in our schools, colleges or offices. The face is our primary focus of attention in social life playing an important role in conveying identity and emotions. Human Brain can recognize lots of faces learned throughout it's lifespan and is able to identify faces at a glance even after many years of separation. This skill is quite robust despite of

wide variations in our visual stimulus due to changing condition, aging factors and distractions such as beard, glasses or variable hairstyles.

In surveillance system, face recognition is an important step for better and accurate surveillance. The complexity involves in it are high dimension subspace, variation of expressions, lighting, size etc. motivates to develop a new and better algorithm which really enhance the security of such systems. The necessity for personal identification in the fields of private and secure systems made face recognition one of the main fields among other biometric technologies. The importance of face recognition rises from the fact that a face recognition system does not require the cooperation of the individual while the other systems need such cooperation. The Face recognition algorithms bound to solve the problem of both verification and identification. When verification is on demand, the face recognition system is given a face image along with the claimed identity. The system is expected to either reject or accept the claim. The face is our number one attention of interest in social sex, playing a major role in conveying identification and emotion. Although the ability to infer intelligence or character from facial appearance is suspect, the human ability to understand faces is incredible. We can recognize lots of faces discovered during our lifetime and discover familiar faces at a look even after years of separation. This ability is quite robust, notwithstanding big changes in the visual stimulus because of viewing situations, expression, getting older, and distractions including glasses, beards or adjustments in hairstyle. Face popularity has end up an critical difficulty in lots of applications which includes safety structures, credit card verification and crook identification. The block diagram and basic system of face recognition may be proven as follows:-



**Fig:1 Face recognition block diagram.**

The first step of human face identification is to extract the relevant features from facial images. Research in this field primarily intends to generate sufficiently reasonable familiarities of human faces so that another human can correctly identify the face. The question comes in our mind is how well facial features can be quantized. If such a quantization is possible then a computer should be capable of recognizing a face given a set of features. Investigations by numerous researchers over the past several years have indicated that human beings to identify faces use certain facial characteristics.

The block diagram of face recognition system is shown in the figure1 above explains about the step by step procedure for Training and Testing of face images. The initial step is the Registration of images present in database. Once all images are registered they are applied to dimension reduction block where the most important dimension are kept and then for classification it goes to classification block where different similarity measures are used to classify the test image.

## II. REAL TIME FACE RECOGNITION

Real-time face recognition involves detection of a face from a series of frames from a video-capturing device. While the hardware requirements for such a system are far more stringent, from a computer vision stand point, real-time face detection is actually a far simpler process than detecting a face in a static image [29]. This is because unlike most of our surrounding environment, people are continually moving. We walk around, blink, fidget, wave our hands about, etc.

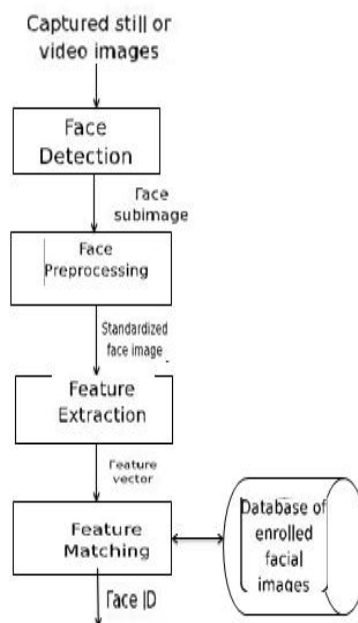


Fig:2 Real Time Face Recognition.

- *Face Detection*

The purpose of face detection is localization of the face in a picture. In the case of video enter, it can be an advantage to tune the face in among more than one frames, to lessen computational time and hold the identification of a face (person) between frames. Methods used for face detection consists of: Shape templates, Neural networks and Active Appearance Models (AAM).

- *Face Preprocessing*

The intention of the face pre-processing step is to normalize the coarse face detection, in order that a strong feature extraction can be finished. Depending of the utility, face preprocessing includes: Alignment (translation, rotation, scaling) and mild normalization/correlation.

