ANALYSIS OF AUTOMATED ATTENDANCE MANAGEMENT SYSTEM USING FACE RECOGNITION

Yogish Naik G R,
Associate Professor, Department of Computer Science and MCA,
Kuvempu University, Shivamogga, Karnataka, India.
ynaik.ku@gmail.com

ABSTRACT

Attendance is an essential part of an institutes to validate the presence of the students. Every institute will carry out this in a particular way. Some institutes are using the old paper based or file-based system and some of them are carrying the strategies of automatic attendance by using some biometric techniques. Recognition of face is method which is based on computerized software which is suitable for determine or validate a person by doing comparisons on patterns on their facial appearance. In this method OpenCV along with Face Recognition libraries are used these are one of the most popular libraries for face detection and recognition. By implementing this we can recognize face accurately and students as well as employee's attendances are automatically stored in database.

1. INTRODUCTION

Face detecting process is a computer-based technology by using this we identify locations along with the size of human face in input image or in the input video. It works by detecting face features and automatically ignores anything which present in the input video or image here anything refers to background, objects, vehicles and others. This is currently an very active research field in which face location detection with identification is the initial process in applications like identification of person in crime, surveillance system, face identification and image related databasemanagement and providing interface in between system and the humans. Locating and tracking human face is most Important thing in face recognition and facial expressions analysis. Task of identifying the previously detected objects a known faces or unknown faces. There is a difference between problems that we face during face recognition to problems that occurs in face detection. Face Recognition process mainly used to decide if the "face of the person" is known, or the face is unknown.

Initially Computer scans and detects face of the particular person using an input digital image.it is done always by validating the image captured in the realtime with the image that already present in database. The characteristics of face structures and features can be obtained from a

realtime image that is always compared with the facial characters of the database image   for the purpose of identification of the face. This is very use full because in common methods where every time the identification is done with placing their hand on the biometric reader or sometimes positioning their eyes in the front of scanner which is used to identify actual person. this system take pics of people faces with their unique user's name, and in colleges and schools the automatic method for attendance taking system provides very good facility to teaching staff to minimize the risk of attendance monitoring. This will record attendance of a students or employees automatically with the help of face recognition technology. This technology mainly used in airports and highly protected areas to provide the security and to minimize the presence of unwanted people. While comparing this technology with today's existing biometrics systems which uses mainly fingerprint and Irish, face recognition technology has multiple applications along with advantages since it works while without having physical contact with the people which means it can take the picture of a person for the purpose of person identification from a distance without touching or without creating an interaction with them. Face recognition technology is used for restrict the crimes and mainly used in identification of criminals that helps in identifying the same facial characteristic person later.

A facial recognition technology that perfectly identifies or verifies person from a given digital image or in a particular video frame from any video sources. There are variety of methods in which working of this technique can be seen but in general, this work while comparing facial features of given image by validation it with faces within database. Face Recognition method is a perfect method to overcome the existing methods of attendance taking. The system is python and tkinter based, supported with commonly known database MySQL database. This is easy to implement by any organizations and institutes. Here we perform the authentication of a face by confirming by tallying the realtime face with data base along with this it completely reduces the possibilities of fake attendance since it is a common problem which is facing in existing traditional methods which are used to take attendance.

According to our observations while detecting a face in an image and also while recognizing it we figured out some of the common challenges which are listed below

- Illumination: Challenges related to different angle of light
- Background: Refers different objects in the background
- Occlusion: Facial feature identification closing.
- Pose variations: Input face with different angles.
- Facial expression charges: Due to this facial feature can be changed so while comparing with database image we won't find any matches.
- Ageing of the face: refers to changes in face shape.
- Image resolution and modality etc.

This system is developed mainly for the purpose of automatically identify a person using OpenCV technique for attendance purpose, which is a leading domain inmachine learning

- This system can be used for taking Attendance in organizations.
- It can store the faces that are detected and can be used for future use as evidence.
- It is convenient and secure for the users.
- It saves their time and efforts.

In modern world Face recognition technology emerged as a very popular topic in on going trends of research because it increases demand by authentication of people with peak security, also extreme improvement and development of smart devices which includes camera in it provides security by using face recognition technology. Some of applications where face recognition technology is been widely used are listed below

- Access control: refers to office access, computer access, phone access, and access to ATMs, etc
- Identity verification: verifying the person by comparing his or her face
- Security systems: providing security with face identification.
- Surveillance systems: Identification of suspicious activities
- Social media networks

Proposed system helps to identify the face by capturing the image of a student or employee and verification of the face is done with existing face then after successfully comparing it provides attendance of the particular student or employee. In the next section we will discuss about related works which are related to our work.

