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# A Novel Attendance System based on face recognition using Haar-cascade and SVM

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***Abstract*—Automated Face Recognition technology (AFR) has led to numerous advancements in the ever-changing world. Smart Attendance utilizes real-time Face Recognition as an actual-world solution that is integrated with everyday activities that help manage students' attendance. For this Automatic attendance system. LBPH and Haar-cascade are used to recognize and detect the image with low-rate error accuracy and for fast calculation of the image recognition. In this process the images were captured from the surveillance and recognized with low error rate.**

***Keywords— LBPH(Local Binary Pattern Histogram),SVM, face recognition, Haar Cascade, face detection.***

## I. INTRODUCTION

The technology seeks to share new information based on knowledge in the present. In [14]Machine Learning is among the fascinating areas that permit the machine to learn by using specific data sets like as input , and then providing the correct output when tests using various learning algorithms. By the development of deep technology for learning, the system automatically determines the level of students' presence and keeps an account of the data. The two most commonly used methods to identify a person's face are

A feature-based approach

Light-based method

A feature-based method, is also known as a face recognition local system, which is used to recognize essential facial features like the nose, eyes, ears teeth, mouth, edges etc. In this step, Haar Cascade is used for the detection of fce While a light-based method is also known as the Face Recognition System. In this LBPH algorithm is used to recognize the face. It is used to view every aspect that make up an image.

Face recognition is widely employed in a variety of applications, Some of the real world applications include security systems such as authentication security, the control of access, surveillance systems unlocking smart phones and social networking systems, for instance. Many procedures don't use facial recognition as the primary way to signify consent. But, due to the development of technology and algorithms facial recognition systems are able to alter passwords and even fingerprints follow.

Face acknowledgment has qualities that other biometrics don't have. Facial pictures can be caught from a good ways and any extraordinary activity isn't needed for confirmation. Because of such attributes, the face acknowledgment strategy is applied broadly, not exclusively to security applications yet additionally to picture ordering, picture recoveries and regular. Automated presence system model to reduce the actual effort of recording data that eliminates the possibility of fraud. The model focuses on the way face recognition combined with Radio Frequency Identification (RFID) to identify authorized students and count as they enter and exit designing a classroom [18]. The use of Haar dividers, KNN, CNN, SVM, Generative adversarial networks, and Gabor filters. After facial recognition Attendance reports will be created and stored in excel format [19]. An effective new method automatic registration based on face recognition with development android app. And to adapt to lighting of different classes, a new one Illumination processing algorithm is suggested [20]. RFID card system, each student gives a card with his or her corresponding identity but there is a chance of losing the card or an unauthorized person may misuse the card to make a false claim. While in some biometrics such as fingerprint, iris or voice recognition, they all have their own errors and are not 100% accurate [22]. The proposed alternative is being tested extensively on the CMU PIE websites, as well as the Extended Yale B. Experimental results show that the proposed method - MD-LBP, can significantly improve the quality of visual acuity under complex light [23]. One of the ways to do this is by comparing selected facial features from the image and a facial database. The human face plays a major role in conveying identity and emotion. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems [24].

A new approach to utilize Eigen face and Fisher face methodology by using medoid instead of mean, a statistic in calculating the Eigen faces and Fisher faces. The method not only requires lesser training but also demonstrates better time efficiency and performance compared to the conventional method of using mean [25].

## II. LITERATURE SURVEY

B.K Mohamed and. Raghu[1] noted that Automatic attendance systems can be used in many different ways. He suggested a fingerprint-based attendance system. A fingerprint device was developed which will be shared between students during lecture. The students will put their fingers on the device , where there is no involvement from the instructor or another person, and there is no possibility of proxy problems This method of attendance is the fact that passing the device in the lecture can take up time and distract the students' concentration during the lecture.

T.Lim,S.Sim and M.Mansor[2] suggested a new model that is based in RFID (Radio Frequency Identification. An attendance systems based on RFID it is made up of antenna & memory. These are the devices which use electromagnetic fields and identifies automatically by tracking tags attached to object. .But there's a problem with this that causes an increase in the number of fraudulent access. Unauthorized persons can use an ID card to enter the company.