- *Feature Extraction*

The goal of function extraction is to extract a compact set of interpersonal dis-criminating geometrical or/and photometrical features of the face. Methods for feature extraction include: PCA, FLDA, Locality Preserving Projections (LPP) and Local Binary Pattern (LBP).

- *Feature Matching*

Feature matching is the actual reputation technique. The feature vector acquired from the characteristic extraction is matched to classes (people) of facial photographs already enrolled in a database. The matching algorithms vary from the pretty obvious Nearest Neighbour to advanced schemes like Neural Networks.

### **III. CHALLENGES FOR FACE RECOGNITION**

- Identify similar faces (inter-class similarity)
- Scale Invariance
- Shift Invariance
- Noise Invariance
- Accommodate intra-class variability due to:
  - head pose
  - illumination conditions
  - expressions
  - facial accessories
  - aging effects
  - Cartoon Faces

### **IV. LOCAL BINARY PATTERN**

LBP thresholds all pixels in a specific neighbourhood based on the value of the central pixel of that neighbourhood to compute a new value for this central pixel. So, if the central pixel is corrupted by noise for any reason the comparison between this corrupted pixel and its neighbours will not be accurate. Also, according to LBP strategy, assigning the value 1 to all pixels greater than or equal to the central pixel value and assigning the value 0 to all pixels less than the central pixel produces inferior. The system may find a pixel with a value which is a little bit less than the central pixel value and there is another pixel which has a value significantly less than the value of the central pixel. Based on the LBP definition both of the two pixels will assign the value 0 and this is undesirable.

The local binary pattern operator is an picture operator which transforms an picture into an array or photograph of integer labels describing small-scale appearance of the photo. These labels or their information, maximum usually the histogram, are then used for similarly image evaluation. The most broadly used versions of the operator are designed for monochrome though images but it is been extended also for coloration (multi-channel) pix further to movies and volumetric information.

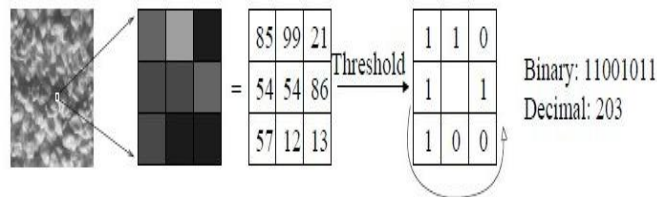


Fig:3 Basic LBP Operator.

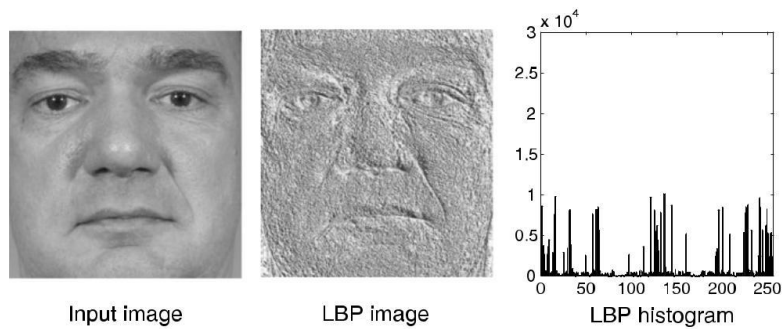


Fig:4 Example of an input image, the corresponding LBP image and histogram

The LBP operator changed into at the beginning designed for texture description. The operator assigns a label to each pixel of an picture through thresholding the 3x3-community of each pixel with the centre pixel value and considering the end result as a binary wide variety. The real version of the LBP operator functions in a 3 × 3-pixel block of an image. The pixels in this block are threshold with the aid of its centre pixel cost, improved through powers of and then summed to achieve a label for the centre pixel.

