

Face Recognition Based Attendance System using Machine Learning

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ABSTRACT

In the era of modern technologies emerging at rapid pace there is no reason why a crucial event in education sector such as attendance should be done in the old boring traditional way. Attendance monitoring system will save a lot of time and energy for the both parties teaching staff as well as the students. Attendance will be monitored by the face recognition algorithm by recognizing only the face of the students from the rest of the objects and then marking the students as present. The system will be pre feed with the images of all the students enrolled in the class and with the help of this pre feed data the algorithm will detect the students who are present and match the features with the already saved images of the students in the database.

KEYWORDS: Face Detection, Face Recognition, Viola-Jones, LBPH

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I. INTRODUCTION

Over the latest couple of decades, facial recognition has been considered the champion among the most basic applications contrasted with other biometric-based frameworks. The facial recognition procedure can be expressed as pursues: given a database comprising of many face pictures of known individuals, one sources of info a face picture, and the procedure intends to check or decide the character of the individual in the information picture. Biometric-based systems have been created as the most able option for seeing individuals generally, as opposed to affirming people and yielding them access to physical and virtual spaces dependent on passwords, PINs, sharp cards, plastic cards, tokens, keys and so on.. These techniques break down an individual's physiological just as conduct properties with a particular ultimate objective to choose and additionally discover his/her personality. Passwords and PINs are hard to recall and can be taken or estimated; cards, tokens, scratches, etc can be lost, disregarded, purloined or duplicated; appealing cards can twist up discernibly corrupted and confused. Notwithstanding, the characteristic science of individuals can't be lost, disregarded, taken, or made. A few models incorporate physiological qualities of an individual, for example, facial pictures, fingerprints, finger geometry, hand geometry, hand veins, palm, iris, retina, ear and voice and conduct characteristics, for example, gait, signature, and keystroke elements, which are utilized in

biometric techniques for individual check or distinguishing proof particularly for security frameworks. Security applications have seen a colossal improvement during the most recent couple of decades, which is a characteristic aftereffect of the mechanical upheaval in all fields, particularly in savvy condition divisions. Face includes in face recognition for singular ID are viewed as a significant technique for the biometric region. These days, if an individual shows up in a video or computerized picture, they can be consequently distinguished by Facial Recognition System (FRS), which is a noteworthy procedure to improve security issues. As of late, numerous scientists concentrated on face recognition techniques. Face recognition is a significant piece of the capacity of human discernment framework and is a standard assignment for people, while building a comparative computational model of face recognition. The computational model add to hypothetical bits of knowledge as well as to numerous commonsense applications like mechanized group observation, get to control, plan of human PC interface (HCI), content based picture database the executives, criminal recognizable proof, etc. Face recognition is an activity that people perform routinely and easily in our day by day lives. The individual recognizable proof for the face that shows up in the info information is the face recognition process. Face recognition process is appeared in Fig1.1

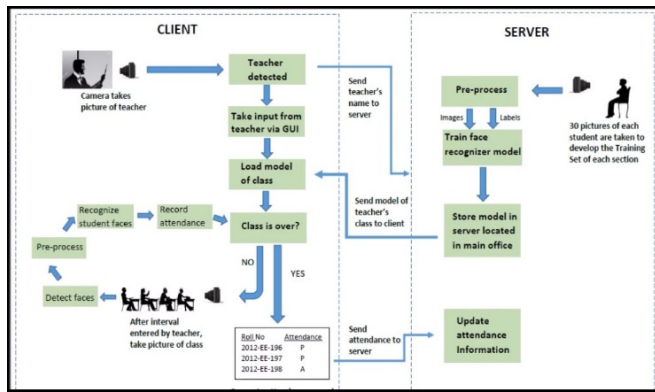


Fig1.1 In the above fig shows the flowchart of the project.

II. METHODS

2(i) Django

Django is a python-based free and open-source web framework that follows the model-template-views (MTV) architectural pattern. It is maintained by the Django Software Foundation (DSF), an American independent organization established.

Django's primary goal is to ease the creation of complex, database-driven websites. The framework emphasizes reusability and "pluggability" of components, less code, low coupling, rapid development, and the principle of don't repeat yourself. Python is used throughout, even for settings, files, and data models. Django also provides an optional administrative create, read, update and delete interface that is generated dynamically through introspection and configured via admin models.

3(ii)SQL

SQL is a domain-specific language used in programming and designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS). It is particularly useful in handling structured data, that is data incorporating relations among entities and variables. SQL offers two main advantages over older read-write APIs such as ISAM or VSAM. Firstly, it introduced the concept of accessing many records with one single command. Secondly, it eliminates the need to specify *how* to reach a record, e.g. with or without an index.

