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AUTOMATED ATTENDANCE MARKING SYSTEM-A System for Attendance Marking Using Face Recognition

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***Abstract*—In this modern world Facial Recognition System that distinguishes a person from others is an excellent biometric approach. Attendance record is an essential part in the analysis of a student's performance. The traditional way of attendance marking and record keeping is a hard and time-consuming job. Hence, there is a need of a system which can operate accurately and in real time. Different biometric based systems are available in the market but all of these have to verify the identity of the user. However, blur conditions, lighting, pose variations are major problems in live attendance taking. In paper, we are introducing an automated attendance marking system which uses Local Binary Patterns Histogram (L BPH) algorithm for the face identification.**

Keywords*— *L BPH, Haar Cascade Classifier, Face Recognition

I. INTRODUCTION

Nowadays the face recognition is an important subject within the computer vision and pattern identification analysis. There has been many existing systems available like taking attendance of the scholars manually or using bio metrics method. Altogether these methods students need to wait for a long time in the queue before they join to the class[13][14]. There'll be wastage of 1 hr if we calculate the time for taking attendance of the scholars every day.

Today in the fast growing world automatically doing a work is preferable over manually doing the same since the amount of data in increasing and the time is decreasing. So the smart attendance system will take over the traditional manual way of taking attendance.

Many Bio metrics methods are available in the market, but all these methods require the user authentication is identical. Within the biometrics methods there are mainly two processes, the features of faces of the person is stored within the warehouse and then the method of recognition and verification is done. These processes differentiate the biometric characteristic feature of an individual with the previous stored data captured at the time of the student's registration. The information were often fingerprint, iris etc. Without the involvement of the scholar our system automatically marks the attendance of the scholars using face recognition method. Main motive of developing the system is to automate the traditional system of taking the attendance of the scholars. Automatic face recognition is all about extracting the meaningful features of the face, converting into useful representations, classify them. This is done by face detection and recognition algorithms. Also, a dataset is used for training and recognition of human faces. Almost 70 images of a person will be added to the dataset for improving the accuracy of recognition.

In the traditional approach students got a roll number which were used to check whether a student is present or absent but these wastes tons of time. We've developed the system to stay track the attendance of the scholars. By using the automated attendance system there's no wastage of your time in order that teachers can improve the quality of teaching[6][7]. The scholars who skip the classes can be easily identified with this model.

We have used the L BPH Algorithm in our system. LBP is an efficient descriptor style used to classify computer vision[1].For doing the extraction of features the input image is split into cells. There'll be a central pixel and its surrounding 8 neighbor's pixel values also are taken. If the surrounding pixel is smaller than that of the central pixel, then it'll be marked as 0 otherwise it'll be marked as 1 and it results in an 8-bit value. Thus the face features are extracted. This is then compared with the training dataset. If match occurs the person are going to be recognized otherwise the person won't be recognized.

There are many face recognition algorithms available within the market to extend the efficiency of automatic attendance system. But this technique gives a far better precision due to the utilization of characteristic features like color, correlation, appearance of the face. But the face recognition however, last as a challenge due to its basic problem concerning various elements like face cropping, face rotation and face appearance[12].

II. RELATED WORK

In[2]Viola and Jones suggested a system in which the images used within the integral representation that permits a machine to calculate the necessary object features. The features of the faces can be extracted by using the Haar Cascade which uses AdaBoost Algorithm to detect the multiple features of the face. These were the input to the classifiers which classifies the output as true or false.

In[8] Ahonen suggested a method in which the occurrences of LBP codes in an image is gathered into histogram using the texture LBP approach. It is the followed by computing the similarity between straight-forward histograms. The essential feature for LBP is based on the facial description suggested by Ahonen et al dividing the image into local areas the LBP features from each area. Successfully, this histogram features a face description on three different localization levels: The LBP histogram labels contain data on unit pixel-level patterns, labels are added over a small region to integrate data at a regional level, and local histograms are also joined together to provide a global facial description.

