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ATTENDANCE SYSTEM USING CASCADE CLASSIFIER

Abdul Azeem[1], Ankit Verma[2], Akansha Bhatnagar[3], Harsh Choudhary[4], Ms. Kanchan Singh[5]

[1,2,3,4]Student, [5]Assistant Professor

Department of Computer Science & Engineering

Moradabad Institute of Technology, Moradabad, India

I. Abstract

Various organisations like schools, colleges, companies, etc., require to keep the daily record of their students/employees. Manual attendance maintaining is difficult process, especially for large group of students. Traditional face recognition systems employ methods to identify a face from the given input but the results are not usually accurate and precise as desired. Some automated systems developed to overcome these difficulties but they have drawbacks like cost, fake attendance, accuracy, intrusiveness, etc. To overcome these drawbacks, there is need of smart and automated attendance system. In this paper, we present Attendance System by using cascade classifier with real time video as an input. The working method of this system is entirely divided into six main modules:

- Image Capture
- Image Pre-Processing
- Face Detection
- Training Data
- Face Recognition
- Database Development

System will recognise one or more people captured in that video, this is taken as an output of this system. After recognition the attendance will marked and saved in database.

Keywords: Image processing, Expressions, HAAR features, HOG features, Face Detection Method, Face Recognition Method, Features Extraction, Features Matching, Query Image

II. Introduction

Tracking student attendance in the classroom is done manually by using the traditional pen and paper or file based approach which is normally passed around the classroom while faculty member is conducting the lecture. The task of every day attendance is a real struggle as it frustrates the one who is calling each name in every class that too in every single lecture. The human effort in the existing system is much more than the proposed system. The retrieval of the information is not as easy as the records are maintained in the hand written registers. This application requires correct feed on input into the respective field. Suppose the wrong inputs are entered, the application resist to work. So the user finds it difficult to use.

Our proposed system consists of a camera that captures the images of the classroom and sends it to the image enhancement module. After enhancement the image comes in the Face Detection and Recognition modules and then the attendance is marked on the database server. At the time of enrolment, templates of face images of individual students are stored in the face database. If any face is recognized the attendance is marked on the database from where teachers can access and use it for different purposes. Camera takes the images to detect and recognize all the students in the classroom. Two databases are displayed in the experimental setup. Face Database is the collection of face images and extracted features at the time of enrolment process and the second attendance database contains the information about the teachers and students and also uses to mark attendance.

III. Proposed system

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. The proposed automated attendance system can be divided into five main modules. The modules and their functions are defined in this section. The five modules into which the proposed system is divided are:

a) Image Capture

The Camera is mounted at a distance from the entrance to capture the frontal images of the students and further process goes for face detection. A proper and efficient face detection algorithm always enhances the performance of face recognition systems. Various algorithms are proposed for face detection such as Face geometry based methods, Feature Invariant methods, System Diagram Machine learning based methods. Out of all these methods Viola and Jones proposed a framework which gives a high detection rate and is also fast. Viola-Jones detection algorithm is efficient for real time application as it is fast and robust. Hence we chose Viola-Jones face detection algorithm which makes use of Integral Image and AdaBoost learning algorithm as classifier. We observed that this algorithm gives better results in different lighting conditions and we combined multiple haar classifiers to achieve a better detection rates up to an angle of 30 degrees.

b) Pre-Processing

The detected face is extracted and subjected to pre-processing. This pre-processing step involves with histogram equalization of the extracted face image and is resized to 100x100. Histogram Equalization is the most common Histogram Normalization technique. This improves the contrast of the image as it stretches the range of the intensities in an image by making it more clear

c) Face detection

Although many different algorithms exist to perform face detection, each has its own weaknesses and strengths. Facial detection is impossible if the face is not isolated from the background. Analyzing the pixels for face detection is time consuming and difficult to accomplish because of wide variations of shape and indecent within a human face. Pixels are also required for scaling and precision. Viola and Jones devised an algorithm, called Haar Classifiers, to rapidly detect any object, including human faces, using AdaBoost classifier cascades thatare based on Haar-like features and not pixels.