Kadry and K.Smaili proposed a different model, Daugman's algorithm-based Iris recognition system[3].This is a system that does not include eyelashes, eyelids and also work by lighting the iris using invisible infra-red light that can detect unique patterns. But the drawback is that Iris scans will be matched against your eye , and it is possible to be deceived by a high-quality photos, and the problem is to draw the trans-mission lines that the topography isn't ideal.

In [4], researchers have suggested a system that is based on real-time face recognition that is reliable and has solved several issues, and improved security. It is rapid, and requires improvements in various lighting conditions. It also aids in a foolproof method of marking the attendance system.

Xiaofe He,Shuincheng Yan[5] Proposed another approach called Laplacian face and they also explained this approach has better representation and achieves low error rates ,this approach concentrates on only optimal linear approximation to the eigenfunctions .Then it will make task easy by eliminating unwanted variations result in changes in expressions on face and he also conclude Laplacian face is better than the PCA and LPP(Locality Preserving Projections)

Josh Harguess, J.K.Aggarwal proposed a model for face recognition using 2d and 3d database and he also used 6 algorithms (MPCA,LDA,ICA,SVM,MPCDALDA)to detect the average half face[6] .He also stated that by using this model is superior to average-half-face for frontal face recognition and also saves the storage and computational time.

Shrija Madhu[7] explained the importance of HOG with LBPH(Linear Binary Pattern Histogram) this model detects the person and encode the image as it is a powerful feature descriptor.it gives high accuracy in detection of faces.] Sathish explained the hybrid representation using major redundancy types and they presented a mixed LF data presentation using LF and he Proposed the method uses both SAI-based and MI-based representations for compliance with predictive mode[8].

Smitha, Pavithra S Hegde and Afshin[9] proposed a novel model of face recognition system. In the proposed system, the program aims to create an effective classroom approach using face recognition techniques. Upon recognition, it will mark the presence of a known student and update the attendance record

Mayur Surve,Priya Joshi,Sujata Jamadar, Minakshi Vharkate[10], they implemented a system with Haar Cascade graphical user interface captures graphical user interface captures the images to create and train the data set at a single time check and also they used AdaBoast classifier in this.

Rajath S Bharadwaj, Teju S Rao, Vinay T R[11] They proposed main function using System Part Analysis in detecting the face of a person obtained with high accuracy. And In this default system keeps record of student attendance as a manual managing ledgers is a very tedious task

Reetha.s , Dr.P.Visu[12] They put forward a system called OT-based web camera system. In this case the student photo is taken at a time the registration process is also maintained on the website with all relevant and personal information. Calculation the presence of a student photo is taken where the information is taken from the website.

Rohit Chanvan ,Baburao Phad,Sankalp Sawant, Vinayak Futak,Asha Rawat[13], they used facial recognition to monitor student attendance and improve the system. The method is effective in a variety of shapes and combinations. The system needs to be improved in the future as it is often difficult to identify students from a distance

Narendar Singh, M Kusuma Sri, K. Mounika[15],They used the camera when they were connected to the Raspberry pi USB port and then only photographs of the students found in it face detection class. With the photos stored in those pictures, every student saw their faces in photographs and accordingly the lesson was given.

Rathod, Hemantkumar, et al[16] , They used Algorithms like ViolaJones features and HOG features and SVM separator are used get the results you want. Various real-time scenarios are required it is considered to measure, light, close and stand

Hapani, Smit, et al[17], they used the Ways to utilize this visual feature have seen a dramatic change since the advent of image processing strategies. Measure the shape of the whole face, the distance between the eyes, the nose, the mouth, and the tips of the jaws and then camera detects and identifies a person based on these factors

Nazare Kanchan Jayant and Surekha Borra [21], they done the Challenges such as dim light and face shape are detected, detected and presence updated. The system detects and detects all faces that are provided as input without losing information.

