

Real Time Face Recognition in Group Images using LBPH



S. Jothi Shri, S. Jothilakshmi, G. Jawaherlalnehr

Abstract: Face recognition is a beneficial work in computer vision based applications. The goal of the proposed system is to provide complete face recognitions system capable of working a group of images. The faces are detected and verified the identity of an individual using a machine learning algorithm. The haar cascade detects the face from a group of images for training and testing dataset. The dataset contained positive and negative images for training and testing. The LBPH algorithm recognizes the faces from input images. The proposed system detects and recognizes faces with 98% accuracy.

Key Words: Haar Cascade, LBPH (Local Binary Pattern Histogram), Face Recognition, Face Detection.

I. INTRODUCTION

Face recognition is a real time image processing based technique. Face detection finds the position of the face of an individual. Detecting the face of a single person is considered for face recognition. Positive identification of individuals is very important in a group of images. After detecting faces its facial features are extracted and used in many applications like facial expression recognition, face recognition, observations system, etc., Different approaches have been tried by several groups working world wide to solve this problem. In many applications like the surveillance and monitoring system, the traditional biometric techniques will fail as for recognizable reasons. To overcome the problem, the proposed system developed an automated recognizing system.

In the existing system, the human faces are recognized by Viola Jones algorithm [1] for identifying the individual human face. The LBPH and Euclidean distance are used for feature extraction and face recognition. Some steps involved to recognize the faces are the following: collecting dataset, face attainment, feature extraction, and face recognition. Image quality may affect by poor lightning to degrade the performance in this work. Thus the system may not get a perfect solution.

To overcome the problems of the existing system, in the proposed system the face recognition system recognizes a group of people based on its facial image using a web camera. The system has two different methods developed with the hardware support of the video camera.

1. Face detection finds the location, size of faces in a group image and extracts the faces with features used by haar algorithm. 2. Face Recognition finds characteristics and describes the facial image using LBPH (Local Binary Pattern Histogram) already extracted and converted to grey scale. The recognition has two steps; it compares the input face with face image database in the way of one to one and one ton method. The rest of the paper is organized as follows: Section 2 provides a more brief description of related works. Section 3 discusses the methodology used in the proposed system for face recognition. The experiments, implementation, and results are discussed in Section 4, where the system uses real time data. Finally, Section 5 concludes the paper.

II.RELATED WORKS

Face recognition using PCA based method [1] has developed the image processing based face recognition using PCA technique. Mainly the data sets are collected from Indian faces. The system matches known images and unknown images. The Mat lab techniques are implemented to identify faces. Some techniques are performed in this work namely, the sum of absolute difference SAD, the sum of squared difference SSD and normalized cross correlation.

To focus on age variations, the system of recognizing face images [2] considers the skeletal structure muscle mass body fat. Mainly the system used weight information to improve the work of face recognition. The age variation also considered in this work using a random decision forest algorithm. The system maintains a database with 1109 individual's images to show the outperformance.

The system has proposed the method of automated student attendance with face recognition [3] for individual or unique face identification. The individual face is performed in the attendance making system. Mainly face location found by face detection to recognize the face in this work. The detected face regions are stored in the data bases to match the faces with the facial image using Haar method. Mostly the purpose of the system is making attendance in university duration of class hours.

The face recognition is a broad area in the research field. The traditional method has faced some problem with object illumination pose variation, expressions, and face disguise. To overcome the problem and encourage the researchers to continue the research the system considers individual facial features with three dimensional cubic dataset [4] in this work.

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This type of Multi/ Hyper spectral Imaging System provides valuable discriminates for individual appearance.

Human's biometrics uses face recognition techniques [5] to human communication everyday of life. Some characteristics are identified as the main thing to find identity and emotion. Mainly the system remains the real time application and gives the best solution to expected situations. The face recognition system considers the problems to recognize faces accurately in light, aging, expression similarity faces, camera distortion.

