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Face Recognition Based Automated Student Attendance System

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ABSTRACT

Face recognition system is very beneficial in real-time applications, concentrated in security control systems. Face Detection and Recognition is a vital area in the province of validation. In this project, the Open CV based face recognition strategy has been proposed. This model integrates a camera that captures an input image, an algorithm - Haar Cascade Algorithm for detecting face from an input image, identifying the face and marking the attendance in an excel sheet. The proposed system implements features such as detection of faces, extraction of the features, exposure of extracted features, analysis of students' attendance, and monthly attendance report generation. Faces are recognized using advanced LBP using the database that contains images of students and is used to identify students using the captured image. Better precision is accomplished in results and the system takes into account the changes that occurs in the face over some time.

KEYWORDS: *Face Recognition, Haarcascades, Adaboost, OpenCv, LBPH*

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I. INTRODUCTION

These days, biometric authentication methods begin increasing rapidly as one of the assuring authentication techniques, besides the standard authentication method. All biometrical technologies require certain actions to be entered by the user, which are the user needs to place funds on the scanner to set the fingers or the hand geometry detection. The user should standstill in a fixed spot in front of the camera for face identification purposes. The face recognition method has numerous advantages when compared to other biometric methods, as this method is done passively without explicit action. This method can be really useful for supervision. This project is based on the Open CV based face recognition approach has been proposed. OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. The library has more than 2500 optimized algorithms, which incorporates a complete set of both classic and state-of-the-art computer vision and machine learning algorithms. The experimental results show that the system can recognize the faces captured automatically by the camera accurately. Thus face detection and recognition module detect faces from the image captured by the camera, and the image of the face is stored. The training database is created by training the system model with the pictures of the authorized students. The obtained images are later stored in a database with appropriate labels. The features are extracted using LBPH algorithm. Haar features are basically used to detect the presence of particular features in the selected image. Histogram is unique for every unique image and helps in determining and recognizing the physique accurately. Thus, using this technique, all images are identified during the face identification phase.

II. LITERATURE SURVEY

Traditionally attendance was taken manually which is very time-consuming and had the problem of human error. Adding on, there are numerous ambiguities towards the roots of the attendance records which in fact, most of the attendance records are not recovered from the substantive situation. The existing method uses paper or attendance registers for marking student's attendance which causes a lot of trouble. Based on various research, many resolutions are available to resolve this concern. "Face Recognition Based Attendance Marking System" (Senthamil Selvi, Chitrakala, Antony Jenitha, 2014) is based on the identification of face identification to solve the former attendance system's issues. The system utilized a camera to capture images to establish face recognition. The captured image was rivaled one by one with the face database to examine for the students face where attendance would be marked when an appropriate result was found in the database. The foremost benefit is that the system where the attendance is recorded is actually on the server resulting in high security, where a proxy cannot be given. Furthermore, in this proposed system, the face detection algorithm is enhanced by using skin analysis technology to enhance the certainty of the detection process. Although more efforts were invested to obtain an accuracy of the face detection algorithm, this system required a standalone pc that needed

a constant power supply making it static and hence was not portable. This type of system is only proper for marking staff's attendance as they only need to report their attendance once a day, unlike students which require reporting their attendance for every class every day. It would be inconvenient if the system is not portable. Thus, the attendance management system can be established on a rooted design so that it can work similarly with just batteries making it portable.

