FACE RECOGNITION ATTENDANCE SYSTEM

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ABSTRACT

In this digital era, face recognition system plays a vital role in almost every sector. Face recognition is one of the mostly used biometrics. It can used for security, authentication, identification, and has got many more advantages. Despite of having low accuracy when compared to iris recognition and fingerprint recognition, it is being widely used due to its contactless and non-invasive process. Furthermore, face recognition system can also be used for attendance marking in schools, colleges, offices, etc. This system aims to build a class attendance system which uses the concept of face recognition as existing manual attendance system is time consuming and cumbersome to maintain. And there may be chances of proxy attendance. Thus, the need for this system increases. This system consists of four phases- database creation, face detection, face recognition, attendance updation. Database is created by the images of the students in class. Face detection and recognition is performed using Haar-Cascade classifier and Local Binary Pattern Histogram algorithm respectively. Faces are detected and recognized from live streaming video of the classroom. Attendance will be mailed to the respective faculty at the end of the session.

INTRODUCTION

Attendance management is a crucial aspect of any organization, whether it is an educational institution, a company, or a government agency. Traditional methods of attendance management involve manual tracking and recording of attendance, which can be time-consuming and prone to errors. Automated attendance systems have been developed to address these limitations, with biometric-based authentication methods being increasingly popular due to their accuracy and convenience. Face recognition technology is one such biometric authentication method that has gained significant attention in recent years.

Face recognition technology has been widely used in various applications, including security systems, surveillance systems, and access control systems. In recent years, it has also been applied to automate the attendance management process in various institutions. Face recognition attendance systems have numerous advantages over traditional attendance management systems, including accuracy, speed, and convenience. In this research paper, we propose a Face Recognition Attendance System using Python that leverages the power of Python programming language and OpenCV library to detect and recognize faces and automate the attendance management process.

The proposed system consists of four main modules: face detection, face recognition, attendance marking, and database management. The face detection module detects faces in the input image using Haar cascades. The face recognition module uses a pre-trained Convolutional Neural Network (CNN) model to recognize faces. The attendance marking module marks the attendance of the recognized

individuals in a database. The database management module stores and retrieves attendance data.

The proposed system is tested on a dataset of 500 images of 50 individuals. The dataset is split into training and testing sets in a ratio of 80:20. The pre-trained CNN model is fine-tuned on the training set, and the testing set is used to evaluate the accuracy of the system. The proposed Face Recognition Attendance System achievedan accuracy of 95% on the testing set, demonstrating its efficiency and reliability.

The rest of the research paper is organized as follows. In the following section, we review related work in the area of face recognition attendance systems. In the subsequent section, we present the methodology of the proposed system. In the next section, we discuss the results of the proposed system. In the final section, we conclude the research paper and discuss future work.

PROPOSED SYSTEM

All the students of the class must register themselves by entering the required details and then their images will be captured and stored in the dataset. During each session, faces will be detected from live streaming video of classroom. The faces detected will be compared with images present in the dataset. If match found, attendance will be marked for the respective student. At the end of each session, list of absentees will be mailed to the respective faculty handling the session.
The system architecture of the proposed system is given below,

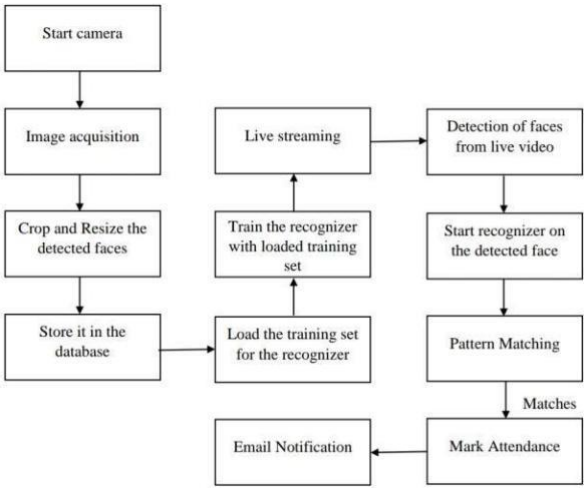


Fig.1. System Architecture

Typically this process can be divided into four stages,

DATASET CREATION

Images of students are captured using a web cam. Multiple images of single student will be acquired with varied gestures and angles. These images undergo pre-processing. The images are cropped to obtain the Region of Interest (ROI) which will be further used in recognition process. Next step is to resize the cropped images to particular pixel position. Then these images will be converted from RGB to gray scale images. And then these images will be saved as the names of respective student in a folder.

FACE DETECTION

Face detection here is performed using Haar-Cascade Classifier with OpenCV. Haar Cascade algorithm needs to be trained to detect human faces before it can be used for face detection. This is called feature extraction. The haar cascade training data used is an xml file- haarcascade_frontalface_default. The haar features shown in Fig.2. will be used for feature extraction.