III. FACE RECOGNITION

Face recognition system includes three primary stages: face detection, extraction of features, face recognition. 1) Face Detection: haar algorithm detects face acquisition and location from a picture. Human face pre-processing in this work is separating the face objects from the image. 2) Extraction feature: The system extracts the characteristics from the detected face using LBPH (Local Binary Pattern Histogram).First, the system calculates the local binary pattern pictures in LBPH and then it creates histograms. 3) Face Recognition: The characteristics obtained are supplied to the classifier that acknowledges or classifies using the LBPH algorithm. With monitored machine learning classifier, the system compares the test picture with the pictures saved in the database. As shown in figure 1, the suggested algorithm is used to examine the sub-window that can detect faces from a specified picture input. The model proposed is deployed in two stages, such as registration and testing. Each stage is faced with the acquisition, pre-processing, extraction of features. After registration and testing phases, a classifier is

used to organize the image test and the image dataset. The image processing progresses likely to rescale the input picture to extraordinary dimensions and then operate the detector of fixed size. The access becomes comparatively time-consuming due to the calculation of images in different sizes.

A. Haar-Cascade

Haar cascade is one of the machine learning techniques used to identify individual face from video captures or images. The method has been trained from a lot of various positive and negative pictures. It is then used to identify human faces from pictures. Generally speaking, the system can detect the human face and part of it. In this task, the haar algorithm used to detect a human's face.

The proposed system first collects a lot of positive and negative images to train the classifier. Then the system needs to extract features from it. From the collected training dataset, the haar Consider nearby rectangular areas at a particular place in the group image detection window. All human faces have similar properties namely eyes, nose, and cheeks. In this work, the face properties are compared using a color variation of brightness.

It was the first algorithm the computer vision used to detect objects in real time. However, it was mostly used to detect faces. The algorithm utilizes four phases to identify the faces namely Feature selection, integral image, Adaboost training, cascade classifier.



Figure 1: Haar features similar to the human face

The feature selection compares the colour of properties eyes are dark than cheeks and noses are bright than eyes. In the integral method, each pixel value adds some value to calculate the correct feature value to integrate sub windows. Adaboosting is used to find the best feature to find face using machine learning. The system adds some haar features to classifiers. The sub windows are passed through the classifier to detect a face. Several classifiers are cascaded in this work to improve the efficiency of face detection. Cascading is pre-trained classifier to find the desired object in the video frame. All human faces share some similar characteristics. In the black and white part of the picture, hair-like characteristics are used to identify distinction. Using hair features, these regularities can be identified. Figure 1 shows some of the kinds.

The system uses the function of the two Haar rectangles. Some prevalent characteristics of human faces are 1. The region of the eye is brighter than the upper cheeks. 2. The region of the nose bridge is shinier than the eyes. Composition of characteristics forming matching facial characteristics: Location and size: eyes, mouth, and nose bridge= Value: focused pixel intensity gradients

The system takes the picture and transforms it into a 24×24 window and pixel-by-pixel each hair feature. Each function is associated with a particular sub window place. The value is calculated by applying hair characteristics is

$$\text{Value} = \text{range(black area pixels)} - \text{range(white area pixels)}$$

Figure 3 shows the second step of the haar algorithm to transform an input picture to an integral image. The location integral picture (x, y) includes the sum of the above and left pixels of (x, y) [7].

This work has only four values to calculate the addition to the whole pixels within any given rectangle. These values are the pixels in the integral picture that resemble the edges of the rectangle in the picture input.

Haar algorithm [5] utilizes a 24×24 window as the base window size to assess all the characteristics in a picture. It will result in a feature of 160,000, not all characteristics are essential to us. So we eliminate the unimportant characteristics.

Adaboost is a machine learning algorithm that only enables from 160,000 plus characteristics to umpire the most exceptional characteristics. After these characteristics, a weighted arrangement consists of all the characteristics used to gage and decide whether or not any specified window has a face. These characteristics are known as weak classifiers [8].

B. LBPH(Local Binary Pattern Histogram)

Local Binary Pattern Histogram is a simple and effective texture operator. The LBP is used in many applications of biometrics, eye localization, iris recognition and palm print recognition, age classification. The LBP has proposed in this

work instead of the extraction method SIFT operator. The texture based method was implemented for background subtraction. Each pixel is showed as a collection of adaptive local binary pattern histograms and calculated over a circular region around the pixel in this work.

