Face Recognition Based Automated Attendance System using Haar cascade & LBPH Algorithm

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Abstract ***---****Face recognition system is one of the biometric method of taking attendance, it is easier to use and working range is larger than others like, fingerprint, iris scanning, signature etc. Face recognition system is able to automatically detect a face from a live image. This involves extracts some features and then recognize it. Regardless of lighting, expression, illumination, ageing, transformations and pose, face recognition systems can detect any face without facing any problem. This paper describes a method of taking attendance using face recognition here we use Haar Cascade algorithm for face detection and Local Binary Pattern Histogram for face recognition. After recognition the system is able to put attendance automatically into a C.S.V with accurate time and date without any human interaction.*

Keywords**---***Face Recognition, Face Detection, Attendance System, Automated Attendance System.*

I. INTRODUCTION

Biometric has a huge range of applications in the security system field. Its performance is very much reliable, fast and secure. Because every biometric is unique. There are many biometric system is present now such as

Fingerprint, iris, signature etc. Face recognition is one of them. Generally this biometric information's are very complicated to process but face recognition is much simpler and easier than other biometric information system. Face recognition is a biometric method for identifying an individual by comparing live capture or digital image data with the stored record for that person.

Human face perception is an active research area in the computer vision community nowadays. Generally in any organization like office or educational institute they take attendance through finger print or manually by call name or ID. This process are very time consuming and some time the employees has form a big queue. In face recognition attendance taking method this problems can be reduced. So in this work we try to propose a model the attendance taking method will be fully automatic and can reduce all the hassle of manual attendance taking.

In the face recognition system we first we need to enroll the image into the system, then we have to process the image to recognize that person whenever he comes in front of the system again. We capture an image of an individual first then process the image using computer vision (Opencv) then if we the recognizing phase recognize that person then the will save its enrollment time into the database.

II. RELATED WORK

Automated attendance management system is mainly focused to predicament of recognition of faces in biometric systems, to different real time scenario. Which incorporates a camera that captures input image, an algorithm to detect a face from the input image, encodes it and recognize the face and mark the attendance in database and convert it into PDF file. The face recognition algorithm used here are Histogram of Oriented Gradients (HOG), with LBPH. [20][18]

Proposed an attendance system which basically uses faces as objects to be detected and recognize person's identity and then store in a database. There the process of matching face images are captured by the camera. And the face

images which are stored in the database is the identification of the object faces captured by the camera. This study uses a hybrid feature extraction method using CNN-PCA (Convolutional Neural Network - Principal Component Analysis). [19][16]

The proposed paper describes the work of An Automatic Attendance System in a certain classroom environment. They took video clip of classroom and is stored in the database, and those videos are converted to images, then they apply Face detection techniques as Ada-boost algorithm to detect the faces in the images and then detect face by Histogram of Oriented Gradients (HOG) and Local Binary Pattern (LBP) algorithm. It first stores the faces of the students in the database then detected faces are compared with the faces stored in the database during face recognition by using Support Vector Machine (SVM) classifier. If the system recognizes faces, the attendance gets marked immediately of recognized faces. [14][15][12]

Presented research is aimed at providing a less intrusive, more efficient automated and cost effective student attendance management system using face recognition based on cloud computing (CC) infrastructure named FACECUBE. Which takes attendance by using IP camera mounted in front of a classroom, to acquire images of the entire class. It detect the faces in the image and compares it with the existing faces in the database. Identifying a registered face on the captured image collections, the attendance file is marked as present otherwise absent. [11]

Proposed paper is aimed at implementing a digitized system for attendance recording. Which take attendance using face recognition technology and store attendance. Here for taking attendance they use high definition camera for capturing images and recognizing by using PCA algorithm and after detecting the face accurately it store the attendance into excel file. [10]

III. PROPOSED MODEL

The proposed model is aimed to develop an automated face recognition based attendance system which can recognize faces accurately and store individual's attendance according to time they get with their name and ID.

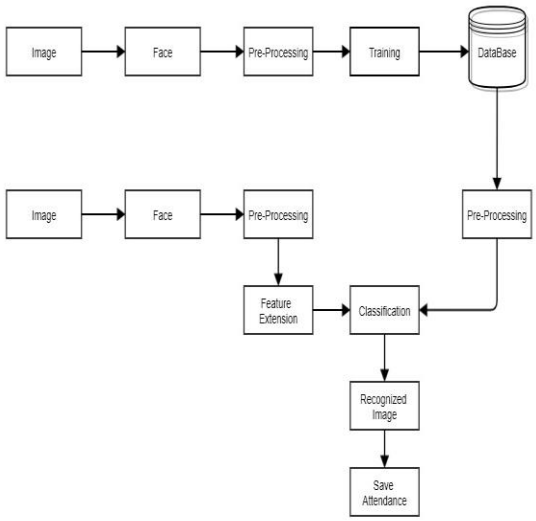

Figure-1: System Architecture

Here in our model the process is accomplished by three steps. Face detection, Face recognition and Storing attendance.