TABLE 1. EXISISTING MODEL OF ADVANTAGES AND DISADVANTAGES.

| System type | Advantages | Disadvantages |
|---|---|---|
| RFID card system | Simple | Fraudulent usage |
| Fingerprint system | Accurate | Time-consuming |
| Voice recognition system | - | Less accurate compared to others |
| Iris recognition system | Accurate | Privacy Invasion |

Table 1 describe about existing models and their corresponding pitfalls.

## III. PROPOSED MODEL

In this model, Haar cascade and LBPH is used for Image detection and recognition. Haar-cascade helps to detect the faces in an image or in real –timevideo,Lbph helps to recognize in both front face and side face.

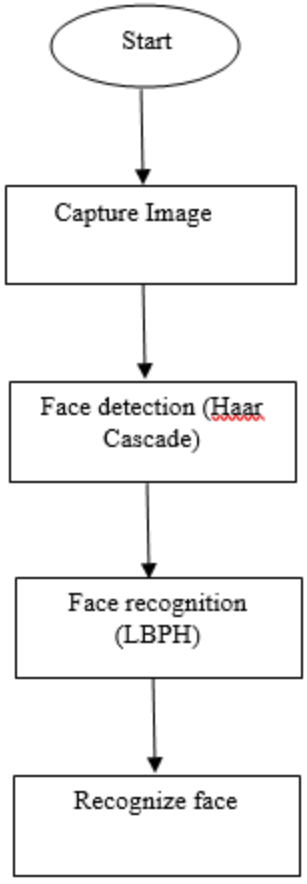


Figure 1. Flowchart of automatic attendance system

Fig.1. illustrates the flow of automatic attendance system. This paper explains the use of face recognition to determine attendance of a specific student. In this scenario, when a student is in the classroom, it takes a picture and compares it with its inputs which is a database that has been provided to it. It then marks attendance. If it matches the database, it is marked as present. If not, the students are marked absent. This process reduces duration of the event and does not cause any disruption in the classroom and students are not able to use any proxy to their class in the simple system of databases that is made up of images. Face Recognition is a better method compared to other attendance methods to manage time over the other systems.

## IV. ALGORITHM

### A. Image Capturing

The image capture procedure that captures the face of a specific student and then compares it to various images contained in the databases of that particular student. Faces of humans are unique to each individual identifiers and this recognition of faces is a biometric method to determine the real-time capturing of a specific photograph of a specific student. The following algorithm 1 gives the mentioned idea.

Algorithm 1. Pseudo Code of the Proposed System

1.Photograph the image of the student

2.Apply the Haar Cascade algorithm (Face Detection)

3.Find the ROI in Rectangular Bounding Box Convert to gray scale, apply histogram equalization, and resize to 100x100

4.Detected faces will match with the data already present in database

5.Apply LBPH (Face Recognition)

6.By recognizing the faces it will mark attendances for students

### B. Face Detection

First, Face detection can also be referred to as facial detection.

Face detection is a completely different process from recognition of faces and seem to be very similar, yet distinct. Face detection is the finding the face's region, or face segment. When it comes to face recognition, it can be defined as the process of comparing captured images to database and determines the person or image of the student within the database. Some aspects that contribute to face recognition and detection include the pose the face, its rotation, background, etc.

Today, face detection has become a increasingly popular and has a greater possibilities of use. There are a variety of algorithms used for face detection are used, such as machine learning methods, Haar Cascades Method.

This method is a considered algorithm, the use of lines or edges detection characteristics. This algorithm provides positive and negative images. In this way, it creates certain kinds of features that appear on the image. This makes it easy to determine the lines or edges in the images. The goal of this is to calculate the total of all image pixels that are located in the dark area of haar feature.

### C. Pre-Processing

The image that is captured of the face is then subjected directly for preprocessing. This Histogram Equalization is a method of image processing that adjusts and alters the image through its histogram processing. It increases the pixel's

intensity and of the image. It is an image processing technique that can be used to enhance the contrast of images

*D. Feature extraction*

In this step it will reduce the raw date present in initial set to more manageable groups for processing it will extract the features of a person like ears, nose, hair. This step is more important to recognize a face. It will store all the data which is unique in each person in the data set

*E. Image Recognition*

In this step system will match the data which are extracted using image capturing and then matches the data where the data already present in the data set

*F. Attendance Marking*

After all these if the person is not present then they will be marked as absent and the remaining who are recognized will be marked as present in the excel sheet automatically. In that it will also include date, Time, Month year as well.