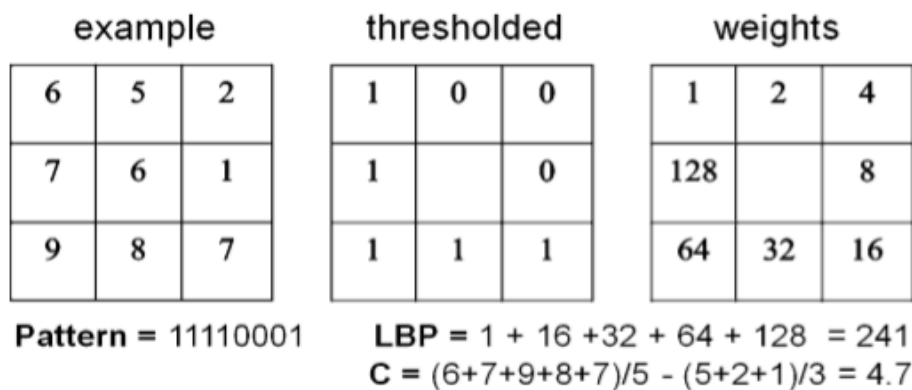


Fig:5 The Original LBP.

• FLOW CHART FOR LBP PROCESS

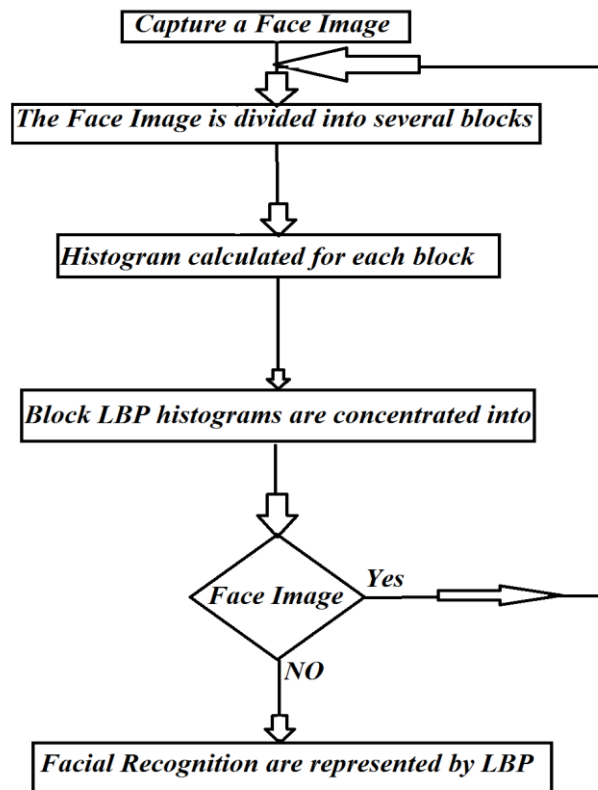
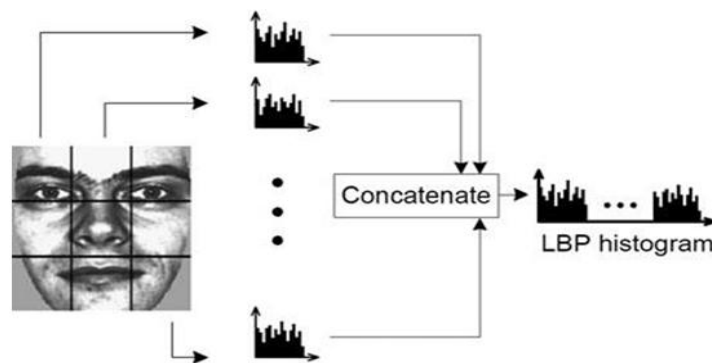


Fig:6 LBP Flow Chart.

The LBP process completes in 6 basic steps, firstly a face image is captured and then it is processed to the block of Face image is divided into several blocks for the calculation & after this the histogram of the image is calculated for each and every block. After this, the block histograms are concentrated into Face Image and Face Image decides the Facial recognition are represented by LBP or not.

• FACE DESCRIPTION USING LBP

Within the LBP method for texture category, the occurrences of the LBP codes in an picture are gathered right into a histogram. The classification is then in line with-formed by computing simple histogram similarities. However, thinking about a comparable method for facial picture illustration results in a lack of spatial facts and therefore one need to codify the texture facts while retaining additionally their locations. One way to reap this purpose is to apply the LBP texture descriptors to construct several neighborhood descriptions of the face and integrate them right into a global description. Such local descriptions had been gaining hobby these days that is understandable given the restrictions of the holistic representations. These neighborhood characteristic based totally methods appear to be more sturdy against variations in pose or illumination than holistic methods.



