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Attendance System based on Face Recognition System using Real-Time Camera with Message Passing

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Abstract - The goal of this project is to create the attendance system using face recognition. The attendance system uses faces as objects to be detected and recognized as a person's identity and then stored as a face database. The process of matching face image data captured by the. camera with face images that have been stored in the face database will result in face identification of the object faces captured by the camera. The face recognition-based attendance system in this study uses a hybrid feature extraction method using CNN-PCA (convolutional neural network - principal component analysis). This combination of methods is intended to produce a more accurate feature extraction method. The face recognition-based attendance system using this camera is very effective and efficient to further improve the accuracy of user data. This face recognition-based attendance system using this camera has very accurate data processing and high accuracy so that it can produce a system that is reliable and powerful to identify human faces in real-time.

Key Words: face recognition-based attendance system, hybrid feature extraction, CNN-PCA, real-time camera.

1. INTRODUCTION

Human face plays an important role in our day to day life mostly for identification of a person. Face recognition is a part of biometric identification that extracts the facial features of a face and then stores it as a unique face print to uniquely recognize a person. An attendance system using a camera-based on a face recognition system has been developed by several researchers to produce a face attendance system that is accurate and able to store a large-scale face image database. The design and manufacture of facial attendance systems using cameras are very useful effective and efficient to further improve the accuracy of user data and is useful for the high mobility of users who use it. Facial attendance system using a camera is very safe and accurate for detecting users because it has a more accurate data process and high accuracy so that it can produce a system that is reliable and robust to identify human faces to be used as a time attendance on attendance machines.

In this study, the preprocessing method for images that will be processed using a compilation method development of the RGB - grayscale and resizing process, then using the addition of the histogram equalization method and the addition of contrast and brightness level adjustment methods to anticipate variations in the illumination of the image used. Some of the additional methods are intended so that the image that has been processed can be a high information value that can improve facial recognition to be more optimal.

Some related research has been conducted by researchers before, so this study used a method face recognition using a hybrid feature extraction method using CNN-PCA. This face recognition method is then used as a reference for making a face attendance application using a camera.

1.1 Problem Statement

When there are so many students in a school/college, it becomes more and more difficult to mark attendance for each student and it is time consuming too. Traditional student attendance marking technique is often facing a lot of trouble. The classical student attendance marking technique such as calling student names or checking respective identification cards. There are not only disturbing the teaching process but also causes distraction for students during exam sessions. Apart from calling names, attendance sheet is passed around the classroom during the lecture sessions. The lecture class especially the class with a large number of students might find it difficult to have the attendance sheet being passed around the class. Thus, face recognition student attendance system is proposed in order to replace the manual signing of the presence of students which are burdensome and causes students get distracted in order to sign for their attendance. Furthermore, the face recognition based automated student attendance system able to overcome the problem of fraudulent approach and lecturers does not have to count the number of students several times to ensure the presence of the students.

1.2 Objectives

1. The objective of this project is to develop face recognition based automated student attendance system.
2. Expected achievements in order to fulfill the objectives are:
    a) To detect the face segment.
    b) To extract the useful features from the face detected.
    c) To classify the features in order to recognize the face detected.

d) To record the attendance of the identified student.
e) Send message to absent student's parents.

2. ANALYSIS OF THE SYSTEM

2.1 Existing System

1. Fingerprint Based recognition system:

In the Fingerprint based existing attendance system, a portable fingerprint device needs to be configured with the students' fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students.

2. RFID (Radio Frequency Identification) Based recognition system:

In the RFID based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of to connect to RS232 and record the attendance to the saved database. There are possibilities for the fraudulent access may occur. Some are students may make use of other students' ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

3. Iris Based Recognition System:

In the Iris based student attendance system, the student needs to stand in front of a camera, so that the camera will scan the Iris of the student. The scanned iris is matched with data of student stored in the database and the attendance on their presence needs be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of laying the corresponding network.

2.2 Proposed System

The automated attendance system uses Multiple faces of students as objects to be detected and recognized as a person's identity and then stored as a face database. The process of matching face image captured by the camera with face images that have been stored in the face database will result in face identification of the object faces captured by the camera at given time. The face recognition-based attendance system in this project uses a hybrid feature extraction method using CNN-PCA (Convolutional Neural Network - Principal Component Analysis). This combination of methods is used to produce a more accurate result.

In this system, we use feature extraction method PCA (principal component analysis). The use of PCA is to reduce dimensional of face image resolution. The principal component analysis is used to convert a large variable data into smaller variables. We use the Mahalanobis distance method as a method of classification. The Mahalanobis distance method used in this classification process is used to determine the degree of similarity between features in order to produce a more optimal face recognition. To determine the similarity of faces, we compare the training face data that stored in the database with the facial image on testing process. These results will produce identification of data and stored as attendance data then, system check the attendance status of students if student's attendance status is "Absent" then the message is send to absent student's parent mobile number.