## V. METHODOLOGY

Humans are extremely adept in recognizing faces of the pictures as compared to computers, the procedure for each step of this face detention process has to be understood. To do this, a clear understanding of the process has to be developed to solve each step in the process of facial recognition and recognize the face of the student to determine attendance using different techniques. In this case, PCA (Principal Component Analysis) and SVM (Support Vector Classification) are employed.

Principal Component Analysis (PCA) it is a method of statistical analysis that is used in the signals frequently, and it is transformed using statistical methods. PCA makes use of Eigen vectors of the objects selected to determine the properties of objects.

A mathematical image created that is represented using PCA is represented mathematically as

$$x = WY + \mu$$

where $\chi$ is face vector,

Y is vector of eigenfaces,

W is the feature vector, and

$\mu$ is the average face vector.

If it is smaller than the threshold, then the image of the probe is acknowledged.

Support Vector Classification (SVM) it is an algorithm for supervised learning. It is utilized in a variety of classification of data across various classes. The SVM is used for both regression and classification problems. SVM is also employed in image detection and detection of objects. SVM is used to solve a two class recognition problem. SVM algorithm is demonstrated on both authentication and identification application. In identification, the algorithm used to find the image of an unknown person. In authentication the algorithm used to image and a claimed identity of the person.

The threshold outcomes were obtained using a limit of 0.6 for face verification, which was the best discriminative worth. The outcomes are addressed as absolute values since there was no variety in the acknowledgment step when presenting similar testing pictures to the pipeline.

TABLE 2. ACCURACY FOR EVERY TESTED CLASSROOM.

| **Class** | **Webcam(1.2mp)** |
|---|---|
| 1 | 94% |
| 2 | 100% |
| 3 | 94.7% |
| 4 | 90% |
| Average | 91% |

These results were some ways or another normal to be around 95% such reach since similar related works got around 91% overall.

## VI. RESULTS

In this model when a person sits in front of camera then

- The video of the students is captured.
- Face detection and feature extraction.
- Face recognition and marking attendance.

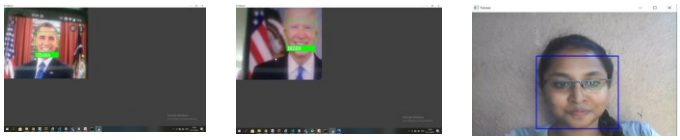

Figure 2. Recognition of faces

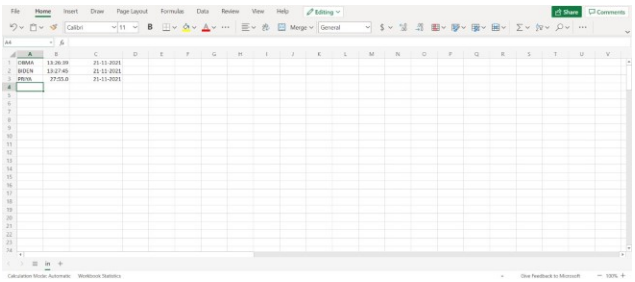

Figure 3 Marking attendance

Figure 2 represents the identification of faces by taking image as input and Figure 3 shows how the attendance will be marked in the excel sheet automatically.

## VII. CONCLUSION AND FUTURE WORK

Attendance Systems based upon face recognition methods can improve security levels, and time and energy in tracking students can be considerably reduced. Automated attendance can be performed by it to give a precise and

effective results. This is done using various techniques that help us identify the person in a quick and precise way. LBPH surpasses other algorithms, with higher recognition rates and a lower percentage of false positives. SVM and Bayesian are also proven to be superior classifiers as compared to distance classifiers. The goal for the future is to increase the accuracy rate as well as detect faces at any direction and also with low image quality, and able to recognize faces even when there are accidental modifications to a person, such as masks.

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