3-D VISION ATTENDANCE SYSTEM

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled **"3-D VISION ATTENDANCE SYSTEM"** is the bonafide work of "**MANSI SAINI (19BCE10053), SANJANA SINGH (19BCE10274), RACHITA JHA (19BCE10283)"** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported here does not form part of any other project / research work on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Dr. Manas Kumar Mishra

Dean SCSE

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ABSTRACT

Maintaining attendance record of each and every person is a challenging task. As also in [1],Calling name of each student is time consuming and cumbersome to maintain and there is always a chance of proxy attendance. From schools to colleges, offices, IT companies, shops, face recognition is one of the mostly used biometrics, security, authentication and identification to reduce the dependency on ID cards only and to minimize proxy system. It has more advantages than fingerprint system and iris recognition as it is contactless, passive and non-invasive process. This system can also be used for attendance marking in schools, colleges, offices, etc. This project aims to build a class attendance system that uses the face recognition concept. To minimize the situations of proxy, the need for this system increases. Smart Attendance using Real-Time Face Recognition is a real-world solution of handling student attendance system This system consists of four modules- database creation, face detection, face recognition and attendance updation on excel sheet. Database contains the images of the students in class. It has used SVM classifier. Faces are detected and recognized from live streaming or movement of video/ photo excluding certain parts such as hair, which can complicate the recognition process.

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1. INTRODUCTION

1.1   Introduction

Face recognition is an important application of image processing making to its use in many fields maintaining the attendance is very important in all the institutes for checking the performance of employees or students. Many biometric systems are available like iris recognition, fingerprint system, hand geometry, signature, gait, voice and so on but the key authentications are same in all the techniques. Traditional method of attendance marking is a tedious task in many schools and colleges and this puts extra burden to the authorities and is time consuming. Chances of proxy attendance increases. Even in the offices, IT companies, employees have to wait for long time and stand in a queue at time they enter the office. However, these systems might consume more time and can be intrusive in nature. But, face recognition has set an important biometric feature, which is contactless, passive and is non-invasive. It consists of two modules: face detection and face identification. Face verification is a matching process as it compares face image. In first step, range image and texture of the face are acquired. Then, image is preprocessed by removing certain parts such as hair that can complicate the recognition process. Nowadays, face recognition is gaining more popularity and is been widely used. In this paper, we proposed a system which detects the faces of students, employees from live video/photo of institutes, offices, IT companies, shops etc. and attendance will be marked if the detected face is found in the database. It will consume less time than compared to traditional methods. The proposed system aims to overcome the loop holes of the existing systems and provides features such as detection of faces, extraction of the features, detection of extracted features, students' analysis attendance and entering it in excel sheet. It integrates techniques like image contrasts, colour, features

and SVM classifier for feature detection. This system has higher accuracy as it is using varied features.

1.2 Motivation for the work

Our primary goal is to help the authorities, improve and organize the process of track and manage student attendance. Additionally, we seek to:

- Provides a valuable attendance system.
- Reduce manual process errors by providing automated and a reliable attendance system using face recognition technology.
- Increase privacy and security which student cannot present him or his friend while they are not.
- Flexibility, authorities capability of attending records.

1.3 [About Introduction to the project including techniques]

Smart Attendance using Real-Time Face Recognition is a real-world solution of handling student attendance system This system consists of four modules- database creation, face detection, face recognition and attendance updation on excel sheet. Database contains the images of the students in class. It has used SVM classifier. Faces are detected and recognized from live streaming or movement of video/ photo excluding certain parts such as hair, which can complicate the recognition process. After the entry in excel sheet along with time, attendance can be mailed to the respective higher authorities.

1.4 Objective of the work

The main objective of this project is to offer system that simplify and automate the process of recording and tracking students' attendance through face recognition technology. It is

biometric technology to identify or verify a person from a digital image or surveillance video. Face recognition is widely used nowadays in different areas such as universities, banks, airports, and offices. We will use pre-processing techniques to detect, recognize and verify the captured faces

1.5   Summary

The system is developed for deploying an easy and secure way of taking down attendance. The software first captures an image of all the authorized persons and stores the information into database. The system then stores the image by mapping it into a face coordinate structure. Next time whenever the registered person enters the premises, the system recognizes the person and marks his attendance along with the time.