3. LITERATURE SURVEY

1. Online Attendance using Facial Recognition
Author Name: Sharanya T, Year:2020

There are many biometric processes, among which face recognition is the best method. In this method the camera is fixed within the classroom and it'll capture the image, the faces are detected and then it's recognized with the database and finally the attendance is marked.

2. Design and evaluation of a real time face recognition system using CNN.
Author Name: Pranav K. B, Year:2020

Face recognition systems use either offline data or real-time input, based on the application. In this paper, design and evaluation of a real-time face recognition system using Convolutional Neural Network (CNN) is proposed.

3. E - Attendance System Using Open cv and CNN.
Author Name: Mr. Omkar Sawant1, Mr. Yash Jain2, Year:2019

In which automatically detects the student when he/she enters in the classroom and marks the attendance by recognizing him/her. This system is developed by capturing real-time human faces in the class. Finally, the absentee lists are displayed on android application for confirmation.

4. Large-pose face alignment via CNN-based dense 3D model fitting.

Author Name: A. Jourabloo and X. Liu, Year: 2016

We proposed a method to fit a 3D dense shape to a face image with large poses by combining cascade CNN repressors and the 3D Morph Able Model (3DMM). We proposed two types of pose invariant features for boosting the accuracy of face alignment.

5. Face Recognition using Principle Component Analysis, Eigen face and Neural Network.
Author Name: Agrawal M and Agrawal H, Year:2010

The paper presents a face recognition approach using PCA and Neural Network techniques. The result is compared with K-means, Fuzzy Ant with fuzzy C-means and proposed technique gives a better recognition rate then the other two:

1. The Eigen face method is very sensitive to head orientations, and most of the mismatches occur for the images with large head orientations.

2. By choosing PCA as a feature selection technique (for the set of images from the ORL Database of Faces), one can reduce the space dimension from 2576 to 50 (equal to no. of selected Eigen faces of highest eigenvalue).

4. SYSTEM ARCHITECTURE

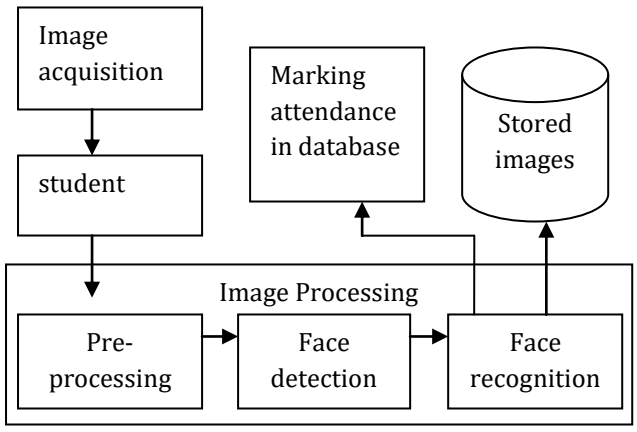

Fig. System Architecture

5. ALGORITHM

1. Start.

2. Image acquisition: Image is captured from camera.

3. Preprocessing face image.

4. Face Detection: Detecting student face using CNN technique.

5. Face recognition:

a) Recognizing student face using PCA technique.

b) Image compare with train data set.

6. Attendance:

If: face recognized successfully mark attendance of student present.

Else: mark the attendance of student absent and send message to student's parents number.

7. End

6. METHODOLOGY

To mark attendance, we follow a series of steps which includes enrolment, face detection, face recognition, and then marking the attendance in a database. training and enrolment are two different steps. Training is performed on millions of images. On the other hand, enrolment is performed using a small set of images. enrolling a person is simply passing a few images of the person through the network to obtain 128- dimensional feature descriptors corresponding to each image. In other words, we convert each image to a feature in a high-dimensional space. In this high dimensional space, features belonging to the same person will be close to each other and far away for different persons.

The camera that used in face detection process is performed using face detection based on the conventional neural network(CNN). Face detection is done by a camera to take face images of objects taken. The image taken from the camera lens is a raw image containing a background image and a face image. In this face detection process is carried out the process of detecting and searching for facial features in the camera image, which at this stage the system recognizes patterns as faces or not. Normalization or pre-processing is a process that result a face image that has detected on process of face detection. In this normalization phase, a combination of several face image processing models is used. We used the cropping method, resizing, RGB-Gray, and using histogram equalization as a contrast-brightness adjustment to optimize the facial recognition. The pre-processing method is used to improve the sharpness of the image to anticipate several variations in illumination that commonly appear when capturing facial images. h, a face database is stored resulting from the 2D-3D image reconstruction process to result a face database that is used in the face recognition process. The 2D

to 3D image reconstruction method is expected to make a strong contribution to face detection and recognition so that it has high accuracy and fast face recognition computing. The CNN method is used to produce 3D face images from 2D face images.