In[19]initially used a Local Binary Pattern histogram. There'll be a central pixel and its surrounding 8 neighbor's pixel values are also taken. Then based on the gray-scale value, allocates the neighbor value as either 0 or 1. Therefore every pixel will result in an 8-bit value.

III. OVERVIEW OF THE SYSTEM

Face detection and recognition process may be a machine learning approach, by learning and extracting the physical features of the human faces. Comparing these features with the analyzed image can detect the person or deny those persons whose faces are not recognized. They are many key challenges in the system which includes pose variation, low quality input images, angle variations, etc.
There were different Prospectives about the face recognition method such as some project gives more preferences for the high resolution images while some on low resolution images. In the face recognition method there were mainly four steps:

- Detection of Faces
- Pre-processing the images
- Extraction of features
- Matching the features

IV. LOCAL BINARY PATTERN HISTOGRAM

LBP is an efficient descriptor style used to classify computer vision. L BHP has the following 4 Parameters:

Radius: To represent the radius around the central pixel and used to outline the circular local binary pattern.

Neighbors: The number of selected points to outline the local binary pattern. The more number of selected points we involve the greater will be the evaluation cost. Usually, it is putting down as (8).

Grid X: The number of unit in the parallel direction. More the units, the grids will be more finer, the feature vector will have more higher dimensionality.

Grid Y: The number of units in the perpendicular direction. More the units, the grids will be more finer, the feature vector will have more higher dimensional.

V. CASCADE CLASSIFIER

It is a collection of weak classifier for the successful classification of image areas. The weak classifier is responsible for choosing the L BPH bin that splits into the positive and negative samples[2]. A weak classifier $t_{i(x)}$ includes feature (k_i) that relates to L BPH bin, a threshold α_j and a parity i_j which represents the direction of inequality sign.

$T_{i(x)} = 1$ if $i_i k_i(x) < i_i \alpha_i$

$T_{i(x)} = 0$ otherwise

Weak classifiers are used to make a strong classifier. The below figure shows the working of weak classifier.

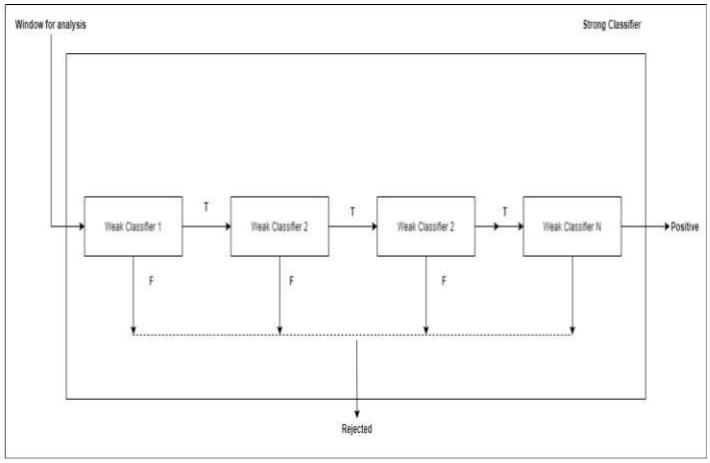

Fig 1: Concept of Cascade Classifier

VI. METHODOLOGY

The proposed system has mainly four phases: image acquisition module, module for feature extraction, training module, classifying module. Initially, a set of data regarding the faces are assembled by the image acquisition module then, by using the feature extraction process we will get the main features. In the next phase recognition of faces is done by training the classifier. From the database the person's information are fetched and the faces are recognized by the classifying module. The Algorithm for the system is as follows:

1. Initialise with temp=0
2. Where I represents the training for every image
3. While H=0, initialise the histogram
4. Calculate the model value of LBP
5. Increment the bin by 1
6. Get a unique vector by combining the greatest LBP feature of each image
7. Comparison of features
8. If it matches with the database then the image is recognised.