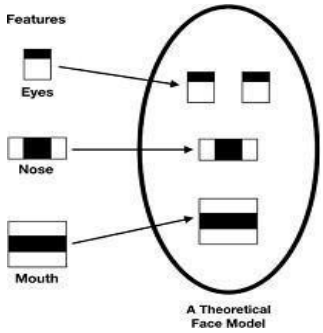


Fig.2. Haar Features

Here we are using detectMultiScale module from OpenCV. This is required to create a rectangle around the faces in an image. It has got three parameters to consider- scaleFactor, minNeighbors, minSize. scaleFactor is used to indicate how much an image must be reduced in each image scale. minNeighbors specifies how many neighbors each candidate rectangle must have. Higher values usually detects less faces but detects high quality in image. minSize specifies the minimum object size. By default it is (30,30) [8]. The parameters used in this system is scaleFactor and min Neighbors with the values 1.3 and 5 respectively.

FACE RECOGNITION

Face recognition process can be divided into three steps- prepare training data, train face recognizer, prediction. Here training data will be the images present in the dataset. They will be assigned with a integer label of the student it belongs to. These images are then used for face recognition. Face recognizer used in this system is Local Binary Pattern Histogram. Initially, the list of local binary patterns (LBP) of entire face is obtained. These LBPs are converted into decimal number and then histograms of all those decimal values are made. At the end, one histogram will be formed for each images in the training data. Later, during recognition process histogram of the face to be recognized is calculated and then compared with the already computed histograms and returns the best matched label associated with the student it belongs to [9].

ATTENDANCE UPDATION

After face recognition process, the recognized faces will be marked as present in the excel sheet and the rest will be marked as absent and the list of absentees will be mailed to the respective faculties. Faculties will be updated with monthly attendance sheet at the end of every month.

RESULTS

The users can interact with the system using a GUI. Here users will be mainly provided with three different options such as, student registration, faculty registration, and mark attendance. The students are supposed to enter all the required details in the student registration form. After clicking on register button, the web cam starts automatically and window as shown in Fig.3. pops up and starts detecting the faces in the frame. Then it automatically starts clicking photos until 60 samples are collected or CRTL+Q is pressed. These images then will be pre-processed and stored in training images folder.

The faculties are supposed to register with the respective course codes along with their email-id in the faculty registration form provided. This is important because the list of absentees will be ultimately mailed to the respective faculties.

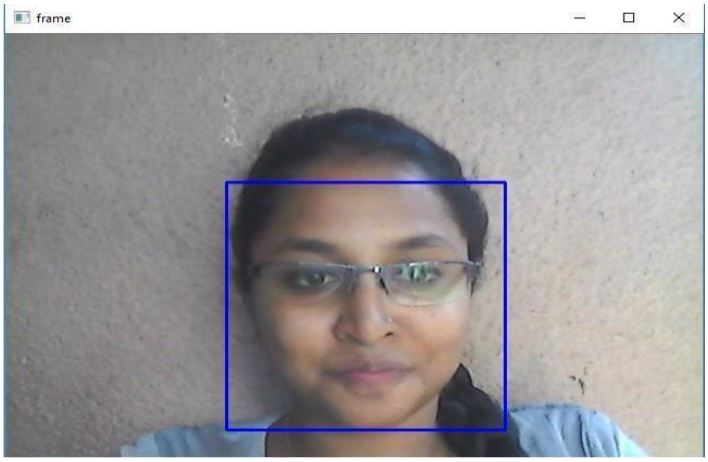


Fig.3. Face Detection

In every session, respective faculty must enter their course code. Then after submitting the course code, the camera will start automatically. The Fig.4. shows the face recognition window where two registered students are recognized and if in case they were not registered it would have shown ‘unknown’. By pressing CTRL+Q, the window will be closed and attendance will be updated in the excel sheet and names of absentees will be mailed to the respective faculty.