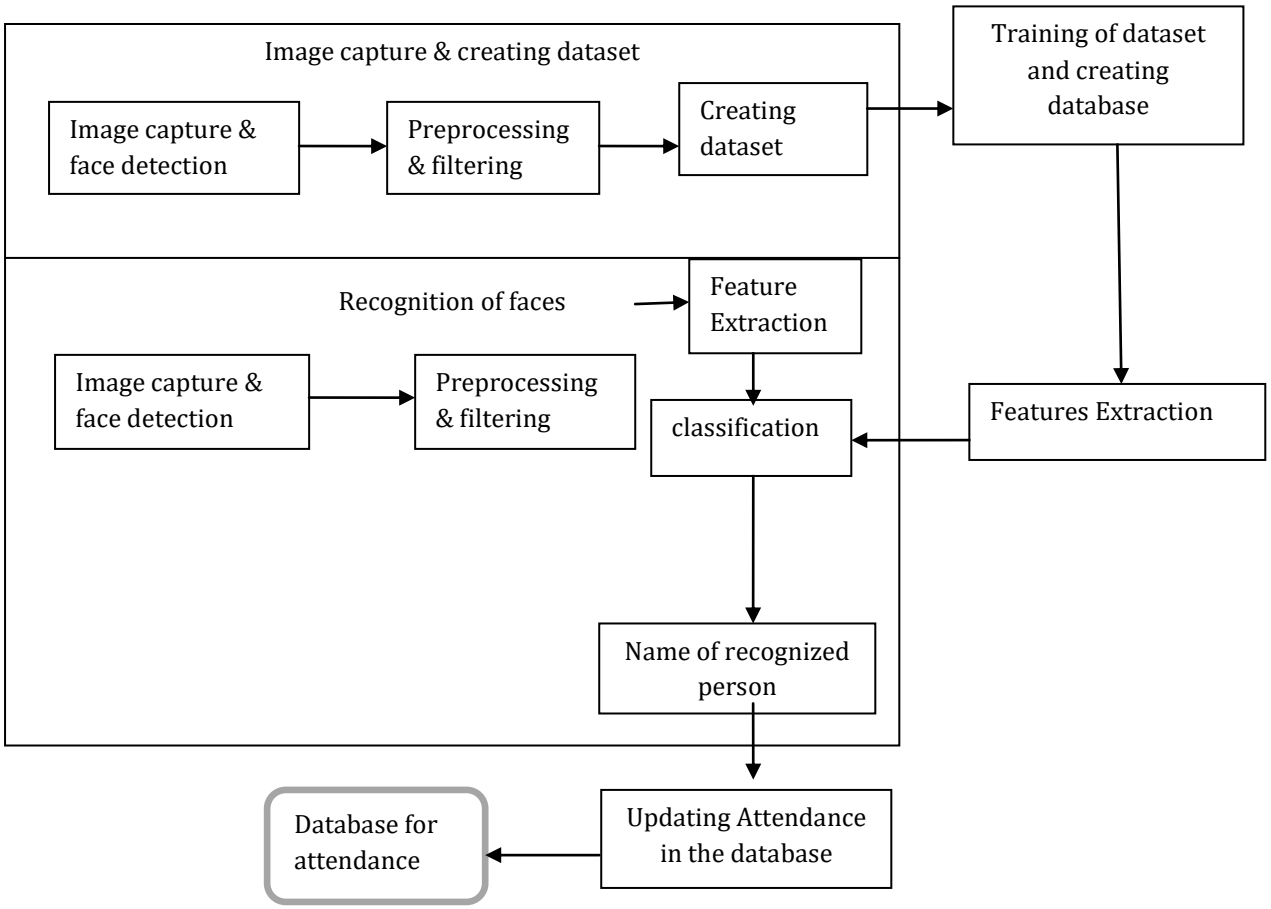

Fig 1. Stages of the process of facial recognition attendance system

feature extraction method namely principal component analysis (PCA). PCA is used to reduce dimensional of face image resolution. The principal component analysis is used to convert a large variable data into a form of representation of other smaller variables.

We use the Mahalanobis distance method as a method of classification. The Mahalanobis distance method used in this classification process is used to determine the degree of similarity between features in order to produce a more optimal face recognition. To determine the similarity of facial features, we compare the training features of face that stored in the database with the features of facial image on testing process. These results will produce identification data and stored as attendance data.

7. ADVANTAGES

1. Robust.
2. Secure.
3. Scalable and reliable.
4. It saves their time and efforts.
5. It automatically detects the important features without any human supervision.

8. MOTIVATION

1. Traditional student attendance marking technique is often facing a lot of trouble.
2. There are not only disturbing the teaching process but also causes distraction for students during exam sessions.

3. Apart from calling names, attendance sheet is passed around the classroom during the lecture sessions.

9. APPLICATION

1. Face Identification.
2. Access Control.
3. Security.

10. CONCLUSIONS

In this system we have implemented an attendance system for a lecture by which lecturer or teaching assistant a record students attendance. It saves time and effort, especially if it is a lecture with huge number of students. The CNN method is used to produce a 3D face image from a 2D face image. The PCA method used as a feature extraction method and the Mahalanobis method used as a classification method on the proposed face recognition-based attendance system can work well. The proposed method can produce a face recognition that has a high accuracy of up to 98 %.

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