3(iii) React (JavaScript library)

React (also known as React.js or ReactJS) is an open-source, front end, JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications. However, React is only concerned with state management and rendering that state to the DOM, so creating React applications usually requires the use of additional libraries for routing. React Router is an example of such a library.

3(iv) System implementation

The proposed system has been implemented with the help of three basic steps: A. detect and extract face image and save the face information in an xml file for future references. B. Learn and train the face image and calculate eigen value and eigen vector of that image. C. Recognise and match face images with existing face images information stored in xml file.

3(v). Python

Python is an interpreted, high-level and general-purpose programming language. Python's design philosophy emphasizes code readability with its notable use of significant indentation. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects. Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly, procedural), object-oriented and functional programming. Python is often described as a "batteries included" language due to its comprehensive standard library.

III. PROPOSED SYSTEM

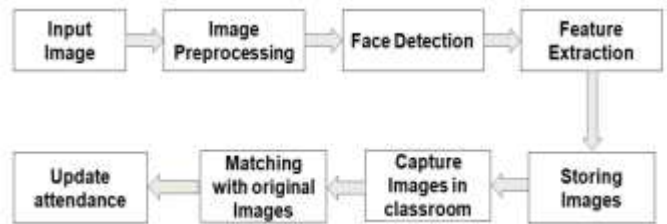


Fig 1: Block Diagram for Attendance Monitoring System Using Face Recognition

For the training data collection, multiple photographs of students are taken. This dataset is used to compare real-time photos recorded in the classroom with matched data and to mark attendance. Preprocessing is applied to the captured images. The aim of image preprocessing is to improve image data by suppressing unwanted distortions or enhancing certain image features that are important for further processing. Image pre-processing includes background subtraction and conversion of image into grayscale. Generally the background of an image does not move i.e. it remains static. Hence the background is subtracted in a set of image. Before subtracting the background, image is converted into grayscale. This is done to get good accuracy in detecting faces. Features are extracted from detected faces and cropped images of faces are stored for comparison. Feature extraction is a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval. After that images of students in classroom are captured to mark attendance of students present in the classroom. These images also goes through preprocessing as well as face detection process. Faces detected in classroom images are compared with the images in original dataset. If the match is found then that students roll number and name will be added in list of present students. Face recognition technique is used for matching purpose.

Face Detection: Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection step will detect faces in captured images so that these faces can be used for comparison. For face detection Viola-Jones algorithm is used.

Viola-Jones Algorithm: The Viola-Jones algorithm is a widely used mechanism for object detection. The main property of this algorithm is that training is slow, but detection is fast. This algorithm uses Haar basis feature filters. The efficiency of the Viola-Jones algorithm can be significantly increased by first generating the integral image.

There are four main contributions of object detection framework which are listed below

1. Haar features
2. Integral Image
3. Adaboost algorithm
4. Cascading

Face Recognition: With the facial images already extracted, cropped, resized and usually converted to grayscale, the face recognition algorithm is responsible for finding characteristics which best describe the image. There are different types of face recognition algorithms, for example: Eigen faces, LBPH (Local binary patterns histograms), Fisher faces. Out of these algorithms LBPH is most suitable for the proposed system.

Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number.

Steps involved in LBPH:

1. Parameters: Radius, Neighbour, Grid X, Grid Y.
2. Training the algorithm
3. Applying the LBP operation
4. Extracting the histograms
5. Performing the face recognition

IV. USES AND POTENTIAL RISKS OF FACIAL RECOGNITION ALGORITHMS

Fields of application of facial recognition for machine learning and AI are plenty. The most common ones are related to security and surveillance (law enforcement agencies or airports), social media (selling data, personalization), banking and payments, smart homes and for providing personalized marketing experiences. Although, it is not the whole picture. There are more subtle ways in which face recognition algorithms are changing our everyday life in meaningful ways too, proving that this technology is still far from infallible.

A famous deep fakes software, which swaps faces of individuals in videos, has already been used by a politician of India's ruling party to gain favor in elections. In China, facial recognition system mistook a famous businesswoman's face printed on the bus for a jaywalker and automatically wrote her a fine. Numerous studies in the USA and UK proved that facial recognition AI has significant troubles recognizing non-white faces, is often biased on gender and identifies "false positives" the majority of time, increasing probability of grievous consequences.

V. FLOWCHART

A flowchart is a diagram that depicts a process, system or computer algorithm. They are widely used in multiple fields to document, study, plan, improve and communicate often

complex processes in clear, easy-to-understand diagrams. Flowcharts, sometimes spelled as flow charts, use rectangles, ovals, diamonds and potentially numerous other shapes to define the type of step, along with connecting arrows to define flow and sequence. They can range from simple, hand-drawn charts to comprehensive computer-drawn diagrams depicting multiple steps and routes. If we consider all the various forms of flowcharts, they are one of the most common diagrams on the planet, used by both technical and non-technical people in numerous fields.

