FACE RECOGNITION BASED ATTENDANCE SYSTEM

[1]Deeksha Singh, [2]Manoj Kumar, [3]Nausheen Khan, [4]Bhushan Malkapurkar

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

Department of Electronics and Telecommunication

Dr D. Y. Patil. School OF Engineering And Technology, Pune, India

Abstract: Traditionally attendance is marked manually by teachers and they must make sure correct attendance is marked for respective student. This whole process wastes some of lecture time and part of correct information is missed due to fraudulent and proxy cases. In order to determine classroom attendance, face recognition is performed. Face detection is used to determine the location of the faces in the classroom image and extract sub images for each face. Then, in face recognition, the face images detected will be compared with the data base consisting of images of students in the class, and attendance will be recorded accordingly.

KEYWORDS: Histogram, Oriented, Gradients, Feature, Descriptor, Dlib

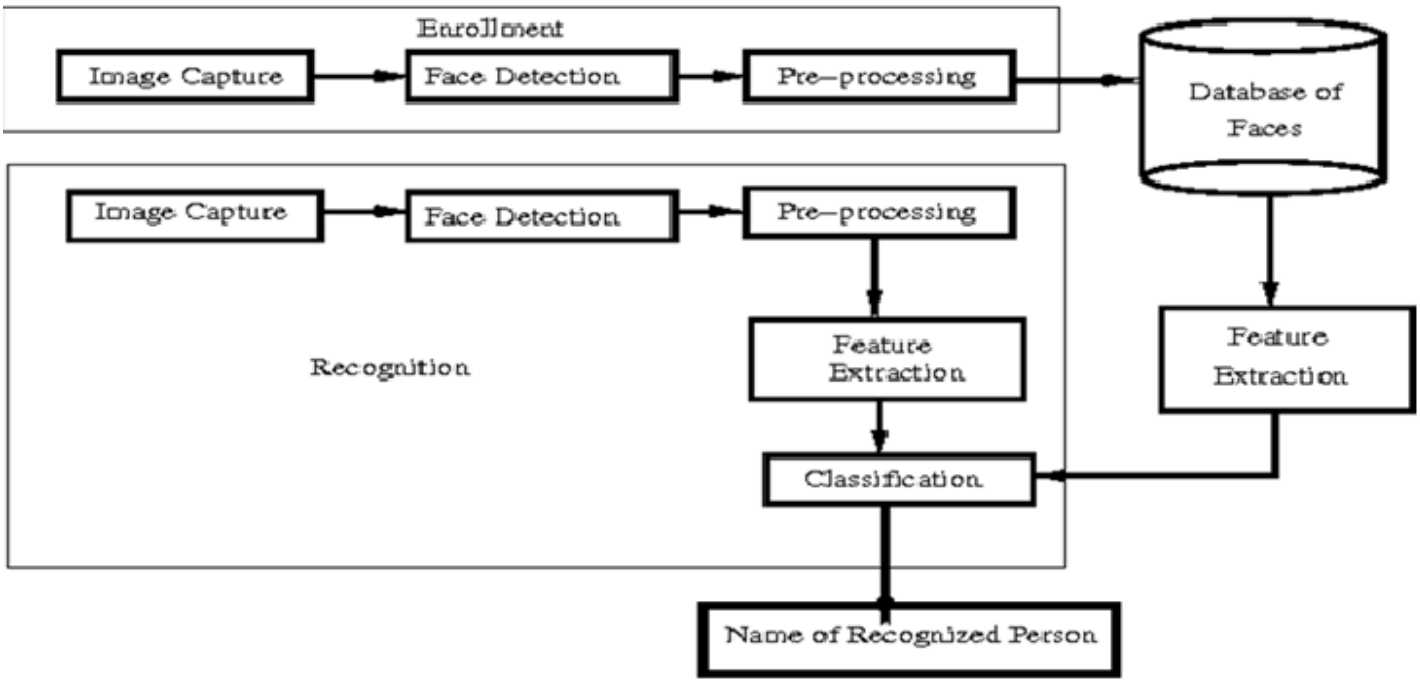
1. INTRODUCTION

Face recognition is an important part of the capability of human perception system and is a routine task for humans, while building a similar computational model of face recognition. Face recognition technologies have seen dramatic improvements in performance over the past years, and such systems are now widely used for security and commercial applications. An automated system for human face recognition in a real time background for school, college and organizations to mark the attendance of their employees. So Smart Attendance using Real Time Face Recognition is a real-world solution which comes with day to day activities of handling employees. The task is very difficult as the real time background subtraction in an image is still a challenge. To detect real time human face are used and a simple fast Principal Component Analysis has used to recognize the faces detected with a high accuracy rate. The matched face is used to mark attendance of the employee. Our system maintains the attendance records of employees automatically. Manual entering of attendance in logbooks becomes a difficult task and it also wastes the time. So, we designed an efficient module that comprises of face recognition to manage the attendance records of employees.

Our module enrols the staff's face. This enrolling is a onetime process and their face will be stored in the database. During enrolling of face, we require a system since it is a onetime process. The presence of each employee will be updated in a database. The results showed improved performance over manual attendance management system. Attendance is marked after employee identification. This product gives much more solutions with accurate results. Maintaining the attendance is very important in all the institutes for checking the performance of employees. Every institute has its own method in this regard. Some are taking attendance manually using the old paper or file-based approach and some have adopted methods of automatic attendance using some biometric techniques. But in these method employees must wait for long time in making a queue at time they enter the office. Many biometric systems are available, but the key authentications are same is all the techniques.