2. LITERATURE SURVEY

2.1   Introduction

Face recognition is one of the few biometric methods. Over past few years many researchers have proposed different face recognition techniques, motivated by the increased number of real world applications requiring the recognition of human faces. There are several problems that make automatic face recognition a very difficult task. However, the face image of a person inputs to the database that is usually acquired under different conditions. The importance of automatic face recognition is much be cope with numerous variations of images of the same face due to changes in pose, illumination, expressions, motions, facial hair etc. Face recognition technology is well advance that can applied for many commercial applications such as personal identification, security system, computer interaction, entertainment system, smart card, law enforcement, surveillance and so on. Face recognition can be done in both a still image and video sequence which has its origin in still-image face recognition.

2.2   Libraries used in the project

So the libraries we have used in our project are as following-

1. OpenCV: OpenCV is a huge open-source library for computer vision, machine learning, and

 image processing. It can process image and video to identify objects, faces.

2. NumPy: NumPy is a general-purpose array-processing package. It gives a high-performance

 multidimensional array object and tools for working with arrays.

3. CMake: It is used for controlling the compilation process by using simple platform and compiler

 independent configuration files and generates native make files and workspaces that can be used

 in the compiler environment of your choice.

4. Dlib: A toolkit for making real world machine learning and data analysis applications. Dlib is a

general purpose cross-platform software library written in the programming language C++. Its

 design is influenced by ideas from design by contract and component-based software engineering.

 Hence, it is a set of independent software components.

5. DateandTime: This package provides a Date Time data type, as known from Zope.

6. Face recognition: The face recognition command lets you recognizes the face in the photograph.

2.3   Existing algorithms for face recognition system for making attendance

2.3.1 Algorithm for Efficient Attendance Management: Face Recognition based approach:

The image of the classroom is captured using a high definition camera. Histogram normalization is used for contrast enhancement in the spatial domain. Median filter is used for removal of noise in the image. The system is trained by the images of faces and then the algorithm is applied on the class room image for detection of multiple faces in the image. Face recognition is done by cropping the detected face from the image and verifying one by one with the face database using Eigen Face method and the attendance is marked . The proposed method is more efficient and accurate than the old manual methods. Multiple face detection is possible.

2.3.2 Automated Attendance Management System Based On Face Recognition Algorithms:

In this, several algorithms were used for feature extraction and classification to identify the best algorithm. The camera is mounted at a distance from the entrance to capture the frontal images of the students. After the histogram equalization and resizing the captured image, the featured is extracted using several algorithms. When recognised the attendance is marked. The LBPH outperforms other algorithms with better recognition rate and low false positive rate. SVM also prove to be better classifiers when compared to distance classifiers. When LBPH is used, recognition rate was high.

2.3.3 Attendance System Using Face Recognition and Class Monitoring System:

This method has used OpenCV for face detection. The picture of the whole class is captured by a camera and loaded to the system. Then, OpenCV library is used for face detection. After histogram equalization, the feature is extracted. The feature extraction is done by PCA algorithm. Then Microsoft excel spreadsheet is used for maintaining attendance records of the students.   The proposed method is fast and secure. Obtained better recognition rate and low false positive rate. Recognition rate may be lower when a whole classroom is considered.

2.4   Observation from the literature survey

As we have seen the applications of face recognition in marking the attendance system using various different algorithms. So far we have use the Eigen face technique, the other method which has used OpenCV for face detection and many other in our literature review. There are many other technical methods that are being proposed. Some of these methods would be Neural networks patterns. The main goal of neural networks is that it has the capability to perform complex face patterns. The neural networks are employed in many layers, different number nodes, and also different learning for

achieving good performance. Other is the Fisher faces approach this is the most widely and effectively used methods for recognition of faces. This method depends on the method of appearance. Similarly there are many other method that can be used in face recognition and detection technique used in Smart attendance system.