2. LITERATURE REVIEW

Literature Review provides a brief survey about various existing methods available in literature for real time face recognition attendance system. There are lot of works are being carried out on facial recognition attendance system techniques, various techniques are used to recognize the face and taking an attendance in a video or in an image. This section reviews the few of the related works to our paper.

Tripathi et.al professed to have a real-time system that could track pupils' presence in a learning environment. Until the computer is shut off, the required supporting photos for this model were delivered through a webcam at a consistent pace. To aid with face recognition and identifying them, the author ran a number of strategies through them. With the aid of the Ada boost and

Haar cascade classifiers, pupils are differentiated. Although the author used the OpenCV modules for facial exposure and memory, for rapid insights he quickly used PCA and LDA. Additionally, the text emphasized the distinction between LDA and PCA. In the conclusion, the author expressed confidence in the system's correctness and highlighted that its high recognition rate.

Ms. Pooja Humbe et.al used a 360-degree spinning lens to construct an object that can identify students in a classroom. According to the author, this system wouldn't have been conceivable without technologies like the XAMPP controller, NetBeans, Java Advance for the interface, and MySQL for the backend. Principal component analysis (PCA) is used to bring the features onto the facial. Once logged in, instructors and parents will get an email with an inventory of the children' names who participated.

Shireesha Chintalapati et.al the Viola Jones Face Detection Algorithm was developed. The researchers have combined numerous Haar classifier to obtain greater output rate that reach 30-degree angles, according to the study, which claims that this technique gives superior results in a variety of illumination circumstances. The face picture is scaled down to 100x100 during the process of preprocessing in order to equalize the histogram's values. Images have been reduced to a size of 100x100, converted to grayscale, and given a histogram equalization. The LBPH method was used by the system to gather the attributes, and the SVM classifier was used for classification. The NITW database, which contained 80 people, was utilized for this paper. For the project, about 20 photographs of each person were gathered. The requirements for assessment of performance while merging LBPH are outlined in this paper.

E. Varadharajan et.al presented the Face Detection-based automated Attendance Management system. The writer explains how individuals are detected, clipped, and then background elimination is used to the image to enhance the system's efficiency. The learned writers advise using Eigen visage because to its ease of use and superior facial recognition capabilities. The document's conclusion noted that, when it came to women, the detection and recognition rates of faces with veils were 45% and 10%, respectively, whereas they were ninety-three and eighty-seven without veils. On the other hand, bearded males had recognition and recollection rates of seventy and sixty-five percent, respectively.

Akshara Jadhav et.al Viola Jones' suggested facial interaction method, the PCA algorithm for face identification, and the SVM for extract ability. The author used processing, which involves scaling the retrieved face picture to 100x100 and equalizing its histogram. It has been demonstrated that deep neural networks can be used for facial recognition, and we may see the potential of a semi-supervised learning technique that employs face recognition SVMs for successful outcomes. After an individual's face is recognized, the next step is to create

attendance data that may be communicated to parents or guardians on a monthly or weekly schedule.

3. PROPOSED SYSTEM

The function of the proposed system is mainly to capture each student's face and store it in a database for their attendance. The student's face should be captured in such a way that all features of the student's face are detected, the student's seat and posture should also be identified by the system. Teachers do not need to manually take attendance in class as the system records the video after that in next steps the is face is recognized and the attendance is updated in database

This automated attendance system technique divided into four modules and their functions are defined. The modules which the system is divided are listed below

- Face Detection
- Capture of Images
- Image Preprocessing
- Post Processing of image

Below diagram represents Architecture of proposed system, where all modules that are part of a recognition process is shown. System contains major 2 phases that are training and test phases. Train phase is conducted and file is created. The recognition system with the help of OpenCV image processing is done and LBPH classifier for face recognition is used.
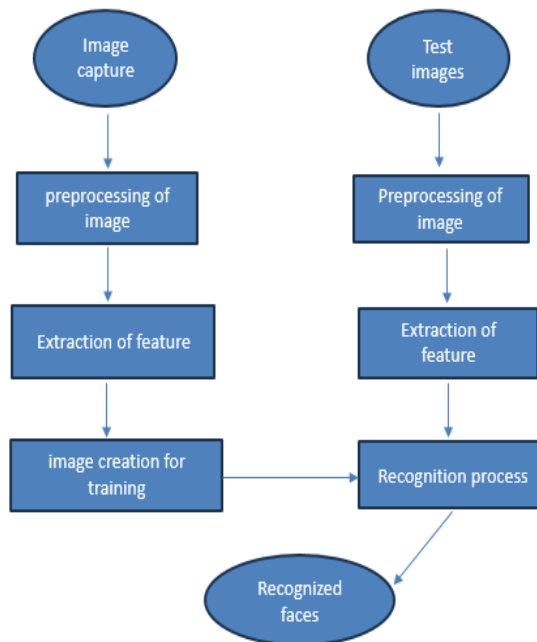

Fig 1: Architecture of Face recognition system

3.1 Face Detection

A good and sufficient face detection algorithm makes the performance of face recognition systems very accurate. different methods and algorithms are proposed for face detection which are facial geometry based, Feature based methods, Machine learning methods. As compared to all of this Viola and Jones framework provides very high detection ratio, and it is fast working.

