ATTENDANCE MANAGEMENT USING FACE DETECTION AND RECOGNITION

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ABSTRACT

Photographic or video evidence is often seen as infallible – either damning or exonerating suspects. Facial recognition technologies have undergone large scale upgrades in performance in the last decade and such systems are now popular in fields such as security and commerce. It becomes a major concern to devise time efficient techniques in identifying the unauthorized person from entering the organization by considering attendance as a part of security. This work details a real-time automated attendance system which will mark attendance of students and employees alike. The proposed system is a real-world solution to handle day-day activities of an organization such as a college. The system focuses on capturing images from a live video stream and crediting attendance based on recognition of faces in the image using Haar Cascade Classifiers and Local Binary Patterns Algorithm. It enrolls the subject's face into the database against the subject's ID (unique) and Name. The system then allots attendance to the recognized faces in the database.

KeyWords – *OpenCV, Facial Recognition, Computer Vision, Face Detection, Local Binary Pattern Histogram, Haar Cascades.*

1.INTRODUCTION

Face detection is the most popular area of research in the vision of computer science. It is a computer technology which is being used in a variety of applications that identifies human faces in digital images. Localization of human faces is considered as the primary and the initial stage in study of face detection. Face localization can be referred to as extraction of facial features using pattern recognition system.

Face recognition which is a combination of machine learning and the biometric techniques which holds the qualities of not only high precision but also the reliability. For automatically detecting the human's face from the databases this system can be used. In recent years open computer vision has been widely used in different kinds of applications such as surveillance camera, robotics etc. This technology is used for authentication, validation, authorization, and identification.

Nowadays Attendance is considered as an important factor for office workers in an organisation as well as for students of an educational institution. In general, the attendance system of the student can be maintained in two different forms namely, Manual Attendance System (MAS) and Automated Attendance System (AAS). Manual Student Attendance Management system is a process where a person has to mark his presence in an attendance register. Manual attendance may be considered as a time-consuming process and can have discrepancies in data. Automated Attendance System is a process to automatically estimate the presence or the absence of a person in an organisation by using face recognition technology.

2. LITERATURE SURVEY

[1] Apoorva P and Impana H C, proposed a real time face recognition using an automated surveillance camera. The system consists of four types: training of real time images, face detection using Haar-classifier, comparison of trained real time images with images from the surveillance camera and result based on the comparison.

[2] Gagandeep Singh Nagpal, Jappreet Singh and Nishant Yadav proposed a system which uses Haar Cascade classifier for face detection in an image followed by Local Binary Pattern Histogram for facial Recognition (LBPH). This paper presents a system consisting of a Raspberry Pi Zero, Raspberry Pi Camera Module, Capacitive touch sensor and an OLED display. The Haar Cascade classifier is used to detect any faces, if present in the image. The Local Binary Patten Histogram (LBPH) algorithm is used for the purpose of facial recognition from the system's face database.

[3] Nandhini R, Duraimurugan N, and S.P.Chokkalingam proposed a novel method to recognise faces in a high definition video to credit attendance. The main working principle of the project is that, the video captured data is converted into image to detect and recognize it. Further the recognized image of the student is provided with attendance, else the system marks the database as absent.

[4] Omar Abdul Rhman Salim, Rashidah Funke Olanrewaju and Wasiu Adebayo Balogun proposed a method of developing a comprehensive embedded class attendance system using facial recognition with controlling the door access. The system is based on Raspberry Pi that runs Raspbian (Linux) Operating System installed on micro SD card. By facing the camera, the camera will capture the image then pass it to the Raspberry Pi. If the student's input image matches with the trained dataset image the prototype door will open using Servo Motor, then the attendance results will be stored in the MySQL database.

[5] Rudy Hartanto and Marcus Nurtiantoro Adji proposed a face recognition attendance system as a step by step process. The four-stage process were face detection process using skin colour detection and Haar Cascade algorithm, alignment process that contains face features normalization process, feature extraction process, and classification process using LBPH algorithm. the face detection process using skin colour detection and face motion tracking was performed.

[6] Kruti Goyal, Kartikey Agarwal and Rishi Kumar proposed a comparison to understand various algorithms like Adaboost, Haar Cascade in an easier manner. The paper compares OpenCV and Matlab in terms of speed, portability and cost. Face recognition involves three basic steps which include face detection, face recognition, and face extraction. Any system needs to encapsulate the image and then manage as well as record the vital features to determine the location of the face in the obtained image.

3. PROPOSED METHOD

The identification process to determine the presence of a person in a room or building is currently one of the routine security activities. Every person who will enter a room or building must go through several authentication processes first, that later these information's can be used to monitor every single activity in the room for a security purpose. Authentication process that is being used to identify the presence of a person in a room or building still vary. The process varies from writing a name and signatures in the attendance list, using an identity card, or using biometric methods authentication as fingerprint or face scanner. This study proposes the method to credit attendance by face recognition.