Adaboost stands for 'Adaptive Boosting'.

Final Equation for classification is given as:

$$F(x) = sign(\sum_{m=1}^{M} \theta_m f_m(x)),$$

Here f_m designates the m^{th} weak classifier and $_m$ represents its corresponding weight.

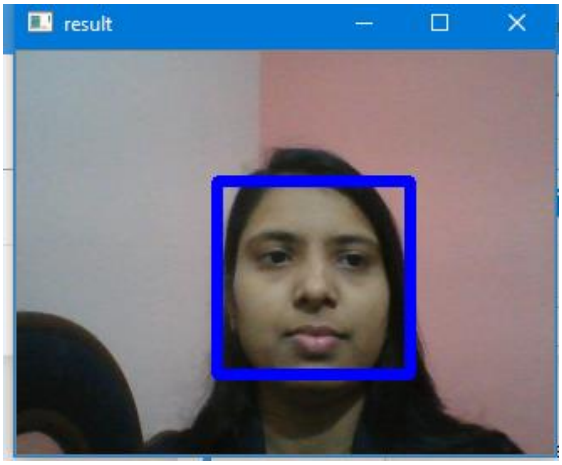

Fig 1.1: Face Detection

HAAR CASCADE CLASSIFIER:

The core basis for Haar classifier object detection is the Haar-like features. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are used to determine relative light and dark areas. Two or three adjacent groups with a relative contrast variance form a Haar-like feature. Haar-like features as shown in figure are used to detect an image. Haar features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to detect objects of various sizes.

The cascading of the classifiers allows only the sub-images with the highest probability to be analyzed for all Haar-features that distinguish an object. It also allows one to vary the accuracy of a classifier. One can increase both the false alarm rate and positive hit rate by decreasing the number of stages. The inverse of this is also true. Viola and Jones were able to achieve a 95% accuracy rate for the detection of a human face using only 200 simple features.

Detecting human facial features, such as the mouth, eyes, and nose require that Haar classifier cascades first are trained. In order to train the classifiers, this gentle AdaBoost algorithm and Haar feature algorithms must be implemented. Fortunately, Intel developed an open source library devoted to easing the implementation of computer vision related programs called Open Computer Vision Library (OpenCV). The OpenCV library is designed to be used in conjunction with applications that pertain to the field of HCI, robotics, biometrics, image processing, and other areas where visualization is important and includes an implementation of Haar classifier detection and training.

Thus with help of this algorithm system will detect the person's face in the video. Face of the person gets Green Square as an indication of detection process. As soon as the face gets detected user can paused the video and enters the data of detected person such as person's name, address, profession, criminal record if any. If the detected person has criminal record then it can be defined as suspect. Check box option is given in the system where user can tick whether the person is suspect on not. This is the working of first module in which sample video is browsed and face is detected.

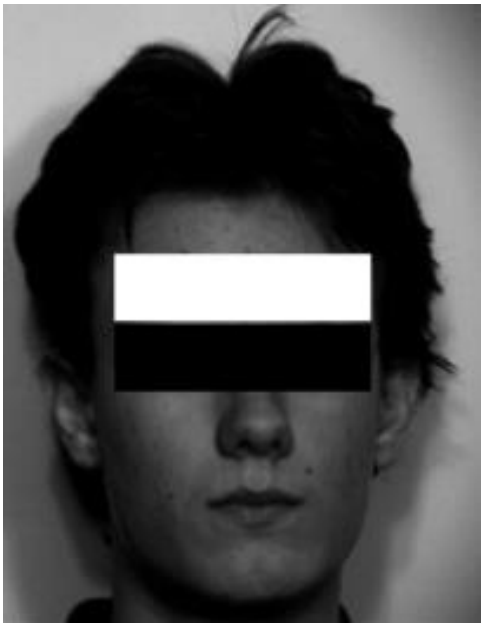

Fig 1.2: Haar Features

d) Training Model

For training the model, we need a set of positive samples (containing actual objects you want to detect) and a set of negative images (containing everything you do not want to detect). The set of negative samples must be prepared manually, whereas set of positive samples is created using the opencv_createsamples application. After preparing the above sets, the next step is the actual training of the boosted cascade of weak classifiers, based on the positive and negative dataset that was prepared beforehand.