The research journal "Fingerprint Based Attendance System Using Microcontroller and LabView" (Kumar Yadav, Singh, Pujari, Mishra, 2015) recommended a solution of using a fingerprint to mark the attendance. This system is based on using 2 microcontrollers to deal with the fingerprint recognition process. Initially, the fingerprint configuration will be achieved over a fingerprint sensor, then the data will be transmitted to microcontroller-1. Next microcontroller-1 will transfer the data to microcontroller-2 to check the database. On finding a student's match, the specifications are sent to the PC through serial communication to be displayed. This scheme is good as it expedites improvement while sustaining design flexibility and simplifies testing. But again, this system is connected to a PC which makes it unportable. Apart from that, the database information cannot be accessed, resulting in a situation where parents who are curious about knowing their child's attendance cannot easily access the data. Therefore, to provide accessibility to the legitimately concerned party, the data can be uploaded to a web server for easy access. The authentication for the appropriate access can be implemented through a login screen. According to the research journal "Attendance System Using NFC Technology with Rooted Camera on Mobile Device" (Bhise, Khichi, Korde, Lokare, 2015). The attendance system was implemented using Near Field Communication (NFC) technology and mobile application. According to the research paper, every student was given an NFC tag that contained a unique ID during their enrolment into the college. Attendance of each class was then taken by touching or placing these tags on the lecturer's phone. The rooted camera on the phone then captured the student's face and the data was directed to the college server for validation and verification. The benefit of this method is that the NFC is uncomplicated to use, and the speed of connection establishment is very high. However, the system couldn't automatically spot any violations when the NFC tag is not carried or tagged by the authenticated owner. The NFC reader was an inconvenience to the lecturer. Most of the lecturers did not like to prefer their smartphones to be used in this way due to privacy concerns. Real Time Human Face detection and Tracking was proposed by J. Chatrath, P. Gupta, P. Ahuja, A. Goel. Their paper outlines the practice of real time profile detection and acknowledgement by modifying Viola-Jones algorithm. Outcomes accomplished by the developed algorithm displayed that up to 50 faces could be distinguished and tracked by systems using the modified algorithm. Processing of data and time consumed is moderately less in such systems. Implementation of Attendance Management System was proposed by G. Lakshmi Priya and M. Pandimadevi. Systems proposed with respect to this idea was to capture an image using a web camera at deviating occurrences. A precision of 68% was observed in such systems.

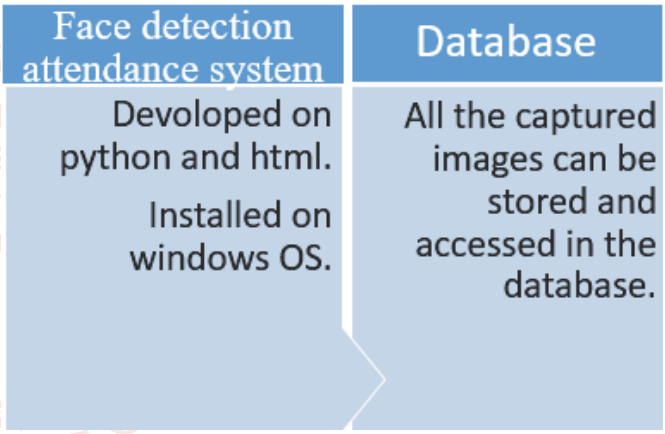
III. PROPOSED SYSTEM

In the existing system, attendance is accomplished using the attendance register. Lecturers mark the attendance of students manually, resulting in increased paperwork, preservation of records, and computing the attendance of each student becomes exasperating and time-consuming. The intention of developing a Face recognition based Attendance System is to computerize the traditional way of practicing attendance. It assists to access the attendance information of a specific student in a certain class. It also avoids proxy of attendance. Data accuracy is affirmed, within a short span of time. The

FACE RECOGNITION BASED AUTOMATED STUDENT ATTENDANCE SYSTEM demonstrates "Human Face Identification using LBP and HaarCascade and openCv Features for Real Time Attendance Monitoring. The investigational outcomes demonstrate that the system can distinguish the faces captured automatically by the camera precisely. The results obtained from the proposed system is very accurate and is unambiguous resulting in accurate system. The captured images are then detected and compared with the images present in the database and the attendance is then marked.

