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SMART ATTENDANCE SYSTEM USING FACE RECOGNITION

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ABSTRACT
The management of the attendance can be a great burden on the teachers if it is done by hand. To resolve this problem, smart and auto attendance management system is being utilized. But authentication is an important issue in this system. The smart attendance system is generally executed with the help of biometrics. Face recognition is one of the biometric methods to improve this system. Being a prime feature of biometric verification, facial recognition is being used enormously in several such applications, like video monitoring and CCTV footage system, an interaction between computer & humans and access systems present indoors and network security. By utilizing this framework, the problem of proxies and students being marked present even though they are not physically present can easily be solved. The main implementation steps used in this type of system are face detection and recognizing the detected face. This paper proposes a model for implementing an automated attendance management system for students of a class by making use of face recognition technique, by using Eigenface values, Principle Component Analysis (PCA) and Convolutional Neural Network (CNN). After these, the connection of recognized faces ought to be conceivable by comparing with the database containing student's faces. This model will be a successful technique to manage the attendance and records of students.

I. INTRODUCTION

Facial image has set out to be an important biometric feature, which easily is acquirable and doesn't require any special or physical interaction between the subject and the device. As it is observed, image recognition is very complex and challenging one affecting variety of parameters such as intensity, orientation, expression and size. Individual recognition is of most importance in today's world due to varied reasons. Real-time applications of this algorithms faces some limitations to resolve loss of important information. Detection and recognition of faces in videos using image processing is discussed in. Various steps for detection and recognition are demonstrated and details regarding what algorithms are used to implement this techniques are described.

Face detection methods can be classified based on the individuals face appearance, facial geometric structure, face colouretc.. Some of the image processing techniques uses extraction of depth features to detect faces with respect to geometric variations and textures. Mapping of edges and skin colour

thresholding is used to detect faces in Viola- Jones .This new system can ease the hectic attendance maintenance and handling the attendance will be more precise and efficient. It works with human face detection with the help of Viola Jones algorithm and face recognition with Fisher Face algorithm and achieves accuracy of 45 % to 50%. We train the dataset by giving the images of the students and the algorithm itself takes images of the students. Students will first register themselves in the system with proper details, and facial images captured from different angles and positions. On successful completion of registration process, store students data in the database. Video Acquisition is done by capturing the video of the class being conducted in a classroom.

If the faces of students are matched, then their attendance is recorded and updated in the system. Also, it takes care to see that once attendance is recorded for a particular student no more update to the attendance of that student will be recorded(i.e 1 student= 1 attendance).

1.1 MOTIVATION

Now a days, the field of image processing has wide range applications in biometric recognition, behavioral analysis, teleconferencing and video surveillance. This project typically puts forward idea of using image processing techniques such as detection and recognition of faces to design the system that can automatically handle the attendance of the students.

PROBLEM STATEMENT

Institution Type, e.g., universities, corporations often rely on manual or semi-automated methods that are susceptible to time inefficiencies, proxy attendance, and security vulnerabilities. This results in inaccurate records, increased administrative overhead, and potential security breaches. Therefore, there is a need for a robust and secure automated attendance system that leverages facial recognition technology to streamline the process, enhance accuracy, and mitigate security risks. Manual sign-in processes are time-consuming, especially in large institutions. Students or employees queuing to sign in can cause delays and disrupt schedules . Manual data entry is also slow and prone to errors, requiring administrative staff to spend significant time processing attendance records. Manual systems are easily manipulated. Students or employees can sign in for their friends or colleagues, leading to inaccurate attendance records. This undermines accountability and can have negative consequences for academic or professional performance.

OBJECTIVE

The aim is to develop the automated system for detection and recognition of faces using their images from videos and recording the attendance of the students by identifying him/her from their variant facial features. This helps to maintain and handle the attendance system automatically without any human intervention. This new system can ease the hectic attendance maintenance and handling the attendance will be more precise and efficient.

II. LITERATURE SURVEY

Title: “An Analysis of the Viola-Jones Face Detection Algorithm, Image Processing” Author: Yi-Qing Wang

Description: Viola-Jones algorithm, the first ever real-time face detection system. There are three ingredients working in concert to enable a fast and accurate detection: the integral image for feature computation, Adaboost for feature selection and an attentional cascade for efficient computational resource allocation. Here we propose a complete algorithmic description, a learning code and a learned face detector that can be applied to any color image.

Title: “Rapid object detection using a boosted cascade of simple features” Author: P. Viola and M. Jones

Description: The first is the introduction of a new image representation called the "integral image" which

allows the features used by our detector to be computed very quickly. The second is a learning algorithm, based on AdaBoost, which selects a small number of critical visual features from a larger set and yields extremely efficient classifiers. The third contribution is a method for combining increasingly more complex classifiers in a "cascade" which allows background regions of the image to be quickly discarded while spending more computation on promising object-like regions.