After the 'opencv_traincascade' application has finished its work, the trained cascade will be saved in 'cascade.xml' file in the folder, which was passed as -data parameter.

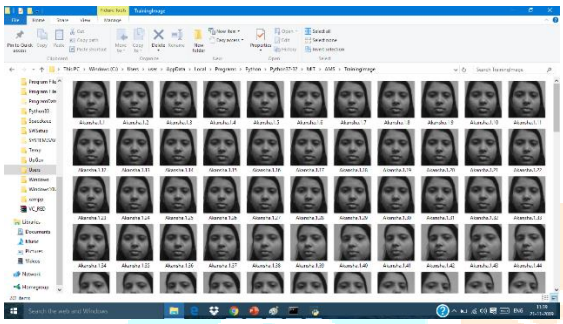

Fig 1.3: Image Samples

e) Face Recognition

Face recognition refers to an automated or semi automated process of matching facial images. Depends on the Appearance based in linear manner, we used PCA (Principal Component Analysis) method for face recognition. PCA is a way of identifying patterns in data and expressing the data in such a way to highlight their similarities and differences. The purpose of PCA is to reduce the large dimensionality of the data space (observed variables) to smaller intrinsic dimensionality of feature space (independent variables) which are needed to describe the data economically.

The main idea of using PCA for face recognition is to express the large 1-D vector of pixels constructed from 2-D facial image into the compact principle components of feature space. This method is also called as Eigen space projection. With the help of PCA, we get a subset of principal components in a set of training faces. We project faces into this principal components space and get Eigen face vectors. Calculating the distance between these vectors, comparison is performed. After performing a PCA, original data is expressed in terms of Eigen vectors found from the comparison matrix.

For the face recognition several types of decision can be made depending on the application. Face recognition is a broad termwhich may be further specified to one of following tasks:

- Identification:- where the labels of individuals must be obtained
- Recognition:- recognition of a person, where it must be decided if the individual has already been seen,
- Categorization:- where the face must be assigned to a certain class

PCA computes the basis of a space which is represented by its training vectors. These basis vectors, actually eigenvectors, computed by PCA are in the direction of the largest variance of the training vectors. When a particular face is projected onto the face space, its vector into the face space describes the importance of each of those features in the face. The face is expressed in the face space by its eigen face coefficients (or weights). We can handle a large input vector, facial image, only by taking its small weight vector in the face space. This means that we can reconstruct the original face with some error, since the dimensionality of the image space is much larger than that of face space. With the help of this technique, system can recognize already detected face from the video. Under the framework of Face Name Graph Matching, recognized face will automatically get the name and all other details. If the recognized face is of suspect's

f) Database Development

As we chose biometric based system enrolment of every individual is required. This database development phase consists of image capture of every individual and extracting the bio-metric feature, in our case it is face, and later it is enhanced using pre-processing techniques and stored in the database. Post-Processing In the proposed system, after recognizing the faces of the students, the names are updated into an excel sheet. The excel sheet is generated by exporting mechanism present in the database system. The database also has the ability to generate monthly and weekly reports of students attendance records. These generated records can be sent to parents or guardians of students. At the end of the class a provision to announce the names of all students who are present in the class is also included. This ensures that students whose faces are not recognized correctly by the system have the chance to send a ticket to staff. And thus giving them the ability to correct the system and make it more stable and accurate. The announcement system is implemented using text to speech conversion. Many algorithms and applications are available that can convert text to lifelike speech.