In LBP approach, the face image is divided into small regions. The descriptor extracts the feature vector from each small region and forms a global description of the human face. The histogram has the human face description [8]-[10] with three levels of the locality. Each label contains information about the class on a pixel level, a region level and global description of the face. The description of the human face has shown in Figure 2.

The proposed system gets the result as a binary number by threshing holding the neighbourhood of each pixel of an image. The LBP combined with the HOG to improve the recognition performance on the image. The LBP has four parameters namely Grid X, Grid Y, neighbours, Radius. Using this it creates intermediate images to highlight characteristics of the original image. Radius used to represent the central pixel of the image. Neighbour is the high computational cost to represent the more sample to build a local binary pattern. Grid x and grid y are the horizontal and vertical direction of cells.

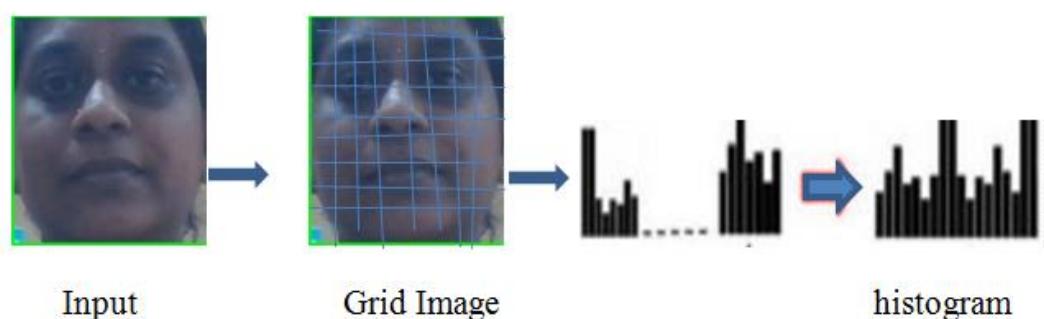


Figure 2. Description of the human face using LBPH

The LBP feature vector is created as in the following way:

The window is split into 8×8 pixels of a cell. The neighbours are compared for each cell. Pixel along a circle is clockwise or counter clockwise. While comparing the centre pixel value is greater than the neighbour's value set as 1 otherwise 0. The binary numbers converted into decimal. The histogram is computed from the frequency of each cell of the pixel. Finally, concatenated histogram gives the final feature vector.

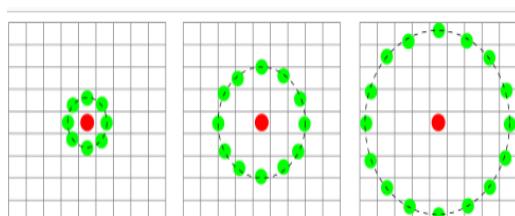


Figure 3. LBPH feature vector creation

IV.EXPERIMENTS AND RESULTS

A. Dataset: Using the webcam or camera connected to the laptop, datasets are created. The system brings and stores the 100 samples per individual in the dataset. The system can



Figure 4. Dataset

B.Face detection: The next stage is face detection. Using the haar face detection algorithm, the faces are identified. It consists of four steps: the classifier for cascading is an assembly of phases containing a powerful classifier. This stage's job is to combine the weak classifiers and figure 5 shows extraction.