Title: "Face Detection by Using OpenCV's Viola-Jones Algorithm based on coding eyes" Author: Abdul Mohsen Abdul Hossen

Description:Facial identification is one of the biometrical approaches implemented for identifying any facial image with the use of the basic properties of that face. In this paper we proposes a new improved approach for face detection based on coding eyes by using Open CV's Viola-Jones algorithm which removes the falsely detected faces depending on coding eyes.

Title: "Face recognition using Fisherface algorithm" Author: Hyung-Ji Lee

Description: the Fisherface algorithm as a class-specific method is robust about variations such as lighting direction and facial expression. In the proposed face recognition adopting the above two methods, the linear projection per node of an image graph reduces the dimensionality of labeled graph vector and provides a feature space to be used effectively for the classification.

Title: "Face recognition using Eigenfaces" Author:M.E. Gaikwad

Description: Face is a complex multidimensional visual model and developing a computational model for face recognition is difficult.The goal is to implement the system (model) for a particular face and distinguish it from a large number of stored faces with some real-time variations as well. The Eigenface approach uses Fisher Face Algorithm (FFA) algorithm for the recognition of the images. It gives us efficient way to find the lower dimensional space.

EXISTING SYSTEM

Face recognition is a part of pattern recognition. In early 1990s, Fisher faces and Eigen faces were proposed by. Fisher faces has better performance than Eigenfaces. Belhumeur, Hespanha, Kriegman presents Eigen and Fisher face as face recognition methodology based on the features. This feature based methods helps to achieve stability towards lighting conditions and poses variations with use of non-linear feature spaces.

DRAWBACKS

As it is observed, image recognition is very complex and challenging one affecting variety of parameters such as intensity, orientation, expression and size. The traditional methods lags the effectiveness of the system leading the time and paper wastage, and causes proxy attendance which is eliminated in automated system.

PROPOSED SYSTEM

The proposed system aims to develop an automated attendance system. To achieve the project objective, firstly, video segments are captured of the classroom lecture. Pre – Processing of video is done to remove unwanted artifacts i.e. noise and other invariants. The next stage demonstrates detection of faces from the complex backgrounds recognition of human being. This system helps to identify students to track his/her presence in the lecture and to avoid proxy attendance caused by unauthorized students. There are four stages of operation to develop the system, they are: Video acquisition, detection of faces and cropping, extraction of features and recognition of face.

ADVANTAGES

This system has been designed to automate the attendance maintenance. The main objective behind developing this system is to eradicate all the drawbacks and unconventional methods of manual

attendance handling. So to overcome all such drawbacks of manual attendance, this framework would come out to be better and reliable solution with respect to both time and security.

METHODOLOGY

Various steps for detection and recognition are demonstrated and details regarding what algorithms are used to implement this techniques are described.

Face detection methods can be classified based on the individuals face appearance, facial geometric structure, face colour etc. Some of the imageThe proposed system aims to develop an automated attendance system. To achieve the project objective, firstly, video segments are captured of the classroom lecture. Pre – Processing of video is done to remove unwanted artifacts i.e. noise and other invariants. The next stage demonstrates detection of faces from the complex backgrounds and recognition of human being. This system helps to identify students to track his/her presence in the lecture and to avoid proxy attendance caused by unauthorized students. There are four stages of operation to develop the system, they are: Video acquisition, detection of faces and cropping, extraction of features and recognition of face.

Work Flow of the system: Students will first register themselves in the system with proper details, and facial images captured from different angles and positions. On successful completion of registration process, store students data in the database. Video Acquisition is done by capturing the video of the class being conducted in a classroom. Acquired video is used to detect and recognize faces of different students and differentiate them from background using image processing techniques i.e. Viola – Jones Algorithm for face detection, Cropping of faces and Binary Face Algorithm for face recognition. Student's identityverification is done by comparing facial image of the students with the faces stored in the database. If the faces of students are matched, then their attendance is recorded and updated in the system. Also, it takes care to see that once attendance is recorded for a particular student no more update to the attendance of that student will be recorded (i.e. 1 student = 1 attendance).