Flow chart of the face recognition system is given below:

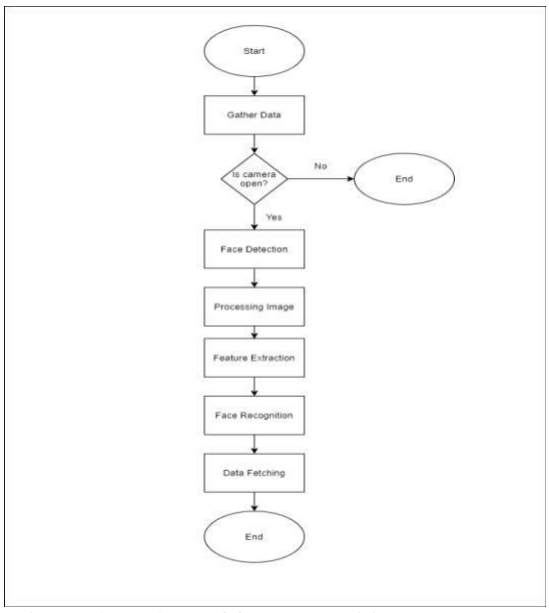

Fig 2: Flow chart of face recognition system

1. Face Detection Module

Open CV represents a Haar cascade classifier which is employed for the detection of faces [3][4]. For detection of various countenance AdaBoost algorithm is employed by the Haar cascade classifier. Initially a picture is taken by the camera which acts because the input for our system then it converts the input image into grayscale image. To verify whether the image contains any human faces we should always load the Haar cascade classifier. If any human faces are recognized then it proceeds to work out for the next countenance and an oblong frame are going to be drawn to the recognized face. Otherwise, it proceeds to see subsequent image. The detection process is shown below.

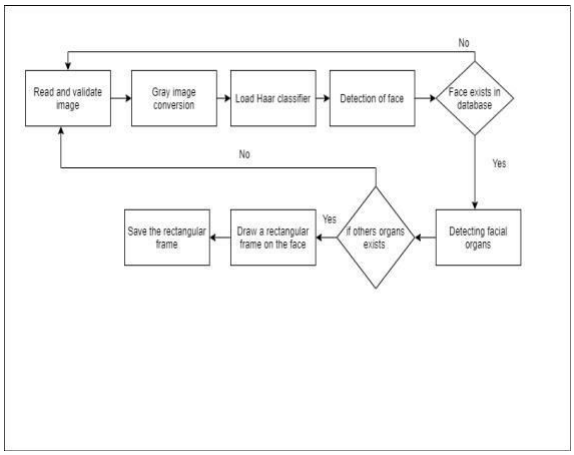

Fig 3: Flow chart of Face Detection Process

2. Feature Extraction Module

To extract the features of the face from the image, the LBP operator is applied which compares the central pixel value with the neighboring 8 pixel values[10]. If the neighboring pixel value is less than that of the central pixel value then it set the neighborhood pixel value as 0 otherwise set as 1. It is given as an equation below:

$$M(x) = \begin{cases} 0, & x < 0 \\ 1, & x \geq 0 \end{cases}$$

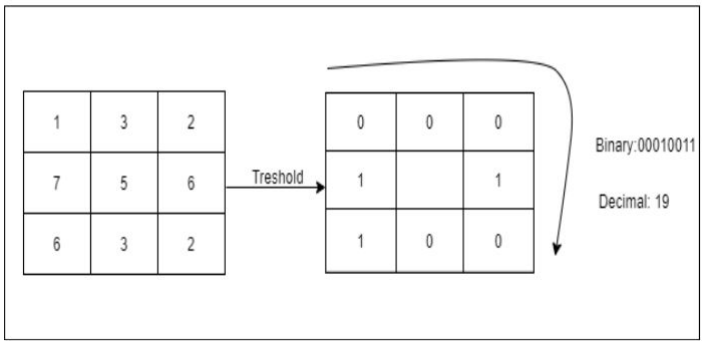

Fig 4: Extraction process

After the LBP operator is applied the input image is divided into various sub-images and for each sub-image histogram of the LBP values are extracted. Image-representing vector are produced by associating all the histograms and is used by the training module.