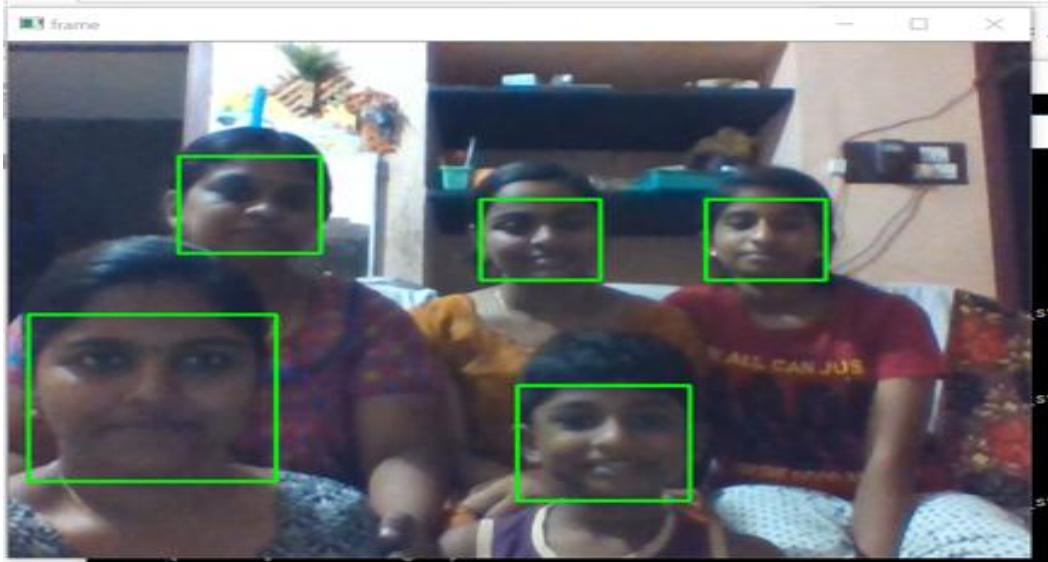


Figure 6: Face detection in a group images

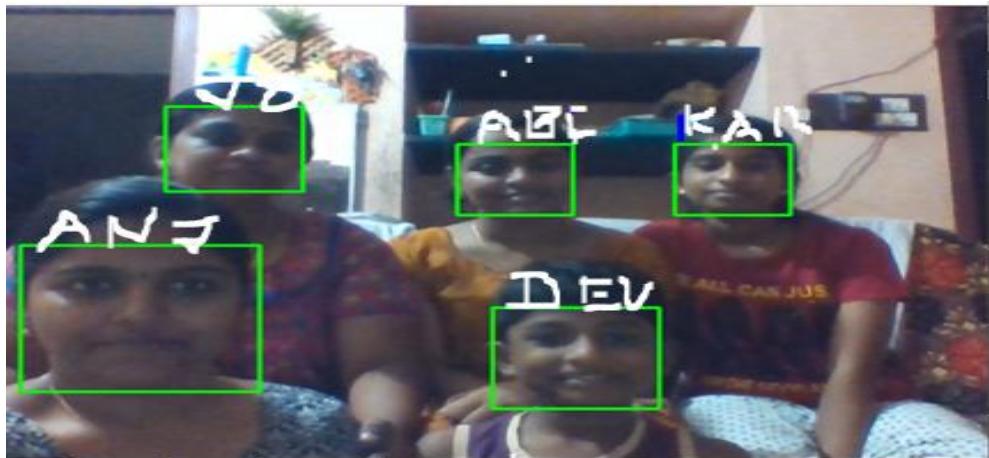


Figure 7: Face recognition in a group images

C. Feature Extraction:

Utilizing the Local Binary Pattern Histogram (LBPH). The system extracts the characteristics from the identified face. The LBPH feature vector is calculated as shown below:

Divide the scanned window into cells (e.g. for each cell 8x8 pixels). Compare the pixel with each of its 8 neighbours (on its left-top, left-middle, left-bottom, right-top, etc.) for each pixel in a cell holding middle pixel value as a reference [14]-[18].

If the value of the middle pixel is higher than the value of the neighbour, assign "1." Allocate "0," otherwise. This provides a binary number of 8 digits (which is generally converted to decimal). Calculate the histogram of the frequency of each "number" happening over the cell (i.e., each pair of narrower pixels and larger than the center)[9].

D. IMPLEMENTATION

The system assigns Id number to each individual with his / her name when producing the dataset. During recognition, if the test individual is discovered in the classifier's dataset

indicates the person's name. If the test individual is not discovered in the dataset, the classifier demonstrates as an unidentified individual portrayed in Figure 5.