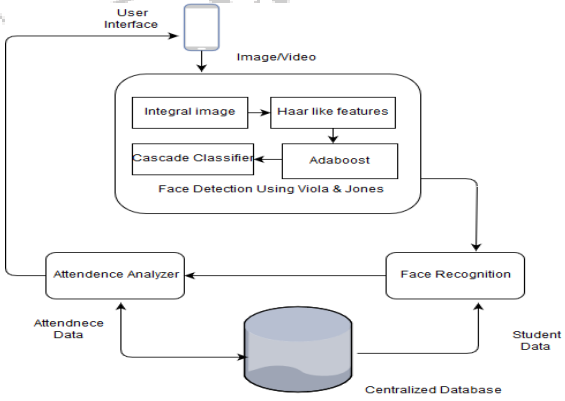

Fig 1.4: Proposed System

IV. APPLICATIONS

a) Institutions

Institutions have the traditional way of marking attendance where call out each student name to check if they are present. This method of roll call is time consuming and tedious. By using Facial Recognition, the process of taking attendance can be significantly improved to save time and provide a hassle-free way to automatically mark attendance. Since the number of students

in an institution are more, using an automated system improves the productivity and standard of the college.

b) Companies

In most companies, employees have the practice of using their biometrics or ID card to log their time of entry and exit. During the peak hours the number of people entering and exiting the office.

c) Prison

In prisons, everyday a head count of the prisoners is done to check if all inmates are present. Using facial recognition to automate this process of doing head count the increases the efficiency and reliability is improved. The security also increases as tabs can be kept on each prisoner at all times

V. CONCLUSION

Automated Attendance System has been envisioned for the purpose of reducing the errors that occur in the traditional (manual) attendance taking system. The aim is to automate and make a system that is useful to the organization such as an institute. The efficient and accurate method of attendance in the office environment that can replace the old manual methods. This method is secure enough, reliable and available for use. No need for specialized hardware for installing the system in the office. It can be constructed using a camera and computer.

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VII. REFERENCES

[1]Yohei KAWAGUCHI, Tetsuo SHOJI, Weijane LIN, Koh KAKUSHO, Michihiko MINOH, "Face Recognition-based Lecture Attendance System", Oct 2014.

[2]Face Recognition Based on HOG and Fast PCA Algorithm Xiang-Yu Li(&) and Zhen-Xian Lin

[3]Attendance System Using Face Recognition and Class Monitoring System, Arun Katara1, Mr. Sudesh2, V. Kolhe3

[4]Benfano Soewito, Ford Lumban Gaol," Attendance System on Android Smartphone", 2015 International Conference on Control, Electronics, Renewable Energy and Communications (ICCEREC).

[5] AparnaBehara, M.V.Raghunadh, "Real Time Face Recognition System for time and attendance applications", International Journal of Electrical, Electronic and Data Communication, ISSN 2320-2084, Volume-1, Issue-4.

[6] Xinjun Ma, Hongqiao Zhang, XinZang, "A face detection algorithm based on modified skin-color model", CCC, vol. 1, pp. 3896-3900, IEEE, 2013

[7] V. Shehu and A. Dika, "Using Real Time Computer Algorithms in Automatic Attendance Management Systems." IEEE, pp. 397 – 402, Jun. 2010.

[8]Anushka Waingankar, Akash Upadhyay, Ruchi Shah, Nevil Pooniwala, Prashant Kasambe "Face Recognition based Attendance Management System using Machine Learning " IRJETVolume: 05 Issue: 06June-2018

[9] Seema Rao and Prof.K.J.Satoa, "An Attendance Monitoring System Using Biometrics Authentication", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 4, April 2013, ISSN: 2277 128X

[10] Rajath S Bharadwaj, Tejus S Rao, Vinay T R "Attendance Management Using Facial Recognition" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-6, April 2019

[11] Dan Wang, Rong Fu, Zuying Luo, "Classroom Attendance Auto-management Based on Deep Learning",Advances in Social Science, Education and Humanities Research, volume 123,ICESAME 2017.