Every biometric system consists of enrolment process in which unique features of a person is stored in the database and then there are processes of identification and verification. These two processes compare the biometric feature of a person with previously stored template captured at the time of enrolment. Biometric templates can be of many types like Fingerprints, Eye Iris, Face, Hand Geometry, Signature, Gait and voice. Our system uses the face recognition approach for the automatic attendance of employees in the office room environment without employees' intervention. Face recognition consists of two steps, in first step faces are detected in the image and then these detected faces are compared with the database for verification. A number of methods have been proposed for face detection i.e Hog Algorithm (Histogram of oriented gradient) and Face Landmark Estimation. The efficiency of face recognition algorithm can be increased with the fast face detection algorithm. Our system utilized this algorithm for the detection of faces in the office room image.

2. BLOCK DIAGRAM:



" Fig.1: System Architecture**"**

3. DESIGN PROCEDURE:

3.1. Histogram of Oriented Gradients

HOG is a dense feature extraction method for images. Dense means that it extracts features for all locations in the image (or a region of interest in the image) as opposed to only the local neighbourhood of key points like SIFT.

Intuitively it tries to capture the shape of structures in the region by capturing information about gradients. It does so by dividing the image into small (usually 8x8 pixels) cells and blocks of 4x4 cells. Each cell has a fixed number of gradient orientation bins. Each pixel in the cell votes for a gradient orientation bin with a vote proportional to the gradient magnitude at that pixel.

To reduce aliasing, the pixels votes are bilinear interpolated. This interpolation happens in both the orientation as position. This statement is important - it means that a pixel will not only vote for its orientation bin, but also for the two neighbouring orientation bins (e.g. it the gradient orientation at a pixel is 45 degrees, it will vote with a weight of 0.5 for the 35 to 45-degree bin and a weight of 0.5 for the 45 to 55-degree bin). Similarly, it will vote for these two orientation bins not only in its cell, but also in the 4 neighbouring cells of its cell. The weights here are decided by the distance of the pixel from the cell canters.

