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AUTOMATED SMART ATTENDANCE SYSTEM USING FACE RECOGNITION

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Abstract—**In the human body, the face is the most crucial factor in identifying each person as it contains many vital details. There are different prevailing methods to capture person's presence like biometrics to take attendance which is a time-consuming process. This paper develops a model to classify each character's face from a captured image using a collection of rules i.e., LBP algorithm to record the student attendance. LBP (Local Binary Pattern) is one among the methods and is popular as well as effective technique used for the image representation and classification and it was chosen for its robustness to pose and illumination shifts. The proposed ASAS (Automated Smart Attendance System) will capture the image and will be compared to the image stored in the database. The database is updated upon the enrolment of the student using an automation process that also includes name and rolls number. ASAS marks individual attendance, if the captured image matches the image in the database i.e., if both images are identical. The proposed algorithm reduces effort and captures day-to-day actions of managing each student and also makes it simple to mark the presence.**

Keywords—face detection , face recognition , image Processing, local binary pattern

I. INTRODUCTION

Image processing is a technique for performing operations on an image in order to enhance it or obtain useful information. It's a form of signal processing in which the input is an image and the output is either an image or the image's characteristics or features. Image processing is one of the fastest-growing technologies nowadays which can be integrated to any novel applications[5]. Biometrics or Fingerprint Scanning is one of the existing techniques that takes time as the student has to explicitly give their impressions onto the machine [4]. But to recognize the face, it explicitly does not require time and is even much lesser compared to other techniques like biometrics [8][10].

Face Recognition has knowledge and is capable of classifying or verifying a creature from a digital Image. The different types of face detection methods involve

1)Feature Based

2)Knowledge Based

3)Appearance Based

4)Template Matching

A picture is nothing additional than a two-dimensional indication. It is defined by the mathematical function f(x,y), where the two horizontal and vertical co-ordinates are x and y. The value of the function f(x,y) function at any point gives the pixel value of an image at that point.

II. RELATED WORK

A. Eigen Faces

The eigen faces approach is based on PCA (Principal Component Analysis) which is a mathematical technique. This approach has been successfully used to reduce the dimensionality of the images [1]. Face recognition and identification of the images mostly use Principal Component Analysis by considering the principal components that divide the face into feature vectors numerically [2]. The details about the feature vector can be found in the covariance matrix (Equ.(1)). The difference between multiple faces is quantified using these Eigenvectors as shown in the Fig.1.

Formation of covariance matrix

$$C = \frac{1}{M}\sum_{n=1}^{M} \phi_n \phi_n^T = AA^T \qquad (1)$$

Where $\phi_i = Normalized\ Vectors$

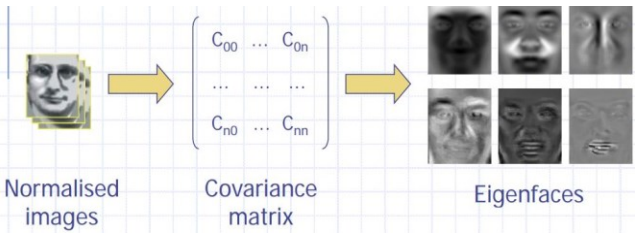

Fig. 1 Example of Formation of eigenfaces

The main drawback of this approach is it is sensitive to lightning conditions, pose and illumination, expression of the face and misalignment of the pixel [9].

B. *Fisher Faces*

The implementation of the fisher face technique is based on the principle of Eigen face. Fisher face is based on the Linear Discriminant Analysis (LDA) method, which is an appearance based methodology. LDA is based on the notion of labels such that when the requisite dimension is projected onto the image, PCA searches for the highest variance in the matrix [1]. It is possible to maximize the disparity between class means. The key idea is to maximize the proportion between class scatter and its matrices, which is achieved using LDA.

Fisher face has the drawback of being more difficult to locate the projection of face space than Eigen face. The ratio of between-class scatters to within-class scatter takes a long time to calculate.Computation of mean image for each class will be done first.

Between class scatter matrix is calculated as shown in Equ. (2).

$$S_B = \sum_{i=1}^{c} N_i \, (\mu_i - \mu)(\mu_i - \mu)^T \quad (2)$$

Within class scatter matrix is calculated as shown in Equ. (3)

$$S_w = \sum_{i=1}^{c} \sum_{y_k \in y_i} (y_k - \mu_i)(y_k - \mu_i)^T \quad (3)$$

C. *Local Binary Pattern*

Local Binary Pattern is one of the best reliable performing texture descriptor methods. The property of Local Binary Pattern Histogram (LBPH) operator is the most significant in real world application because of its robustness to monotonic gray-scale change [4]. Both Side and Front faces can be recognized and Local features can be represented in the images with the help of LBPH method [6]. The LBPH method will work better than the other methods such as eigen faces and Fisher faces in various environments of conditions and lights [7]. The dataset is considered as whole in eigen faces and fisher faces method where as in LBPH each single image is independently analyzed as illustrated in Fig 2 and Fig 3.