3. SYSTEM ANALYSIS

3.1   Introduction

     3.1.1   Background Introduction

The current methods used by the authorities are taking attendance in sheet or making roll call, using fingerprints, etc. which sometimes disturbs the discipline and then it further goes to the admin department, which is then updated to an excel sheet. This process is quite hectic and time- consuming. Also, for professors or employees at institutes or organizations, the biometric system serves one at a time. So, why not shift to an automated attendance system which works on face recognition technique? Be it a classroom or entry gates, it will mark the attendance of the students, professors, employees, etc.

     3.1.2   Current System

At present, attendance, marking involves manual attendance on the paper sheet by professors or authorities, but it is a very time- consuming process and chances of proxy are also an issue that arises in such type of attendance marking. Also, there is an attendance marking such as iris recognition, biometrics, RFID (Radio Frequency Identification), etc. But these systems are currently not that particular in schools, offices, shops for employees, students, etc.

     3.2   Disadvantages/Limitations in the existing   system

- **If in the wrong hands, it will be a disaster -** Cases, where a particular person or a group uses contactless biometric attendance, will mean, they can easily monitor the

whereabouts of a person meaning you will be tracked at all times. This means that AI in Face recognition system can be easily worked against us.

- **Data privacy breach–** The data can be easily tampered and used to in against a particular organization or person which can be very much dangerous. Therefore, companies that use Artificial intelligence based attendance system have a very strict security to safeguard the information of their employees**.**

- **Low reliability-** Sometimes there have been instances where the identity of a person is not able to get verified. There have been also cases where the identity of a person is verified with another person's identity. This means a person who is "X" is recognized as "Y" instead of "X". Times like this can be misused as criminals can loot or commit a crime in the name of other people. This means, that even though we have achieved a lot of advancement in the technology sector, there will always be a small gap between us and the ideal system.

3.3   Proposed System

The proposed method is implemented based on capturing the image, loading the face image in the system, reading and resizing the image, and obtaining RGB, height and width of the image to detect the face and updating it in excel sheet.

The four modules of this proposed work are:

3.3.1 Database creation- A database is a collection of related data that is stored off a computer and organized in a manner that enables information to be retrieved as needed. When first creating a database, you would create the database file first using a program like Access. Access has many different types of objects to be created.

3.3.2 Face detection- Face detection refers to computer technology that is able to identify the presence of people's faces within digital images. In order to work, face detection applications

use machine learning and formulas known as algorithms to detecting human faces within larger images.

3.3.3 Face recognition- Face recognition is the process of identifying one or more people in images or videos by analysing and comparing patterns. Face recognition is an important part of many biometric, security, and surveillance systems, as well as image and video indexing systems.

3.3.4 Attendance updation- Recognized attendee's name and time is updated in excel sheet, that could be further used by the authorities.

