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Research Article

Facial Recognition Based Attendance System

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Abstract

The face is the key feature of identification of a person. And there are so many methods to exploit the system. This paper solely aims on the Face Recognition technique to maintain the authenticity of the person. In facial recognition we verify any person by their face. It captures the data and then analyzes and co relate person's facial aspects. Face recognition is in trend nowadays because of the availability of feasible technologies after years of research. In these times this system is treated as the most anticipated of all biometric systems. We recognize ourselves not by our fingerprints or eye but by looking at our face. Considering all the above mentioned points andtheir implications we've tried to realize some experience with some of the commonly available face recognition algorithms and make our Facial attendance system more effective.

Keywords- *Haar Cascade Classifier, LBPH face recognizer, Xampp.*

can be moved from one place to another and anyone can use other's card for scanning. The rate of proxy is so high we can't even imagine. So we can see how big is this threat. To overcome this problem we have Facial Recognition based Attendance system which helps to keep the track of our identity by

capturing several sample of images and then analyzing it .

I. INTRODUCTION

In today's changing world, where everything is becoming possible and achieved with the help of technology, the only thing which everyone wants to protect is their identity. The security is becoming less and less effective . So , the facial recognition technology comes into light which not only protects us but helps us to keep us real. As we all know that there are many manual and biometric systems which are to be still in existence whose effectiveness is questionable.

The manual systems can be easily manipulated, biometric systems

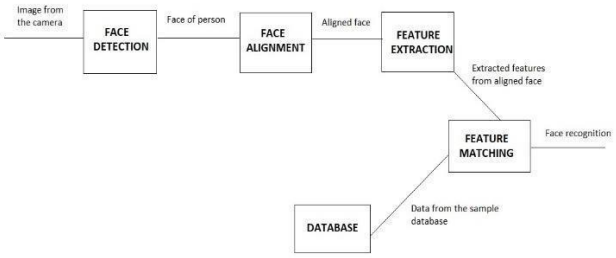

Fig 1: Recognition Process

The objective of our attendance system is to keep the students and employee updated with their attendance system by decreasing time and increasing accuracy. We used The Local Binary Pattern Histogram (LBPH) algorithm, which can recognize both front face and side face. Also, we used Haar Cascade which is a machine learning-based approach.

Our system captures the image of a person and matches with the data that is already stored in our system, if not stored we can register it by registering whose information is not there in our database.

II. RESEARCH OBJECTIVE

This research paper aims to detect unique face image irrespective of the beard, glasses and other backgrounds. In this system we extract unique characteristics features of a face in reorganization of a person's face.
The central focus is to keep the students updated with their attendance ratio by decreasing time complexity and increasing accuracy.

III. RELATED WORKS

Influence of low resolution of images on reliability of face detection and recognition [10]. In this paper they have examined the fidelity of the system by using the low resolution images for detection of face and recognition. There is a differentiation done between the various face detection methods. During the research, they have brought to notice each and every little detail considering both, the accuracy of extraction of the face from image and also the accuracy of identifying which is based on eigen faces method .

Fingerprint Biometric based Access Control and Classroom Attendance Management System [2] .They has proposed two different implementations of fingerprint biometric system in this paper. An Access Control System (ACS) which is an electronic system that uses electronic keys (the tags) for person-specific access to door locks that too using a fingerprinting device. Another prototype Classroom Attendance Management System (CAMS) is presented in which we use fingerprint for marking attendance for classroom. Both of these are introduced to reduce the possibilities of fraud or spoofing (or proxy).

Class Room Attendance System Using Facial Recognition System
[11] . In this paper, they have used MATLAB language to implement their system and for face recognition which is much more advanced technique than as used in. Also The various methods that are used here are color based detection and PCA for face recognition and for feature matching, as well as used Principle Component Analysis and Linear Discriminate Analysis (LDA) for detection which is based on the detection of the human skin tone and all the different textures in the image. The selected area of the image is then separated and passed to the further method ahead.

Automatic Attendance Management System Using Face Recognition [7]. This paper explores face recognition method based on feature extraction, and uses extensive geometry. This enables us to find the colors of the eye, mouth, nose, and even the face itself. The main component for face recognition is based on the information theory approach. Here, the necessary information in a face image is gathered in an effective manner

IV. DESIGN AND IMPLEMENTATION

A. Proposed Model

When the image screen is detected by the system, it simultaneously starts to search and select the area of interest to be detected, which is the face of the person in this case. The next step that the system undertakes is to recognize the face of the person after it searches into its already recorded face database and eventually the attendance of the person is marked in the subsisting database of attendance.
After marking the attendance of a person, the system readies itself for marking the attendance of another person by taking a fresh sample.

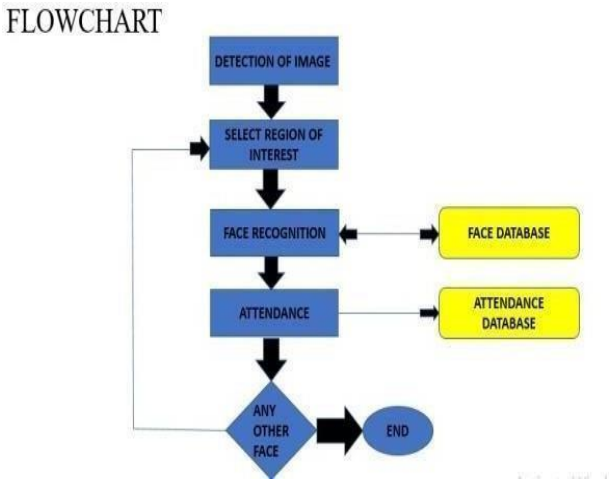

Fig 2: Flowchart of Model

The algorithms used for face identification and for detections are LBPH and HAAR cascade respectively.
A python module Tkinter, which provides a friendly and trouble-free creation of GUI application, has been used to create the GUI for this system as shown in figures 2 and 3.