In the fig 7.1 is the brief flowchart for the face recognition.

- A. Face Detection and Extract
- B. Learn and Train Face Images
- C. Recognise and Identification

Flow Chart

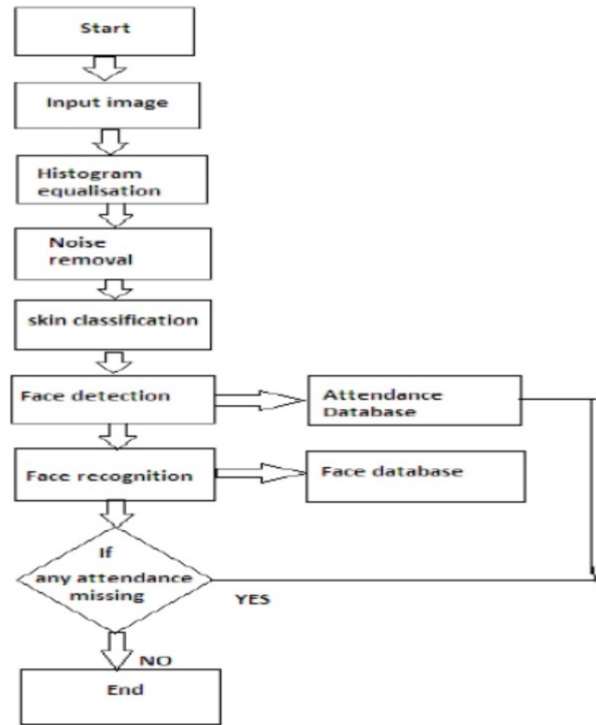


Fig 7.1

VI. EXPERIMENT AND RESULT

For face recognition implementation, the following results were obtained –

6.1. User Interface

It contains list of menu items which can be accessed to have the complete view of the system. The system takes the input such as Id and name of the students for registration purpose. The 'Take Images' button is used to capture the images of the students. 'Train System' button is used to train the captured images. 'Take Attendance' button is used to store the attendance results in an excel sheet. Fig 2 shows the registration page



Fig 2 User Interface

6.2. Face Detection

Multiple images of the students are captured and the images are pre-processed for detecting only the faces of the students. Fig 3 shows Face Detection.



Fig 3 Face Detection

6.3. Training

The captured images of the students are stored in a local database. The stored images are trained and are assigned corresponding labels such as Id and name. Fig 4 shows multiple images stored in a database.



Fig 4 Dataset of Images

6.4. Face Recognition

On carrying out the recognition process, feature comparison takes place with respect to the features stored in the database. The face is displayed along with corresponding roll no and the name of the student and used for marking the attendance. Fig 5 shows the Face Recognition.



Fig 5 Face Recognition

6.5. Attendance Results stored in an excel sheet

The corresponding attendance of the students is stored in an excel sheet. Fig 6 shows the Attendance Results.

Id	Name	Date	Time
40	[Prajwal More]	07/04/2020	13:42:33

The step of the experiments process are given below:

1. Face Detection: Start capturing images through web camera of the client side:

Begin:

//Pre-process the captured image and extract face image
 //calculate the eigen value of the captured face image and compared with eigen values of existing faces in the database.
 //If eigen value does not matched with existing ones, save the new face image information to the face database (xml file).

//If eigen value matched with existing one then recognition step will done. End;

2. Face Recognition:

Using PCA algorithm the following steps would be followed in for face recognition:

Begin:

// Find the face information of matched face image in from the database.

// update the log table with corresponding face image and system time that makes completion of attendance for an individual students.

end;

VII. FUTURE SCOPE

Almost all academic institutions require attendance record of students and maintaining attendance manually can be hectic as well as time consuming task. Hence maintaining attendance automatically with the help of face recognition will be very helpful and less prone to errors as compared to manual process. This will also reduce manipulation of attendance record done by students and it will save time as well. The future scope of the proposed work can be, capturing multiple detailed images of the students and using any cloud technology to store these images. The system can be configured and used in Atm machines to detect frauds. Also, the system can be used at the time of elections where the voter can be identified by recognizing the face.

VIII. CONCLUSION

This paper introduces the efficient method of attendance management system in the classroom environment that can replace the old manual methods. This method is secure enough, reliable, accurate and efficient. There is no need for specialized hardware for installing the system in the classroom. It can be constructed using a camera and computer. There is a need to use some algorithms that can recognize the faces in veil to improve the system performance.

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