4. SYSTEM DESIGN AND IMPLEMENTATION

4.1   Introduction

There are two parts- Enrollment and recognition. In enrolment, the students have to register themselves by entering details. In pre-processing phase, detection of faces, extraction of the features, detection of extracted features will be processed and will be stored in data base. And in recognition phase, after the detection of extracted features, a canonical form of the facial surface is computed and recognition itself is performed. Faces will be detected from live video/photo of people present there and then their detected faces will be compared with images present in the database. If match found, attendance will be marked in excel sheet along with time. At last, this attendance list can be used by respective higher authority. The system architecture diagram of the proposed system is given below,
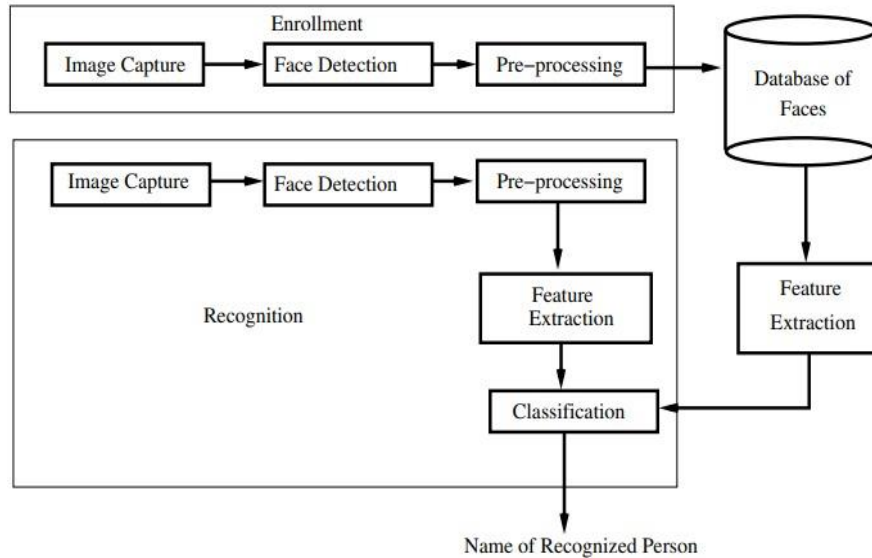
Fig. 1 System Architecture

The four modules of this proposed work are:

- Database creation
- Face Detection
- Face Recognition
- Attendance Updation

4.2 Database creation

First step is to create the database containing the pictures of the people whose attendance has to be taken. The power of modifying the folder/database is solely in the hands of the authority. Database is open to further future updations.

4.3 Face detection

With the help of powerful libraries like open-cv, face-recognition etc. the face of the attendees from training images in database is detected through face landmarks and their encodings/embeddings is taken through inbuilt methods. Similar steps would be followed to detect the faces in real-time.

4.4 Face recognition

As we have encodings of the training images and also that of the people in real time, face distance is found i.e. the basic difference between the training images and the real image through webcam. Image having the least face distance is the desired person. In this SVM classifier is used. Therefore in real time person's face is surrounded by rectangular box along with name. Its really efficient even in dim lights as it's using HOG.
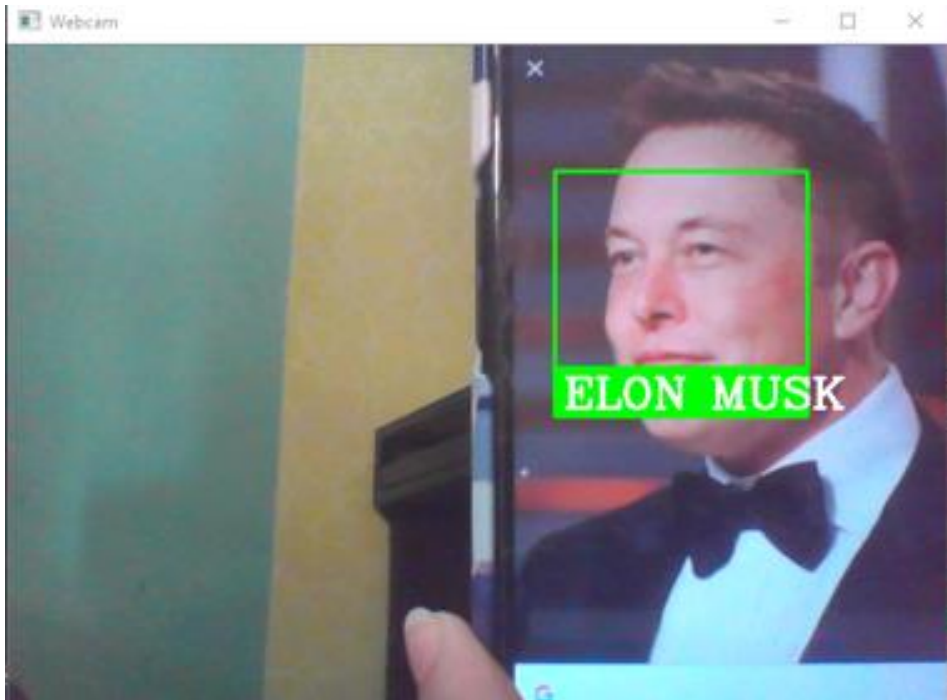