**Fig: 7 Facial Representation Using LBP.**

Another reason for choosing the nearby characteristic based totally approach is that looking to build a holistic description of a face the usage of texture strategies isn't always affordable when you consider that texture descriptors have a tendency to common over the photo vicinity. This is a suitable belongings for textures, due to the fact texture description should commonly be invariant to translation or even rotation of the feel and, especially for small repetitive textures, the small-scale relationships determine the advent of the feel and thus the massive-scale relations do no longer contain useful statistics. For faces, however, the state of affairs is one-of-a-kind: preserving the facts approximately spatial members of the family is critical. The fundamental technique for LBP primarily based face description is as follows: The facial photo is split into nearby areas and LBP texture descriptors are extracted from each region independently. The number one histogram that is used to acquire records approximately LBP codes in an picture may be prolonged proper proper right into a spatially superior histogram which encodes each the arrival and the spatial participants of the own family of facial regions. This histogram efficaciously has an outline of the face on 3 outstanding levels of locality: the LBP labels for the histogram incorporate records about the patterns on a pixel-level, the labels are summed over a small location to provide facts on a neighborhood degree and the local histograms are concatenated to build a global description of the face.

## V. DATABASE

- ▶ Database consist of various types of images of person from which we have the record of his/ her various angles image information. There are many type of databases such as ORL database or FERET database.
- ▶ 'The ORL Database of Faces'), contains a set of face images taken between April 1992 and April 1994 at the lab. The database was used in the context of a face recognition project carried out in collaboration with the Speech, Vision and Robotics Group of the Cambridge University Engineering Department.

They captured ten different images of 40 people at different time interval in varying conditions. For some subjects, the images were taken at different times, varying the lighting, facial expressions (open / closed eyes, smiling / not smiling) and facial details (glasses / no glasses). The picture were captured in a dark homogeneous background with the people in an upright, frontal position (with tolerance for some side movement).

- **The FERET Database, USA**

- FERET stands for The Facial Recognition Technology.
- The DOD Counterdrug Technology Program sponsored the Facial Recognition Technology (FERET) program. This developed the FERET database.
- The database is approximately 8.5 GB.
- The FERET database was collected in 15 sessions between August 1993 and July 1996.
- The database contains 1564 sets of images for a total of 14,126 images that includes 1199 individuals and 365 duplicate sets of images.
- A duplicate set is a second set of images of a person already in the database and was usually taken on a different day. For some individuals, over two years had elapsed between their first and last sittings, with some subjects being photographed multiple times.

- **ORL Database**

The Face Database consists of 400 images of 40 people. Each person covers a range of poses and expression. The files are all in PGM format, 92 x 112 pixels in 256 shades of grey for this algorithm we use Training dataset which contains 40 persons with 9 images per person with different postures and for Test Dataset, 3 images per person.

- **My Database**

Own Database process has been completed with 26 faces with 10 pictures of each person with 128\*128 pixels through OpenCV code.



Fig: 8 My Database.

## VI. OPEN CV

- Open-CV (Open Source Computer Vision Library) is an open-source BSD-licensed library that includes several hundreds of computer vision algorithms. Open-CV consist of modular structure, it implies that several shared or static libraries are included in Package.

- **The following modules are available: -**

1. Core Functionality



2. Image Processing
3. Video
4. Calib3D
5. Features2D
6. Object
7. High GUI
8. Many more.....

## VII.RESULTS & OUTPUT

Results are calculated in comparison with the three different methods for different purpose for high accuracy we use LBP 16-bit, for speed we use LBP 8-bit, and so, we calculated LBP 10-bit for real time application. So, The Accuracy derived from method LBP 16-bit is 95%, LBP 8-bit 82%,and for Real Time Application we use LBP- 10-bit having accuracy of 92%.