Viola-Jones detection method is very good choice for realtime applications because it is fast and robust. Hence Viola-Jones face detection algorithm is better choice for making use of Integral Image and using ADAboost learning algorithm as a classier. After all this We can me known that this algorithm gives better results in different light conditions and we collaborated Haar classifiers to increase detection rates up to an angle of 35 degrees.

3.1.1 Working of Haar-cascade algorithm

There are so many techniques are used to detect face of human begins, with the help of different techniques, we can easily identify faces with highest accuracy. These techniques had an almost same working procedure for Face Detection such as OpenCV, artificial Neural Networks, MATLAB, etc. The face detection works by detecting multiple faces in a input image. Here it works on OpenCV for Face Detection, and there occurs some major steps that shows actual working of face and it operates, the complete process id described are as follows-

Firstly, the image is imported by providing the particular location of the image provides by importing it. Then actual picture is transformed into gray from RGB since it is very easy procedure to detect faces which are in grayscale.

Fig 2: Converting RGB image to Grayscale.

After this step image is manipulated by changing its size, reducing its dimensions, sharpening as

well as blurring of an image is done if it is necessary. In next step consists of segmentation of image that can is used for contour identification with detection otherwise segments the multiple objects in a single image so that the classifier can quickly detect the objects and faces in the picture.

After completing above procedures Haar-Like features algorithm is applied, which is proposed by Voila and Jones. This algorithm mainly used for find and locate the position of the human faces in a frames or images. the below images clearly show the working procedure of this algorithm.
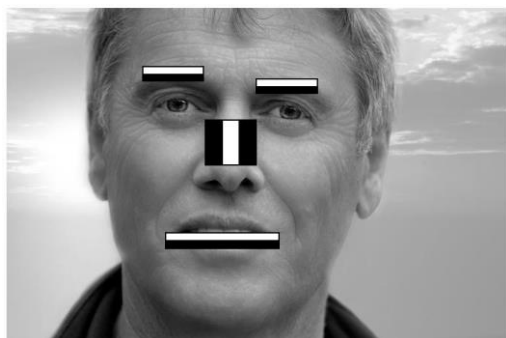

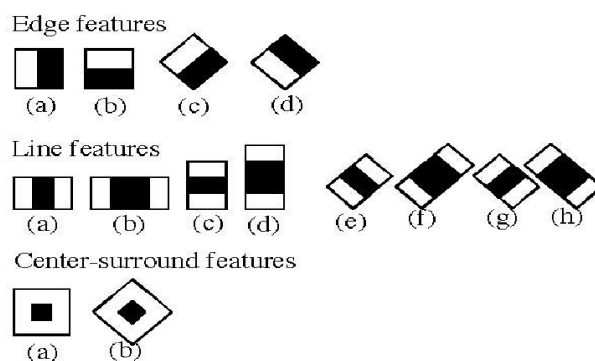Fig 3(a) : finding the location of face in frame

Fig 3(b): Haar-like features for face detection

In next step is the coordinates of a, b, c, d which is u a rectangle box in the picture to show exact position of the face otherwise this can consider to show region of interest in image. After all this, it will create a rectangle box in a particular area where face is detected and located.

Fig 4: Location of a face in an image

3.2 Face Detection using Haar-Cascades

The image is analyzed using Haar-cascades classifier, a scale created and that scale smaller than targeted image. Then it is placed on image along with this the average of the values of pixels in each section it is taken. If difference 2 values overcome a threshold, it is considered as match to

the existing value. Face detection of human face is created by matching combination of different Haar-Like features.