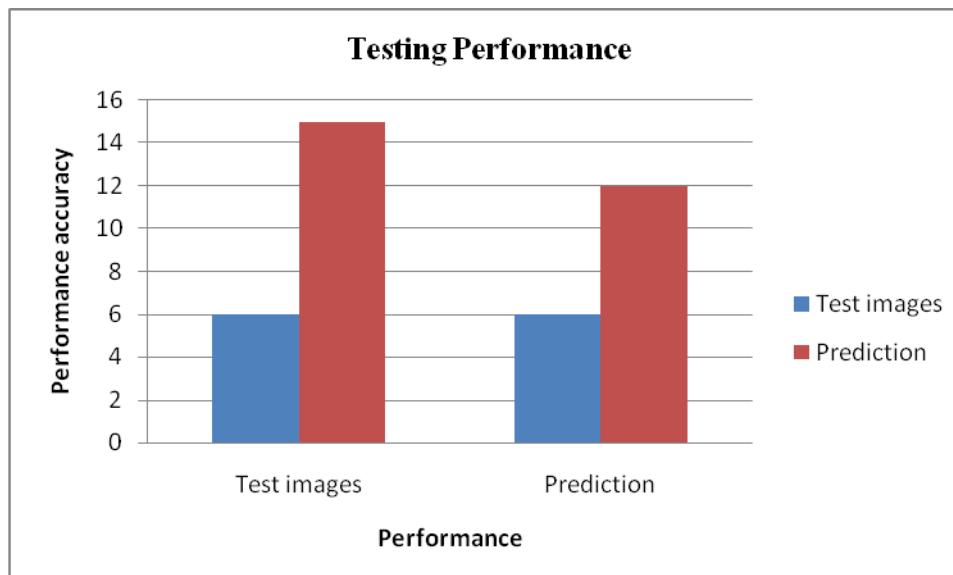
The extraction of the function by using the LBPH, the various facial illuminations is recorded over a certain period of time [11].

Figure7 demonstrates the detected image through a complete image, later in the training phase the detected image is transformed to gray, then the scheme produces a histogram that is simple to calculate using this method [12]. The findings of this suggested scheme are 98% accurate identification rates even under distinct circumstances such as lighting, background, rotation, distinct poses, presence of beard or glass.

From the above figure 8 a) representing the graph for deploying identification frequency Vs amount of people for performance assessment and b), it is evident that the suggested LBP algorithm gave better outcomes and confidence compared with other algorithms. While other algorithms will not provide precise measurements and confidence, chose the LBP algorithm [13], [14].

Table 1: Image prediction in a group of image

S.No	Trained images for each person	Total training images	Test images in the group	Predicted images
1	100	800	6	6

Table 2: Performance accuracy for different images**Figure 8: Testing Performance**

From the above charts, the system can accomplish that there is a better recognition rate for LBPH. The results achieved for these techniques are 98% accuracy.

The following suggestions are available for further studies on the basis of the study conducted in the current review and it is important to focus on the following problems in future work. The suggested scheme is altered to help the minimum range classifier in all circumstances such as brightness, wearing goggles, and beard.

The suggested technique[19]-[23] is tailored to the evolution of genetic characteristics for facial expressions being studied for various safety metrics is useful in obtaining private databases of government and criminal detection.

As shown in Figure 7 the suggested algorithm is used to examine the sub-window that can detect faces from a specified picture input. The model proposed is deployed in two stages, such as registration and testing. Each stage is faced with the acquisition, pre-processing, extraction of features. After registration and testing phases, a classifier is used to organize the image test and the Image dataset.

The image process progresses likely to rescale the input picture to extraordinary dimensions and then operate the detector of fixed size during these pictures. The access becomes comparatively time-consuming due to the calculation of pictures of different sizes.

V. CONCLUSION

The automatic face recognition system will give identity to the individual who will be present in a group of images and will keep record person face in the database. The system will detect faces for 10 minutes and after that detection will

be turned off and the detection will be present within this time period. After the time limit of video ends. The face database will be updated with the final detected face by mapping through LBPH classifier. These will ensure that individual's presents in that group of images if he or she fails to come within that time.

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