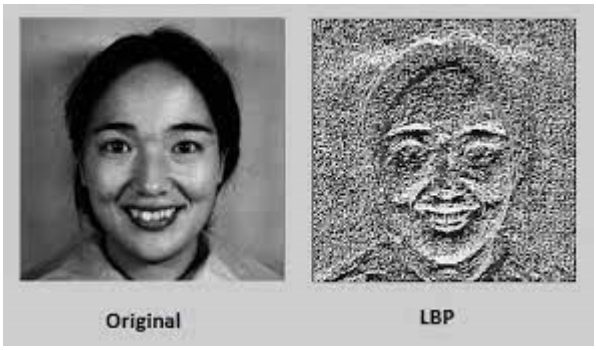

Fig 2. Original image after applying LBP

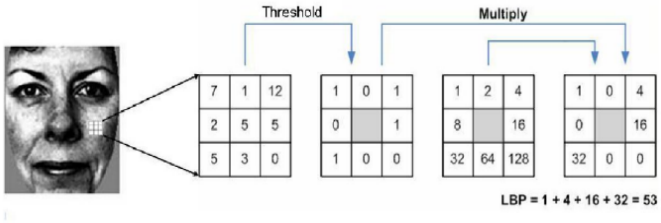

Fig. 3 Example of LBP Calculation from gray-scale image

A texture descriptor is a 256-bin histogram of the labels computed over an image [3].

III. Proposed Work

Existing approaches to capture presence of student consumes some amount of time involving compared to the proposed technique. The proposed model of taking attendance through face recognition uses LBP and the corresponding architecture is shown in Fig 4.

LBP (Local Binary Pattern) operator is applied on a block of 3*3 pixels. There are in total nine pixels where the middle pixel is called as center pixel. The LBP algorithm works by taking eight neighbor pixels which are compared to one central (middle) pixel and in this recognition process LBPH finally generates a binary number by using the Equ (4).

The LBP Operator equation (formula) shown as below

$$\mathrm{LBP}(x_c, y_c) = \sum_{n=0}^{7} S(i_n - i_c) 2^n \quad (4)$$

ic = Central Pixel value

(xi,yi) = 8 close neighbor pixels information or data.

ASAS Mainly Consists of Four Modules

1. Image accession module
2. Feature extraction module
3. Training dataset module
4. Classification / Recognition module

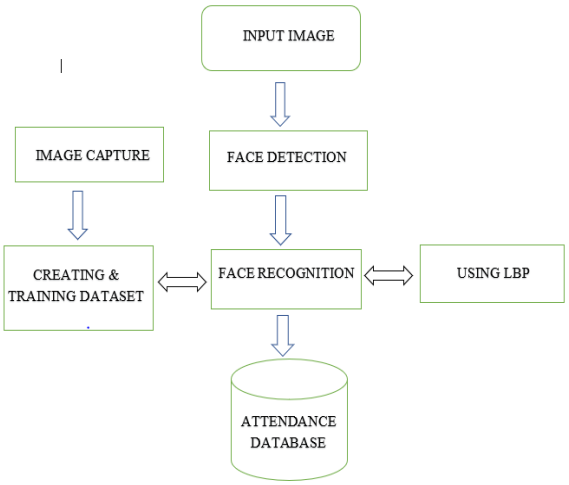

Fig.4. Architecture of proposed work

Automated Smart Attendance System (ASAS) consists pf four modules where each module has its own functionality in capturing the attendance of the pupil.

A. Algorithm

1) Step 1: (Take image) The video is captured when the student enrolls with name and roll number of that particular student and every new student details are stored in student table.

2) Step 2: (Update database) 200 images are extracted from the video captured and are stored in the dataset folder.

3) Step 3: (Train images) The model is trained by using the images stored in the dataset and with the help of applying LBP algorithm.

4) Step 4: (LBP Algorithm) Apply LBP operator on each matrix and result is obtained as decimal number for each block.

LBP Operator algorithm:

If (in>= ic)

{

//put pixel value as 1

}

Else

{

//put the pixel value as 0

}

Here i_n = Neighbour Pixel Value

5) i_c = Central Pixel Value

Hence a binary number is obtained for each matrix then it will be converted into decimal and replaced with that particular block.

6) Step 5: (Attendance Marking) Face of the student is detected from the video by placing camera on top of the blackboard

if image is matched with the images in dataset

// attendance of person is updated with date and time

else

// a message will be shown as “unknown “image.