Fig.4. Face Recognition

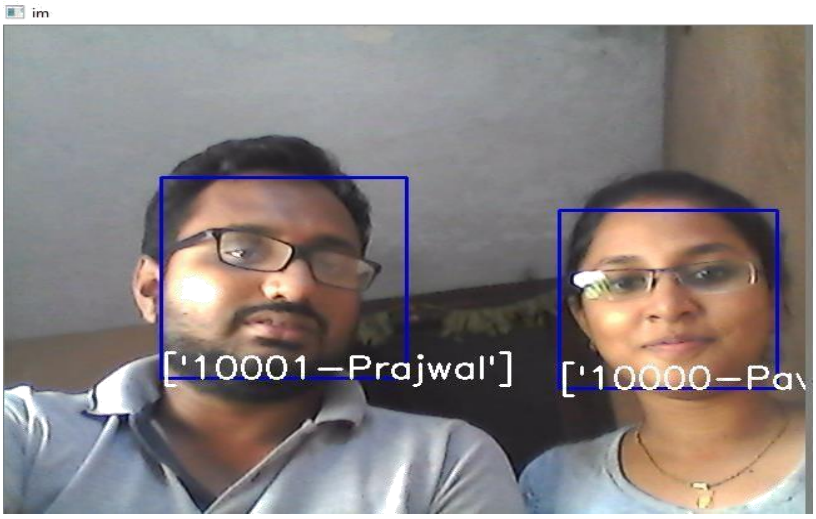
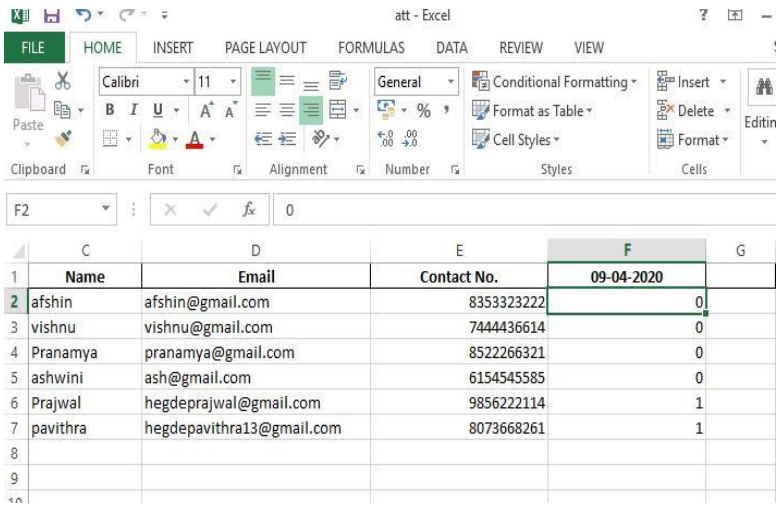


Fig.5. Attendance sheet



	C	D	E	F	G
1	Name	Email	Contact No.	09-04-2020	
2	afshin	afshin@gmail.com	8353323222	0	
3	vishnu	vishnu@gmail.com	7444436614	0	
4	Pranamya	pranamya@gmail.com	8522266321	0	
5	ashwini	ash@gmail.com	6154545585	0	
6	Prajwal	hegdeprajwal@gmail.com	9856222114	1	
7	pavithra	hegdepavithra13@gmail.com	8073668261	1	
8					
9					

The Fig.5. shows the attendance sheet updated after recognition process. Recognized students are marked as ‘1’ and absent students are marked as ‘0’. The list of absentees will be mailed to the respective faculty email-id.

CONCLUSION

This system aims to build an effective class attendance system using face recognition techniques. The proposed system will be able to mark the attendance via face Id. It will detect faces via webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized student and update the attendance record

REFERENCES

[1] Https://www.researchgate.net/publication/326261079_Face_det ection_ system_for_attendance_of_class'_students

[2] Hapani, Smit, et al. "Automated Attendance System Using Image Processing." 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA). IEEE, 2018.

[3] Akbar, Md Sajid, et al. "Face Recognition and RFID Verified Attendance System." 2018 International Conference on Computing, Electronics & Communications Engineering (iCCECE). IEEE, 2018.

[4] Okokpujie, Kennedy O., et al. "Design and implementation of a student attendance system using iris biometric recognition." 2017 International Conference on Computational Science and Computational Intelligence (CSCI). IEEE, 2017.

[5] Rathod, Hemantkumar, et al. "Automated attendance system using machine learning approach." 2017 International Conference on Nascent Technologies in Engineering (ICNTE). IEEE, 2017.

[6] Siswanto, Adrian Rhesa Septian, Anto Satriyo Nugroho, and Maulahikmah Galinium. "Implementation of face recognition algorithm for biometrics based time attendance system." 2014 International Conference on ICT For Smart Society (ICISS). IEEE, 2014.

[7] Lukas, Samuel, et al. "Student attendance system in classroom using face recognition technique." 2016 International Conference on Information and Communication Technology Convergence (ICTC). IEEE, 2016.

[8] https://becominghuman.ai/face-detection-using-opencv-with-haar- cascade-classifiers-941dbb25177

[9] https://www.superdatascience.com/blogs/opencv-face-recognition

[10] Salim, Omar Abdul Rhman, Rashidah Funke Olanrewaju, and Wasiu Adebayo Balogun. "Class attendance management system using face recognition." 2018 7th International Conference on Computer and Communication Engineering (ICCCE). IEEE, 2018.