Fig. 2 Image taken from web cam

4.5 Attendance updation

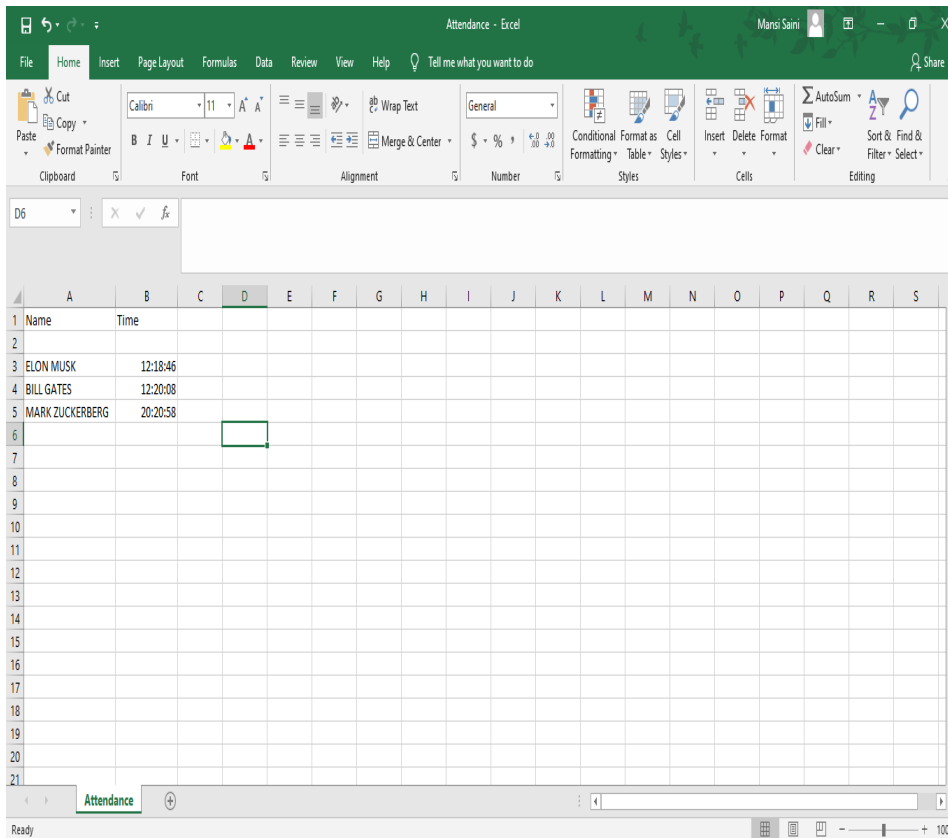Recognized attendee's name and time is updated in excel sheet, that could be further used by the authorities.

Fig. 3 Entry in excel sheet

4.6 Summary

Basically there are four modules i.e. database creation, face detection, face recognition and attendance updates that contribute to the structure/back of working project that aims at automatic updation of attendance of attendees in excel sheet. Database consists of test images that would be added by authority. Next step is to detect and recognize the concerned highlighted face using powerful libraries like open-cv, face recognition etc. Then recognized person's name is updated in excel sheet.