3. Dataset of the system

Our database will store 70 images of every person. It is based on the face detection.
For extraction process, the images are transformed to grayscale images and are stored in same folder. To get good image recognition outcome, standardization method is applied and normalized to image to scaling position. Data images are given below:

Fig 5: Database images

4. Face Recognition Module

LBPH Algorithms are applied for the face identification process. To reduce spatial distribution of image local binary patterns are used by LBP operator[18]. LBP operator is shown in the below equation:

$$LBP(s_c,t_c) = \sum_{n=0}^{7} P(i_n - i_c)2^n$$

Here i_n represents pixel value of the central pixel and s_c,t_c indicates the neighbouring pixels.

VII. OUTPUTS AND INTERPRETATION

In this Research, the primary step is to gather the database and extract the LBP histograms from each of the input image. As a result, we could recognize known and unknown person. For this experiment we've collected 500 images.
LBP operator is applied to the input images and histogram of the LBP values are extracted. After the extraction process we compare it with the image stored within the database, the system recognize persons whose details are present within the database, otherwise recognize it as an unknown person.

Fig 6: Unknown face

In this experiment there are 3 main steps: detection of faces, training and recognition of images.

1. Detection of Faces

Input image is captured by the camera and the system verifies the input image and convert into grayscale images

Fig 7: Detection of faces

2. Training of Faces

The next step after the image acquisition process is to train the images for that LBP operator is applied and the histogram values of the input image are stored.

TABLE 1: STATISTICS OF TRAINING IMAGE

Total no of images	No of recognized images	No of unrecognized images	Training Time
500	470	30	50 sec

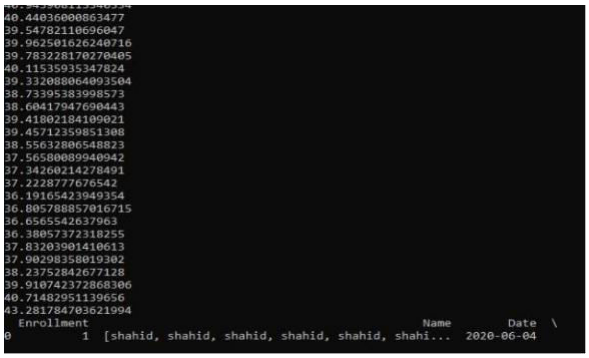

Fig 8: Training of faces

3. Recognition of images

Training Recognizer and Haar cascade classifier perform the face recognition. Then compare the input image with the images stored in the database. If match occurs then recognize as known person otherwise as an unknown person, and it will be displayed on the screen.

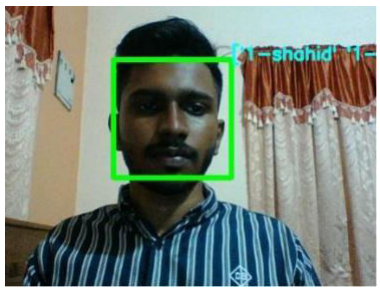

Fig 9: Recognising images

TABLE 2: COMPARISION OF RECOGNITION ACCURACY RATE

Algorithm	30px	20px
LBPH	85%	80%

VIII. SUMMARY AND SCOPE FOR FUTURE ENHANCEMENTS

In this paper for recognition of faces, we used the Local Binary Pattern Histogram. The whole process is split into 3 parts: recognition of faces, feature extraction, classification of image. The face recognition process gives the small print about the face of the person within the given image. Within the extraction process, L BPH are extracted from the input image which provides a satisfied result then we compare the input image with the pictures stored within the database. Then we will see that our system can recognize an individual if the info of that person is stored in our database otherwise our system will recognize it as an unknown person.

The Proposed system also can be used for marking attendance, to look people within the CCTV camera and also helps to spot criminals whose records are stored within the database.

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