Histograms are also normalized based on their energy (regularized L2 norm) across blocks. Since the blocks have a step size of 1 cell, a cell will be part of 4 blocks. This defines four differently normalized versions of the cell's histogram. These 4 histograms are catenated to get the descriptor for the cell. Typically, the elements of histograms are also capped at some value. There are some more bells and whistles, and I refer the interested reader to the paper which also has a lot of evaluations for the parameters (e.g. normalization strategy, cell and block sizes cell and block geometry etc.) and also describes how to use these features with a linear SVM for detecting objects. The paper is quite easy to read.

Histogram of Oriented Gradients is a feature descriptor used in image processing, mainly for object detection. Now here we have some important terms, namely:

Histogram: -This refers to its nature, which is that of a histogram. That means the data is organized in bins. This is important for later.

Oriented: -We are going to consider certain attributes of the objects we are scanning, one of those is the orientation of each pixel.

Gradients: -Another attribute is the intensity change or gradient.

Feature: -Certain characteristics that make it unique.

Descriptor: -This is the goal of the HOG. The HOG creates a descriptor. This contains information regarding the object's features. We can later compare two descriptors to see if they depict the same object. It usually takes the form of a vector.

3.2. How useful is it?

Well, granted, teaching a machine how an object looks like is a difficult task because of reasons like viewpoint-dependent object variability (objects look different from different angles) or high in-class variability of many object types (object of the same type sometimes look different), but great strides have been made. We just have to teach the machines in a different way.

We know that the descriptor is a vector that has information regarding the direction and the magnitude of the energy in the image. This is important because, usually, that information is somewhat unique. That means if we had something that could distinguish between descriptors and organize them in classes, we could make, for example, an application that does face recognition or object detection.

We already have such a thing; it's called an SVM (Support Vector Machine). The SVM is a type of neural network that can be used to analyze vectors of the same sizes. With enough training, it could recognize objects of the same type.

3.3. Face Landmark Estimation Technique

Identifying faces in photos or videos is very cool, but this isn't enough information to create powerful applications, we need more information about the person's face, like position, whether the mouth is opened or closed, whether the eyes are opened, closed, looking up and etc. In this article I will present to you (in a quick and objective way) the Dlib, a library capable of giving you 68 points (landmarks) of the face.

3.4. What is Dlib?

It's a landmark's facial detector with pre-trained models, the dlib is used to estimate the location of 68 coordinates (x, y) that map the facial points on a person's face like image below.

"**Fig.2:**The 68 facial landmark cordinates "

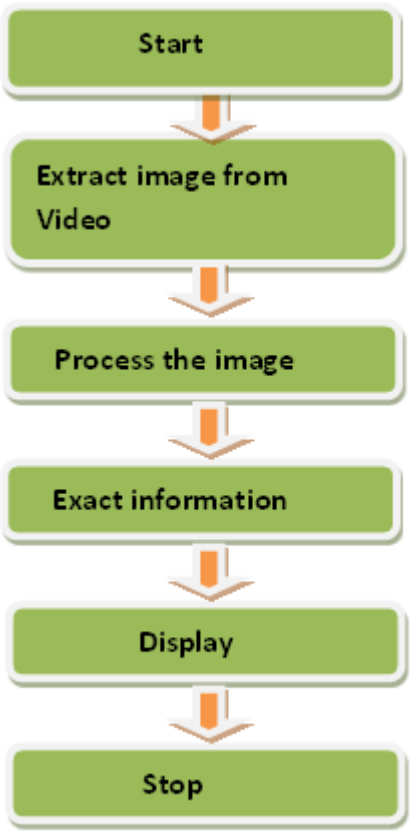
It is an upgraded version of the library, where not only revising the code, but additional task for optimizing dlib library was also needed. As a result, Fast Face speeds up 2x or more from the original app (higher resolution, higher speed).

Real-time head pose estimation**.** Before rendering a 3D model, we need to find the face pose, which are its translation and rotation in 3D space. We didn't find any generic way to solve this task in real-time, so we had to make some compromises. We select just a few landmark points obtained from dlib and match them with an average male face 3D model using OpenCV's solvent function, which applies cascaded regression trees to predict shape (feature locations) changing in every frame. It gives us the translation and rotation vectors of the face from which we can obtain a View matrix.