1.2 Development

We proposed as an alternative to the user-based neighborhood approach. We first consider the dimensions of the input and output of the neural network. In order to maximize the amount of training data we can feed to the network, we consider a training example to be a user profile (i.e. a row from the user-item matrix R) with one rating withheld. The loss of the network on that training example must be computed with respect to the single withheld rating. The consequence of this is that each individual rating in the training set corresponds to a training example, rather than each user. As we are interested in what is essentially a regression, we choose to use root mean squared error (RMSE) with respect to known ratings as our loss function. Compared to the mean absolute error, root mean squared error more heavily penalizes predictions which are further off. We reason that this is good in the context of recommender system because predicting a high rating for an item the user did not enjoy significantly impacts the quality of the recommendations. On the other hand, smaller errors in prediction likely result in recommendations that are still useful—perhaps the regression is not exactly correct, but at least the highest predicted rating are likely to be relevant to the user.

1.3 Collection

The most crucial step when starting with ML is to have data of good quality and accuracy. For example, while preparing for a competitive exam, students study from the best study material that they can access so that they learn the best to obtain the A huge amount of capital, time and resources are consumed in collecting data. Organizations or researchers have to decide what kind of data they need to execute. Example: Working on the Facial Expression Recognizer,

needs a large number of images having a variety of human expressions. Good data ensures that the results of the model are valid and can be trusted upon.

1.4 Preparation

The collected data can be in a raw form which can't be directly fed to the machine. So, this is a process of collecting datasets from different sources, analyzing these datasets and then constructing a new dataset for further processing and exploration. This preparation can be performed either manually or from the automatic approach.

Data can also be prepared in numeric forms also which would fasten the model's learning. **Example:** An image can be converted to a matrix of N X N dimensions, the value of each cell will indicate image pixel.

1.5 Input

Now the prepared data can be in the form that may not be machine-readable, so to convert this data to readable form, some conversion algorithms are needed. For this task to be executed, high computation and accuracy is needed. Example: Data can be collected through the sources like MNIST Digit data(images), twitter comments, audio files, video clips.

1.6 Processing

This is the stage where algorithms and ML techniques are required to perform the instructions provided over a large volume of data with accuracy and optimal computation.

1.7 Output

In this stage, results are procured by the machine in a meaningful manner which can be inferred easily by the user. Output can be in the form of reports, graphs, videos, etc

1.8 Storage

This is the final step in which the obtained output and the data model data and all the useful information are saved for the future use.

1.9 Data Pre-processing for Machine Learning in Python

Pre-processing refers to the transformations applied to our data before feeding it to the algorithm.

Data Preprocessing is a technique that is used to convert the raw data into a clean data set. In other words, whenever the data is gathered from different sources it is collected in raw format which is not feasible for the analysis.

III. SYSTEM DESIGN

SYSTEM ARCHITECTURE

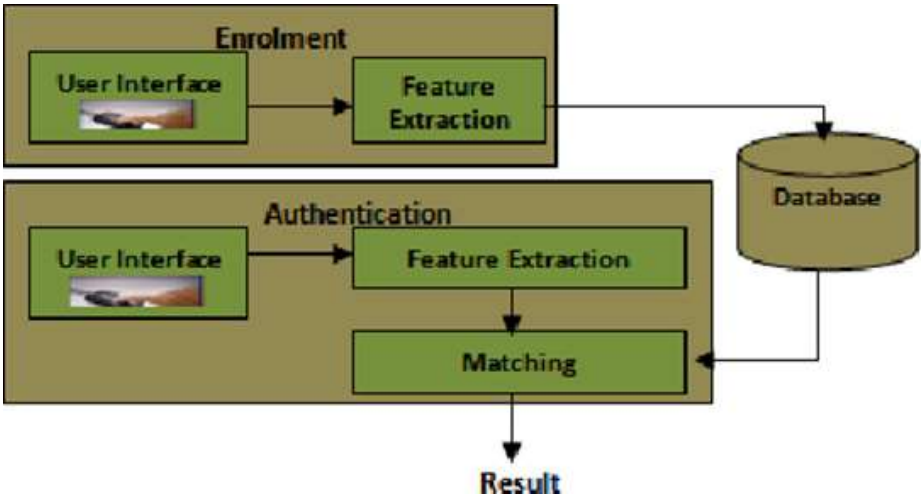

FIG: SYSTEM ARCHITECTURE

IV. OUTPUT SCREEENS

Smart Attendance System

Student Registration

Account Activation

Admin Login

Faculty Login

Student Login

Student Attendance

V. CONCLUSION

This system has been designed to automate the attendance maintenance. The main objective behind developing this system is to eradicate all the drawbacks and unconventional methods of manual attendance handling. The traditional methods lags the effectiveness of the system leading the time and paper wastage, and causes proxy attendance which is eliminated in automated system. So to overcome all such drawbacks of manual attendance, this framework would come out to be better and reliable solution with respect to both time and security. In this way, automated attendance system helps to distinguish between the faces in classroom and recognize the faces accurately to mark their attendance. The efficiency of the system can be improvised by fine tasking of the training process

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