5. PERFORMANCE ANALYSIS

5.1 Introduction

It has a great performance as even in the dark light it works fine due to HOG. By taking many test cases into consideration, we can't deny that dim light could hinder its recognition capacity to a certain extent. Memory consumption of the program is also less which ends up boosting its speed. Speed is inversely related to the size of the database. Hence, this problem can be easily saved by having a good configuration machine. By analysing the data using the spearmen and Pearson metric measures, the correlation is of medium to high. And found that the distance rate and the time rate are in an available range to estimate the face recognition. It is very effective when the time for elapsing the recognition is less that should around the rate of 0.2 to 0.5 seconds that is between 20 to 50 % of time rate. And the distance rate also should be less that is around the 90%. And the pixel value and the resolution rate should be directly proportional to each other. If the pixel rate is high the quality in assuming the resolution rate also should be highly estimated. When the time and distance are in a low range and pixel value, resolution factors are high then the performance analysis of face recognition system is highly efficient. So the accuracy of recognizing the face is very easy and is more worth. In this paper the illustrated works defines the process has the effect of the relation among high and medium correlation factors. The correlation factor determines the measure is as predictable with the quality performance among the time, distance interval, pixel range and the resolution factor. The process outcome is among the correlation factors of high and medium aspects thereby it specifies that analysing the attributes between time, distance and pixel, resolution suits well in dealing the prospective dimensions of the outcomes with the illustration of quantifiable measure with the quality consequences.

5.2 Performance Measures

Accuracy Factor for Time rate and Distance rate

Process	Time factor	Distance factor	Accuracy analysis
1	20	90	more accurate
2	50	80	more accurate
3	70	50	not accurate

Accuracy Factor for Pixel value and the resolution factor

process	Pixel value	Resolution factor	Accuracy analysis
1	145	93	More accurate
2	124	81	accurate

5.3 Performance Analysis

Distance of object for correct recognition	5feet
Training time	670ms
Detection rate	90%
Recognition	80%

5.4 Summary

The performance of this project is dependent on the database size ,distance, illumination etc. However program speed could be further increased by using machine having good configuration.

6. FUTURE ENHANCEMENT AND CONCLUSION

6.1 Introduction

With the advancement of technologies each and every day, world is slowly going towards contactless everything. Due to this advancement it is very evident that most of the things will going to be either contactless or automated. One such advancement will be the facial recognition technology. Facial recognition technology is a system which is capable to verify the identity of a person from analysing an image. Some of the technologies or software are so advanced that even blurred pictures are sometimes rendered enough and analysed to know the identity of the person. But our main focus would be about the limitations or constraints of the attendance system using face recognition. We also would be seeing the future enhancement of face recognition technology going to be used for marking the attendance.

6.2 Limitation/Constraints of the System

- **<u>Poor Image Quality Limits Facial Recognition's Effectiveness-</u>** The quality of the reference image plays an important role in the identification process. If the image's resolution is not high enough, it can trick the camera.

- **<u>Small Image Sizes Make Facial Recognition More Difficult</u>**– Small size of image can sometime create a problem in detection process as the relative size of the face as compared with the image size affects how well the face will be recognized.

- **<u>Different Face Angles Can Throw Off Facial Recognition's Reliability-</u>** Many non-premium facial recognition systems cannot account for faces that are captured at angles other than straight into the capturing camera. It makes the marking process slower and less efficient.

- **Data Processing and Storage Can Limit Facial Recognition Technology-** Depending on the quality of the input data, a system would need an appropriate amount of storage. It could be really tough if data is high as in case of large expected attendance.

6.3 Future Enhancements

The system we have developed has successfully, able to accomplish the task of marking the attendance in the classroom automatically and output is obtained in an excel sheet as desired in real-time. However, in order to develop a dedicated system which can be implemented in an educational institution, a very efficient algorithm which is insensitive to the lighting conditions of the classroom has to be developed. Also a camera of the optimum resolution has to be utilized in the system. Another important aspect where we can work towards is creating an online database of the attendance and automatic updating of the attendance into it keeping in mind the growing popularity of Internet of Things. These developments can improve the applications of the project.

6.4 Conclusion

Basically this system aims to build an effective class attendance system and improving this system in every domain like schools, colleges, organizations, institutions and companies using face recognition technique. Capturing live images from camera and applying different techniques of face detection and face recognition will reduce manual or traditional work and hence will save the time. In our solution, by creating interface, we generate the database. The proposed system will be able to mark the attendance using face Id and webcam and then recognize the faces. We trained the images using SVM classifier. When stored images and compared images matched then attendance sheet get updated automatically along with date and time in excel sheet. Through this system, it becomes easy for higher authorities to keep track on time of student or employees.

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