View matrix is a matrix for transforming vectors from "world" coordinates to the "camera" coordinates, which are basically the same linear 3D coordinates, but now are relative to the camera. To better understand it imagine a 3D space where camera is at (0, 0, 0) and pointing towards the Z axis. When we have that all we need is a projection matrix to calculate final vertex positions in screen coordinate space, that is a simple perspective projection constructed using the field of the camera's view.These are all the pieces required to successfully transform model's coordinates into the 2D image space.

4. ALGORITHM

- **Flow Chart**



"Fig.3: Flowchart to proposed methodology**"**

5. IMPLEMENTATION AND RESULT:

In Face Recognition Based Attendance System we tried to overcome the drawback of traditionally marking the attendance and its consequences that manually marking the attendance by teacher and they must make sure that the correct attendance should be marked for respective student. So, our project will help in overcoming this drawback by using HOG (Histogram of Oriented Gradient) which will help in processing of the image taken by the camera and by Face-Landmark Estimation Technique to recognize the image, which is processed by the HOG Algorithm. So, the manually marking of the attendance wastes some amount of time and part of correct information is missed due to this. So, by using face recognition the face is detected and the attendance is marked with the help of live video which taken by camera and then it is being compared with the database saved before. So, the attendance will be marked automatically with the help face recognition and the database stored. In today's times our project will be helpful in many places such as school, colleges, institutes and many different organizations.

6. CONCLUSION:

This paper attempts a study on the face recognition-based attendance system. Face recognition technologies have seen dramatic improvements in performance over the past years, and such systems are now widely used for security and commercial applications. To detect real time human face are used and a simple fast Principal Component Analysis has used to recognize the faces detected with a high accuracy rate. From the results we have evaluated various face detection and recognition methods and marked the attendance at schools, colleges and various organizations, provided with complete solution for image-based face detection and recognition with higher accuracy, better response rate as an initial step for video surveillance. Solution is proposed based on performed tests on various face rich databases in terms of subjects, pose and emotions.

7. ACKNOWLEDGEMENT

We thank our professors, the head of our department, and our college who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper.

REFERENCES

1) Face and Person Recognition from Unconstrained Video Pooja Malusare , Shivangi Shewale , Sanika Birla , Shivanjali Ghavate , Mohini Arote February 2017.
2) Built-in Face Recognition for Smart Phone Devices Aesha Shah, Kavin Shah, Vidhi Shah, Chintan Shah Apr -2017.
3) Efficient Implementation on Human Face Recognition under Various Expressions using LoG, LBP and SVM Amrutha Bhat , John Prakash Veigas July 2015.
4) Face Detection and Recognition using Viola-Jones algorithm and Fusion of PCA and ANN Narayan T. Deshpande & Dr. S. Ravishankar. , Sept. 2011.
5) Quality-Aware Estimation of Facial Landmarks in Video Sequences Mohammad A. Haque, Kamal Nasrollahi, Thomas B. Moeslund Visual Analysis of People Laboratory, Aalborg University, Denmark May 2015.
6) Facial Landmark Localization: past, present and future Hamid ,OUANAN Mohammed & OUANAN Brahim AKSASSE January 2016.
7) Image Processing Techniques Arpita Mittal1 Amity University, Noida Sanjay Kumar Dubey2 Assistant Professor, Amity University, Noida 3, March 2013.
8) Face Recognition Based on HOG and Fast PCA Algorithm Xiang-Yu Li(&) and Zhen-Xian Lin School of Communication and Information Engineering, Xi'an University of Posts and Telecommunications, Xi'an 710061, China August 2003.
9) Image-based Face Detection and Recognition: based Face Detection and Recognition: based Face Detection and Recognition: "State of the A "State of the Art" Faizan Ahmad , Aaima Najam and Zeeshan Ahmed , November 2012