IV. SYSTEM DESIGN

ARCHITECTURE OF THE SYSTEM:



FACE DETECTION: The principal utility of this step is to accomplish whether the human faces appear in a given image, and what is the position of these faces. The predictable outputs of this step are squares which contain each face in the input image. Face orientation is performed to vindicate the scales and alignment of these squares. FEATURE EXTRACTION: Following the face detection step the extraction of human face areas from images that are done. FACE RECOGNITION: The last step after the illustration of faces is to identify them. For automatic acknowledgement we need to build a face database. Various images are taken for each individual and their features are mined and stored in the database. Then when an input image is served, the face detection and feature extraction is performed and its feature to each face class is compared and stored in the database.

ALGORITHM: Local Binary Patterns Histograms - This method prerequisites the gray scale pictures for dealing with the training. LBPH uses the following parameters: Radius, Neighbours: The number of sample points neighbouring the central pixel which is commonly 8, Grid X: The number of cells along the horizontal direction is denoted as Grid X, Grid

Y: The number of cells along the vertical direction is denoted as Grid Y.

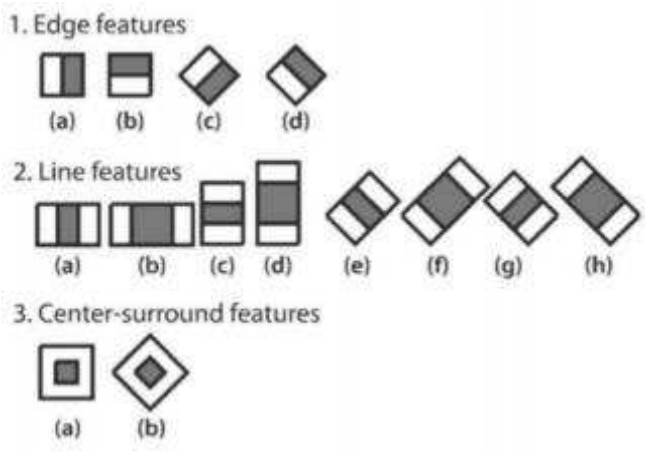
ALGORITHM TRAINING: For the training resolution of the dataset of facial images of the people to be predictable alongside with the unique ID, is compulsory so that the existing approach will utilize the delivered information for recognizing an input image and providing the output. Same images need the same ID.

EXTRACTION OF HISTOGRAM: The image obtained in the preceding step practises the Grid X and Grid Y factors and the image is split into numerous grids. Based on the image, the histogram can be mined as below: The image is in grey scale and each histogram will contain only 256 positions (0-255) which indicates the presences of each pixel concentration. After this each histogram is formed and a new and bigger histogram is done. Let us presume that there are 8×8 grids, then there will be 16.384 locations in total in the final histogram. Ultimately the histogram indicates the features of the actual image. Haar Cascade Object Detection Face & Eye OpenCV: Haar cascade classifier is based on the Viola-Jones detection algorithm which is trained in giving some input faces and non-faces and training a classifier that recognises a face. So we need to gauge a huge set of features for every 24*24 PX. So to evade this AdaBoost is used. AdaBoost is used to eliminate redundant features and choose only appropriate features. These features are also termed as weak classifiers. After these features are found a weighted mixture of all these features is used in assessing and determining if any given frame has a face or not.

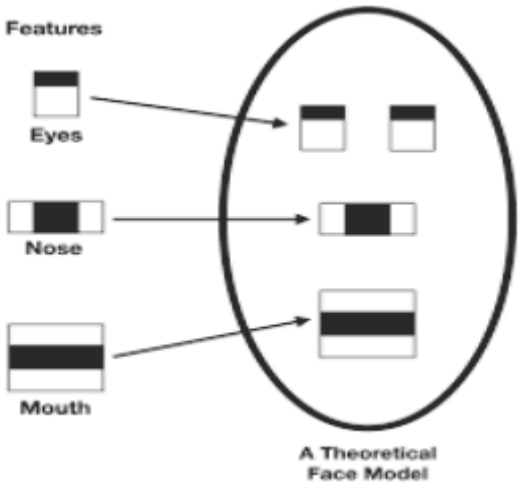
Strong classifier = linear sum of weak classifiers

$F(x) = \sum (\alpha_i * f_i(x))$ [here α_i are matching weights to each weak classifier $f_i(x)$.]