FACE DETECTION:
In face detection part we use Haar Cascade algorithm. In Haar Cascade algorithm it works with lots of positive and negative images the positive images are mainly the images with faces and the negative images are the images with no faces. [20][21]

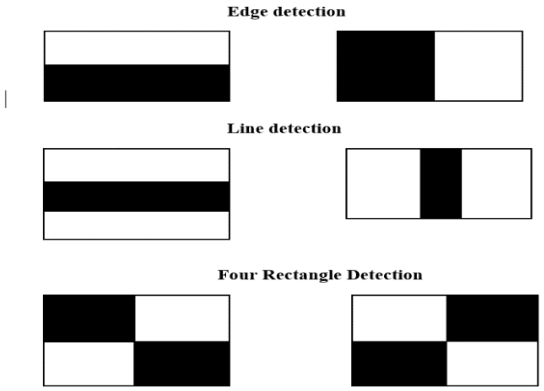

Figure-2: Haar Cascade classifier

Here it uses the both images like convolution kernel as like the image shown in the figure-1 for compering the black pixel to white pixel edge to edge for accurate outcomes. This process is also known as Harr classification. Harr cascade algorithm focuses on eyes, nose, lips for classifying the image and compering the pixels and detect the face accurately. It also resize the image and convert it into gray images for the easier and accurate recognition.

FACE RECOGNITION:
Here in face recognition section we use LBPH (Local Binary Pattern Histogram) because it can recognize both front and side images accurately.[21][5][4] In LBPH it convert the images into cells and it constructed by surrounding pixel values clock or counter-clock wise. The values of each cell is compared with the center pixel values and replaced by 0 or 1 depending on the difference if the difference is low the value will be 0 and if high the value will be 1. After applying the algorithm it can recognize face accurately.

$$LBP = \sum_{P=0}^{P-1} s(i_p - i_c)2^P$$

$$\text{Where } s(x)\begin{cases} if\ x \geq 0\ then\ 1; \\ otherwise\ 0; \end{cases}$$

The Local Binary Pattern Histogram is calculated by the given equation. For mapping the cell and finding the accurate value of each cell and then convert the values to decimal to binary from.

ATTENDANCE:
For attendance we use CSV (Comma Separated Value) for storing the attendance which is mainly a excel file. Here in our proposed system it will create an excel file everyday automatically naming as the current date without any human action. And the system will take an individual's attendance one time at a date. If that individual goes through the system camera more time then it will not store any attendance if it stores that person's attendance once in a day. The system will also store the unknown faces if the recognition systems fail to detect and recognize that individual.

IV. ALGORITHM

Step 1: Take faces using systems camera.

Step 2: Apply Haar Cascade algorithm.

Step 3: Take name and id for users.

Step 4: Create and train dataset.

Step 5: Store the dataset into the database.

Step 6: Take Face for recognition.

Step 7: Apply LPBH algorithm.

Step 8: Recognize face

If (Recognize)

Show name and id. &

Store attendance into C.S.V.

Else

Store unrecognized face.

Step 9: Exit.

V. RESULTS & EVALUTION

The system is very simple and light that it can run in any system no need for high quality equipment. The system a high quality camera for clear image capture. The more clear the image the more accurately it can visualize the faces and recognize it. In this it train the store images and automatically create datasets.

Figure-3: Dataset

Before the detection the system needs the name and id for the individual's identification which later used for storing attendance. In the system we use SQLite 3 for database so the user need SQLite 3 install into their system. As the system sore attendance in CSV (Comma Separated Value) which is mainly excel file so to access the attendance file the user must have MS Excel installed into their machine.

EVALUATION**:**
For evaluating the system performance we use a formula

$$\text{Accuracy} = \frac{\textit{T}\text{otal Recognized Faces}}{\text{Total Faces infront of camera}} \text{x } 100$$

We test the system in different situation with multiple faces in front of it. Farther details will be presented in the table below.

Faces in front of Camera	Total Recognized face	Ratio
1	1	100%
2	2	100%
5	5	100%
6	5	83.33%
10	8	80%

Table -1: Data Table

According to the data table we create it performance graph which is present below.

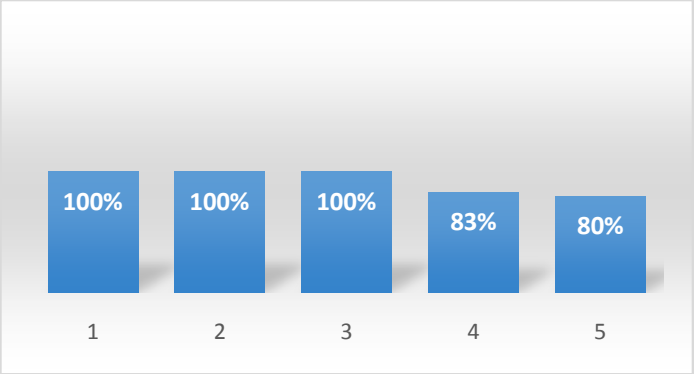

Figure-4: Comparison of performances

From the trail table and performance graph we can see that in a certain amount of faces it can recognize and give attendance accurately and it performance was in the peek. But as the face increases in front of the system it performance decreases a little bit.

VI. CONCLUSION & FUTURE WORK

In this study we proposed an attendance system based on face recognition which is completely automated. We know all there is other bio-metric attendance system available in the market but most of them take time to record attendance and take physical action for attendance. In finger print based attendance system the user need to scan his finger for attendance and if there is many people has to put attendance by finger then it will be dangerous now for COVID-19. So we proposed this system where there is no physical interaction for attendance. Here we use Haar cascade and LPBH algorithm for face detection and recognition. Both the algorithm has some draw back so in the future we will develop the system using modern deep learning based algorithm where the accuracy and recognition will be increased. And also we will make the system UI more user friendly and we will add more security features also.

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