ADAboost is a machine learning algorithm which is mainly used to tests out some of week classifiers in a particular location then it chooses most perfect one. The direction of the classifiers can be changed to get better output if it is necessary.
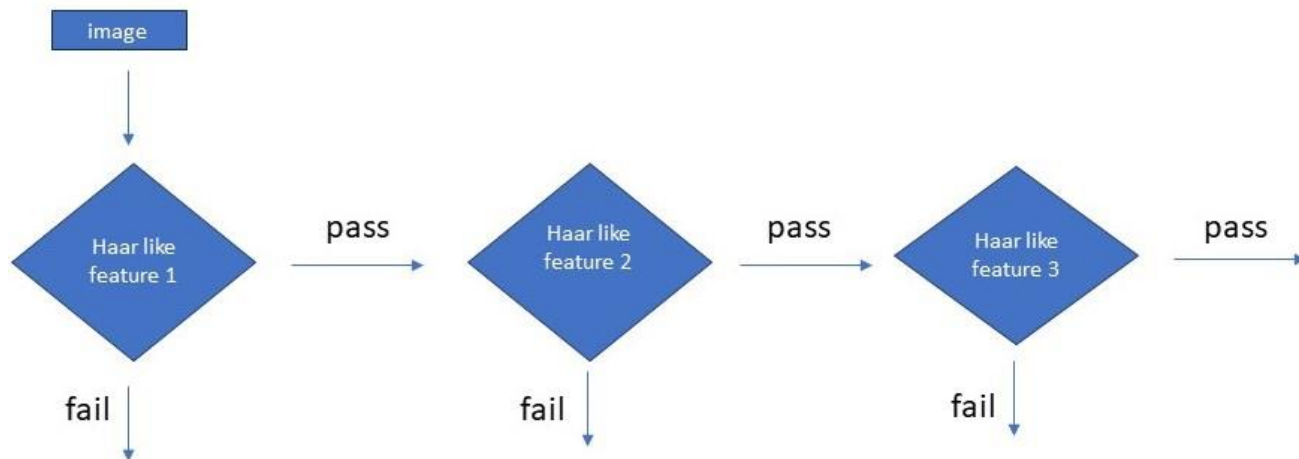

Fig 5: Haar-cascade flow chart

3.3 Capturing of Image

The Camera is placed at some distance from entry point, then it automatically captures the students' images who are entering the classroom and later that image is converted in to a gray scale image.

3.4 Pre-Processing

In this step extraction of the face is done by using preprocessing that includes resizing, sharpening of image to detect exact position of the face in an image. Histogram Equalization is the commonly used normalization technique based on histogram normalization we can easily improve the contrast and intensity of an image by creating an accurate data set and creating images for training using algorithm.

The preprocessing consists of follows steps:

- Transformation to grayscale

- Normalization of image size

- Histogram Equivalization technique

3.5 Post Processing

In postprocessing the actual input image is compared to the image that exists in database, if we get any matches then it consider it as a face which is known, otherwise the face detected is considered as unknown, if the face is known then attendance of the known face is stored in the database with his name and subject details along with the time before recognizing the face the student must get enrolled to this system so we can compare this database with real time images that contains human faces.

4. RESULTS

The complete analysis of our work is clearly described with the help of the table that listed below, which provides accuracy for each and every steps the face is first detected using real time detection method with the help of camera then it is stored in data base, when the attendance is need to be taken on that time the current detecting face is compared with existing faces if it get matches then the attendance of the student is stored as present with date, time and subject name.

Table 1: Accuracy rate of proposed system in different illumination condition.

Accuracy of face recognition attendance system	In good illumination	In average illumination	In bad illumination
Known faces detection Accuracy	Trial 1) 86% Trial 2) 83% Trial 3) 84%	Trial 1) 80% Trial 2) 81% Trial 3) 79%	Trial 1) 65% Trial 2) 58% Trial 3) 61%
Blurring percentage in video of known face	Trial 1) 14% Trial 2) 17% Trial 3) 16%	Trial 1) 18% Trial 2) 19% Trial 3) 20%	Trial 1) 26% Trial 2) 28% Trial 3) 31%
Detection angle in a video	Trial 1) Up to 35^0 rotations Trial 2) up to 33^0 of rotation Trial 3) up to 31^0 of rotation	Trial 1) Up to 28^0 rotations Trial 2) up to 26^0 of rotation Trial 3) up to 25^0 of rotation	Trial 1) Up to 20^0 rotations Trial 2) up to 21^0 of rotation Trial 3) up to 22^0 of rotation
Unknown faces detection Accuracy	Trial 1) 88% Trial 2) 87% Trial 3) 89%	Trial 1) 81% Trial 2) 82% Trial 3) 80%	Trial 1) 66% Trial 2) 59% Trial 3) 62%
Blurring percentage in video of unknown face	Trial 1) 12% Trial 2) 14% Trial 3) 15%	Trial 1) 19% Trial 2) 18% Trial 3) 20%	Trial 1) 25% Trial 2) 28% Trial 3) 29%

5. CONCLUSION

The proposed system works smoothly by detecting and recognizing the face and marking the attendance of an individual person which can be used as attendance records. It is better way of taking an attendance as compared to the existing manual attendance taking techniques. This can be widely used in any institutes, organizations, offices and others. In good lighting conditions this system works with high accuracy and this method is tested in different illuminations, with different angles of face where it is observed that it works smoothly in good illumination condition and struggles little bit in average illumination condition.

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