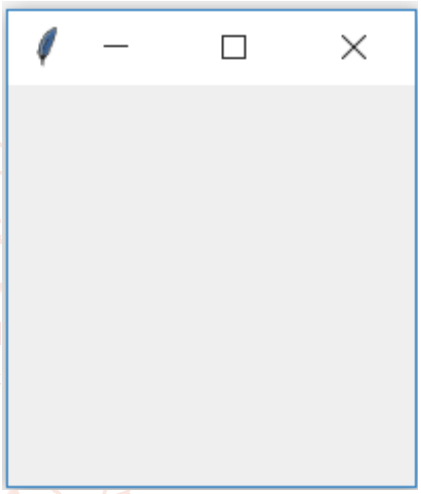
A Haar Cascade is based on "Haar Wavelets" which defines as: An arrangement of rescaled "square-shaped" functions which composed form a wavelet family or basis. It is built on the Haar Wavelet technique to analyze pixels in the image into squares by function. This uses machine learning practises to get a high degree of accurateness from which it is called "training data".



Feature Extraction Haar Cascades use machine learning methods in which a function is trained from a lot of positive and negative images. This process in the algorithm is feature extraction.



Simple GUI is made via the python Tkinter library which permits the user to use the page without any backend familiarity. Tkinter is the standard GUI library for Python.



After recognizing all faces of the students, the names of persons are updated into an excel sheet.

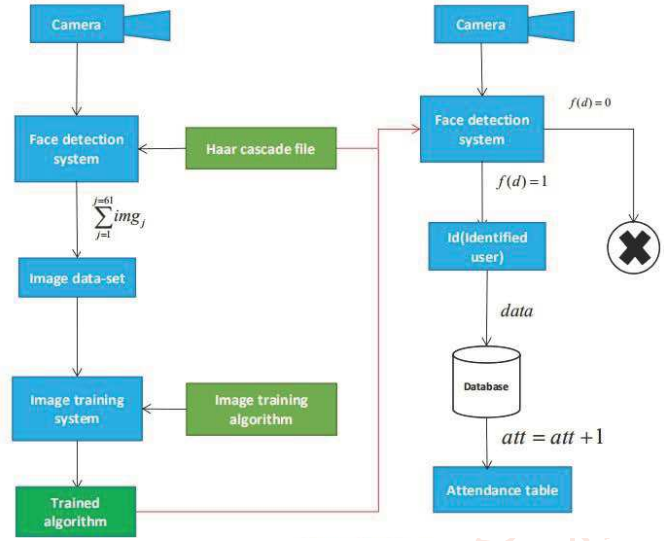
Whose faces are not recognized due to various external factors are stored as "Unknown images" in the database.