Frame Rate per minute for LBP 8-bit is 45 frames per minute; in LBP 16-bit is 25 frames per minute and for real time application LBP 10-bit Is 40 frames per minute. Time taken for detection in sec. LBP 8-bit is 0.8 sec, LBP 16-bit is 2 sec, and for Real Time Application LBP 10-bit is 1 sec.

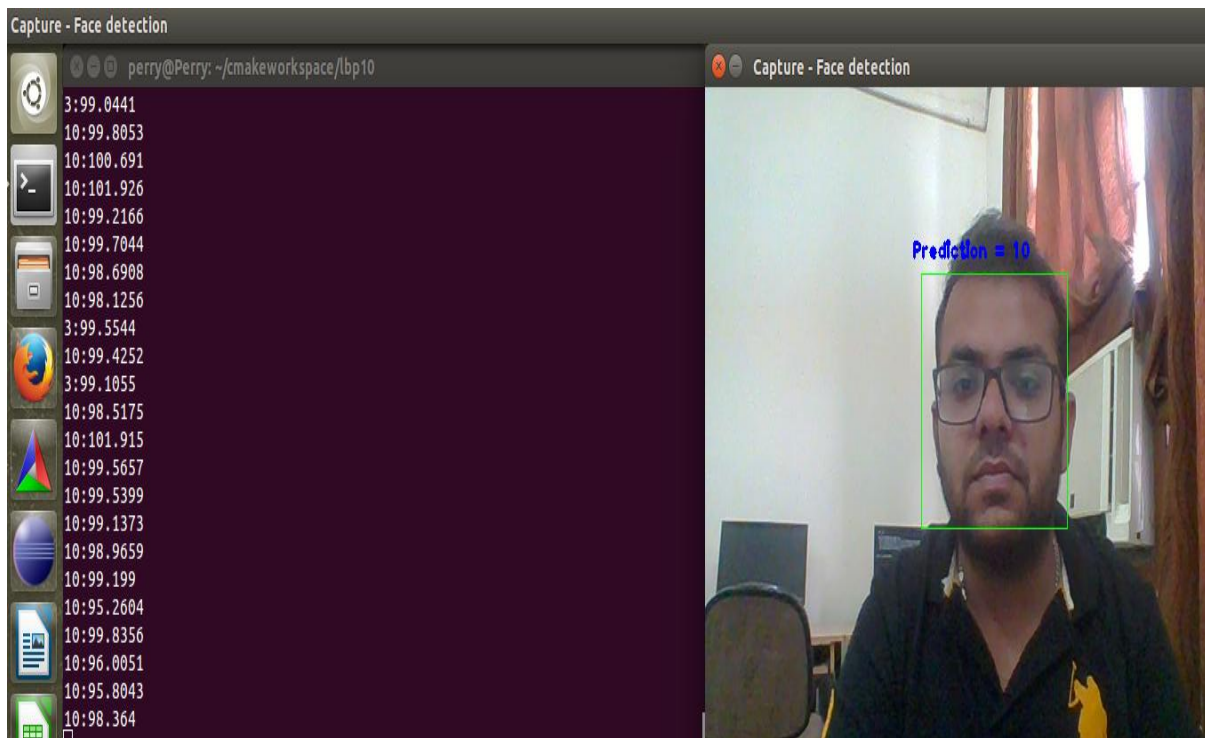


Fig: 9 My Result Screen.

## VIII. Conclusion

The close by binary sample is a easy but very green operator which labels the pixels of an image by means of manner of thresholding the community of every pixel and considers the give up end result as a binary range. The



LBP method can be seen as a unifying technique to the historically divergent statistical and structural models of texture analysis. Possibly the most essential belongings of the LBP operator in actual-international programs is its invariance in opposition to monotonic gray stage changes caused, e.G., via illumination variations. Every other equally vital is its computational simplicity, which makes it possible to investigate pics in difficult real-time settings.

The most beneficial and unique features of the face image are extracted inside the characteristic extraction section. Within the type the face image is in comparison with the pix from the database. This technique represents the neighborhood feature of the face and suits it with the most similar face photo in database. The rate / frame or high decision is our goal to increase for the LBP set of rules in real time application.

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