IV. Results and Discussion

The proposed method consists of different stages to mark the attendance live and are discussed as below

A. Face Detection

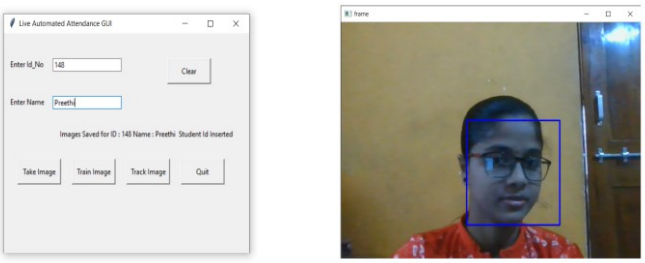

Fig 5. Take Image (Detecting Face)

In Fig.5, the developed GUI take image performs capturing of different instances of image up to 200 in this model from video and it takes the user input as id (integer) and name(string).

B. DataSet Creation and Training

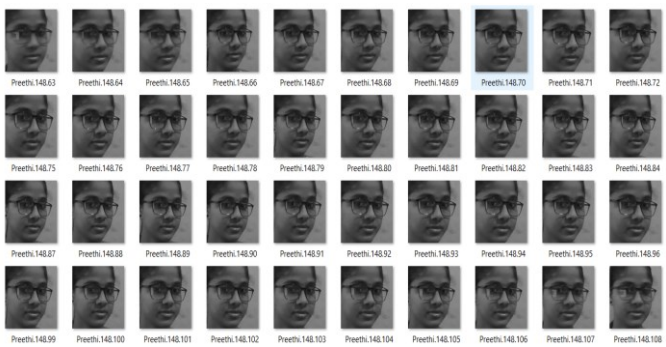

Fig.6 Dataset Creation

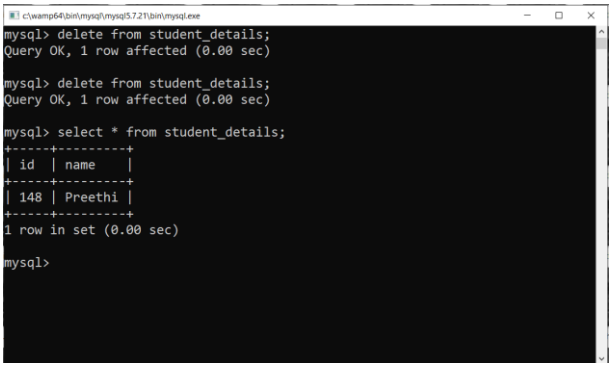

Fig.7 Storing new student details and Training Dataset

Fig.6 and Fig.7 explains about the module where the dataset creation and training will be done. The captured instances will be stored in dataset folder by converting to grey scale and this particular model is trained, the student details will be stored in the database.

C. *Face Recognition and Updating attendance*

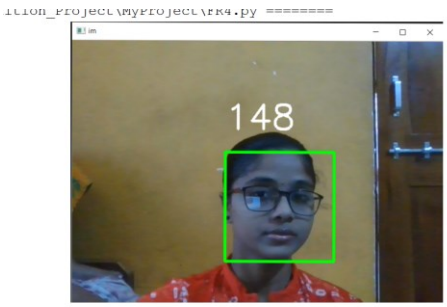

Fig.8 Track Image

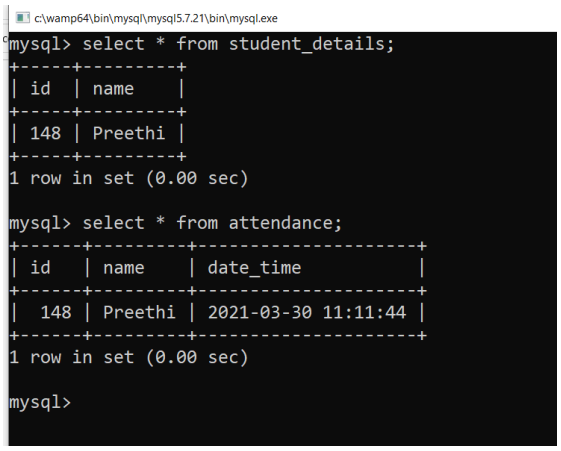

Fig.9.Updated attendance along with timestamp

Fig.8 shows the Track Image module that helps to recognize the input face by comparing with the trained datasets through LBP. If the faces are matched then that student attendance will be marked along with timestamp in the attendance table as shown in Fig.9.

V. Conclusion And Future Scope

From this model we can recognize the faces of students and can mark their attendance automatically in real time without human intrusion. Therefore, in a regulated environment, the proposed method enables identification and recognition of faces. LBPH (Local Binary Pattern Histogram) for facial recognition and detection in a particular area within the surveillance camera. They also have reliable outcomes for pose variance, and illumination after obtaining good results from different experimental studies of this technique.This method completely takes less time to process whole image. The Future Scope of this project can be extended to update attendance for multiple people.

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