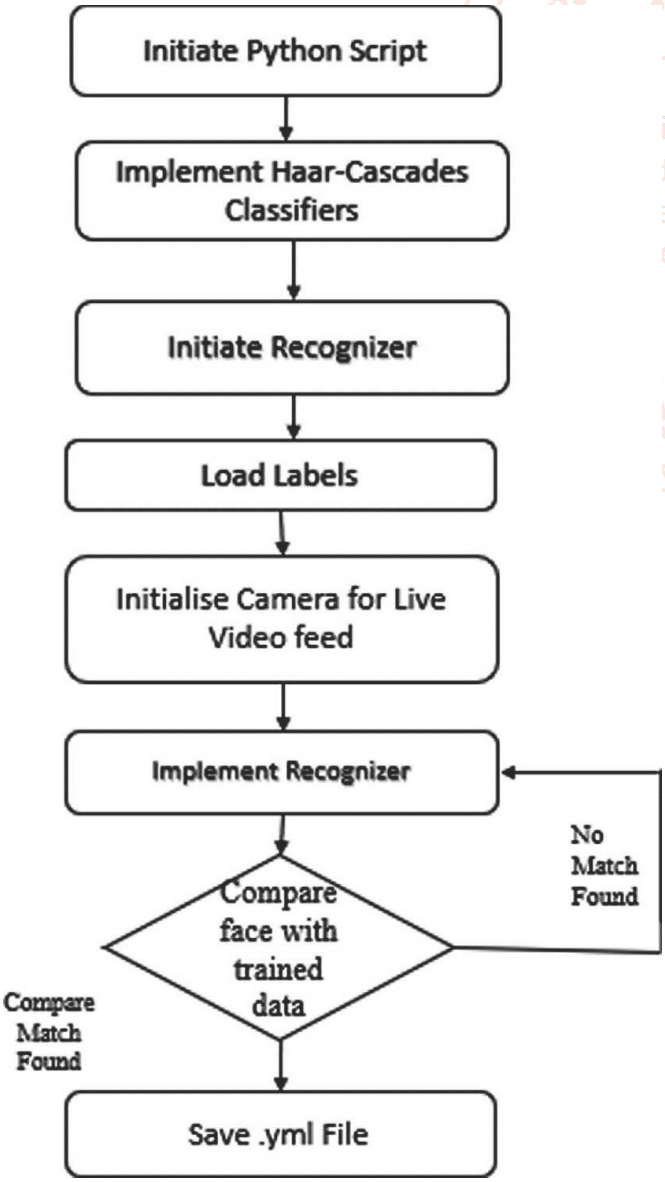
V. IMPLEMENTATION

The face recognition attendance system will be installed on the host device and all the permissions will be granted during the installation. Once the installation is over the administrator can access the system and authorize the user and dictate the image and record the image and mark attendance and the data stored is database using a specialized database. One can give their attendance by merely facing the camera. When we run train.py a window is opened and requests for entering Id and Name. After registering name and id then click the "Take Images" button. By clicking the "Take Images", the web camera of the host computer is opened and starts clicking an image sample of the person. This Id and Name is stored in the folder Student Details and the file name is StudentDetails.csv. After conclusion, it notifies that images are saved. After taking an image sample, click the "Train Image" button. Now it takes a few seconds to train the machine for the images that are taken by clicking the "Take Image" button and creates a Trainner.yml file and stores in the Training Image Label folder. Now all initial setups are done. If the face is recognized by the system then the Id and Name of the person

are shown on the Image. Press Q (or q) to quit this window. After exiting the window, the attendance of the student will be stored in the Attendance folder as a CSV file with name, id, date, and time. After identifying all faces of the students, the names of individuals are updated into an excel sheet. Whose faces are not recognized due to various external factors are stored as "Unknown images" in the database.

VI. FLOWCHART





VII. FUTURE ENHANCEMENTS

Further expansions can be performed, to attain the real time detection of the specific student in the monitoring premises. Alternatively to taking images, we can also work with recorded videos. But some period is managed to record the images, because if a continuous recording is done, then load on database increases. The future output is to develop the recognition rate of algorithms when there are accidental changes in a person like a tonsuring head, using a cap, having a beard, etc. The system manifested only recognizes face up to limited angle variations which can be developed further. Gait recognition can be combined with face recognition systems to achieve better performance of the system.

VIII. CONCLUSION

This method helps to evade the fail-proof attendance system and works as a replacement for all present systems i.e. other bio-metric practices. It's time-saving and consumes low manpower with respect to taking attendance manually. Automated Attendance Systems based on face recognition techniques thus proves to be time-saving and secure. This system can also be used to identify an unknown person, thus being able to recognize if the student actually belongs to the respective class or school. Hence, proving that it's an easy method to take attendance and store as well.

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