3.1 FACE DETECTION

An image is captured based on sum pixel calculations and a rectangular node is selected. The essential features known as Haar features are extracted and is compared with the features in the database. The ROI i.e. face is detected and stored in the database for training. One of the most common tool for face identification is consider as Haar – Classifier. Haar features are convolutional kernels which are used to detect the presence of the feature in an image. In this the cascades of different images of the same person is taken and recorded in the database (Fig. 1). All the pixels in the influence of white region are subtracted from all the pixels in the influence of black region. This method of subtraction is performed on each of the image in the cascade but all the images might not give us the best results. Many of the images have a lot of errors. The image with the least error is selected. The result of all the images are added together and is mentioned as weak classifier. As all the week classifiers are added together to form a strong classifier.
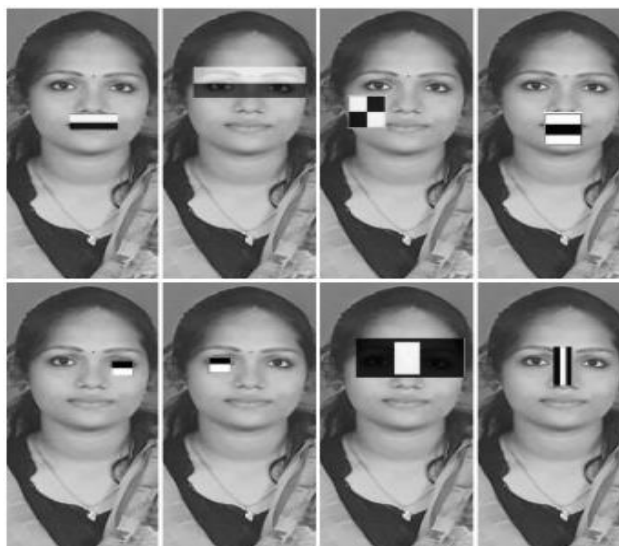
Fig-1 Generation of features

3.2 FACE RECOGNITION

The image is fetched from the database after training. The face is detected from the live video and is compared with images in the database by local binary patterns histogram(LBPH) technique. The face is recognised if the histogram matches with the histogram of the images in the database. The first step in constructing the LBP texture descriptor is to convert the image to grayscale. For each pixel in the grayscale image, we select a neighbourhood of size r surrounding the centre pixel. A LBP value is then calculated for this centre pixel and stored in the output 2D array with the same width and height as the input image. Based on the decimal values, histograms are generated. Each histogram created is used to represent each image from the training dataset. So, given an input image, the above steps are performed again for the new image and creates a histogram which represents the image.


Fig – 2 Generation of image in LBPH

4. RESULTS

Smart Security System is implemented in Python with addition of essential libraries. The system captures the image and stores the image only if face is detected with resolution not exceeding 200x200 for recognition in future. The model falls under Supervised learning implementing Haar Cascades and LBPH Recognizer as the face detection and recognition techniques.

For face recognition, three function modules are implemented in Python. The first module focusses on face detection by capturing faces of the persons from a live video record. The second module focusses on training the images and storing them in the classifier. The final module compares the live image with image in the database for recognition. The flowchart explains the working of the model.
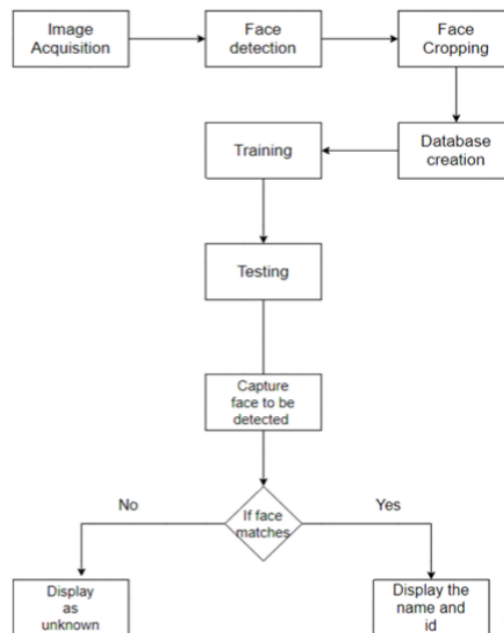
Fig – 3 Flowchart

The system captures around 50 images of every individuals face. The images are converted into grey scale as LBPH operates using images in greyscale and the images are stored in a folder. The stored images will be saved with a name and ID unique to that person and the corresponding attendance is credited in a CSV file.
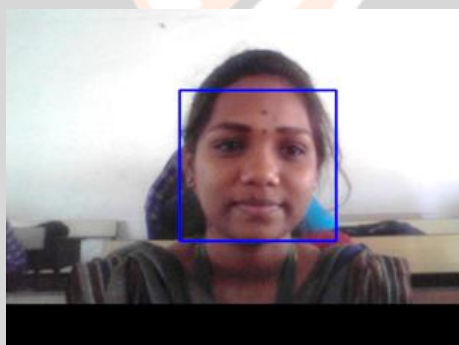
Fig – 4 Face Detection

After the process of taking images, the images are trained by LBPH recognizer. The image obtained from the live video stream is compared with the trained dataset. If the image is recognised, it displays the corresponding credentials or displays as 'Unknown' if the match fails.

Fig – 5 Face Recognition

5. CONCLUSION

In this study, we rigorously reviewed how face recognition can be an important system in crediting attendance. Initially, we reviewed the difference between Python and Matlab in face detection. We researched about the different techniques available in face detection and recognition. The system is implemented with:

  i.   Haar cascades for face detection, which is best in terms of precision for facial expression

  ii.   Local Binary Patterns Histogram for training, which is robust and easy to implement though it suffers slightly from lighting conditions.

The system is programmed using python for face recognition and is stored in CSV as attendance database for reference. The Automated Attendance System helps in increasing the accuracy and speed to ultimately achieve the high-precision real-time attendance.

6. REFERENCES

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