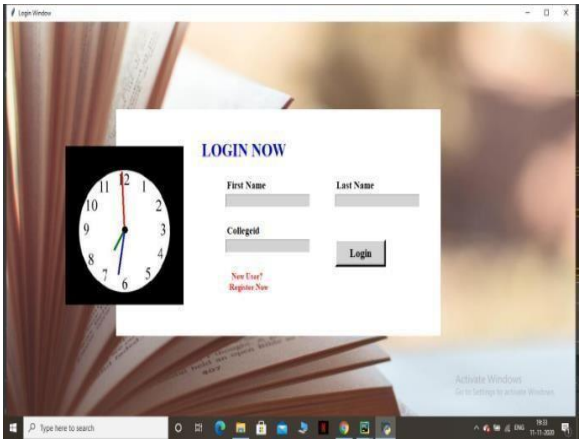

Fig 3: Login Window

Fig 4: Registration Window

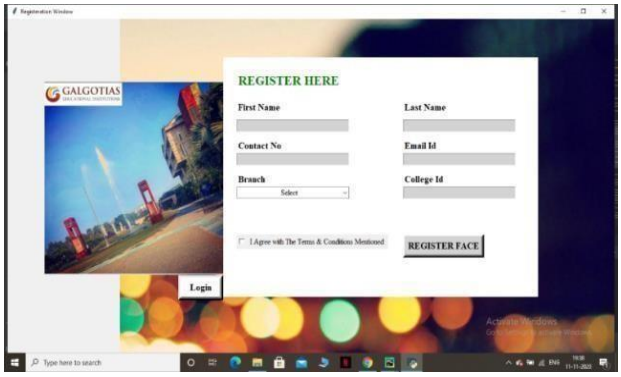

Fig 5: Architecture of the system

Some of the functions performed by the system are:

- record student's image and details for the database
- Train images
- Start tracking in front of the camera

At the registration page when the student stands in front of the camera, the pre-processing takes place, then face detection is done and then that sample of the face detected is saved in the database. At the login page, face recognition takes place when the student stands in front of the camera. If his face matches with a sample already registered or saved in the database his attendance is marked as depicted in figure 4.

Since we couldn't find any existing database on the Internet that contains 50 images for each person we created one of our own. A total of eight individuals were picked up for this experiment, how to which 3 had their faces registered with 50 images each and 5 were not registered which were used to test the recognition of unknown persons. A real, live-time video camera was used to check the reliability of the system where the registered and unregistered individuals came and stood in front of the camera one by one. Images in figure 5 were captured after the pre-processing stage.

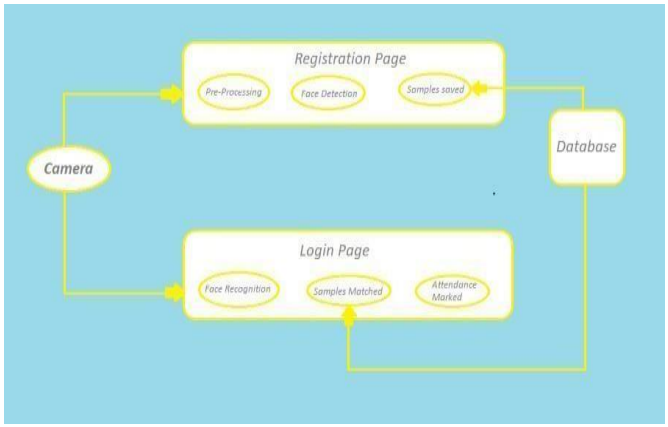

Fig 6: Extracted images from database

B. Pre processing and Face Detection

This is the process where the facial area is separated from the rest of the images in the background.Face tracking devices can be used for tracking faces where video frames are involved. To train cascade function and detect other image's features, LBPH and Haar Cascade classifier are used to detect all the faces initially,where features of haar like 4 rectangles, line and edges are used.

To be sent to the next stages, the Region Of Interest called ROI which are the faces are extracted. Here, large and variable size images are treated with extensive computation and many other features, since most of them are mostly irrelevant.

C Face Matching

Then the comparison of the chosen features takes place with the already registered information in the database. There are two modes of a face recognition system's working:

Authentication of a face image: It basically compares the input facial images with the facial images related to the user which is requiring the verification. It is a 1×1 comparison.

Facial Recognition: It basically compares the input facial images with all facial images from a dataset with the motive to find the users that match the face. It is a 1×N comparison.

In comparison to Eigen faces and Fisher faces, the algorithm used by LBPH is far more capable in identifying both front and side parts of the faces. The features and traits of a face that best describe it are found by the LBPH algorithm. This is a method found easiest from amongst all other methods used by different algorithms because it offers image characterization within the ambit, in a dataset and an equivalent is performed if there occurs a replacement not known image and again the comparison takes place throughout the dataset. As compared to other algorithms available, it is more effective in various surroundings and light settings.

A new and large histogram is formed after the conversion of the image into LBV by extracting histograms from every grid and coupling them. The facial images from the database are all represented by separated histograms that demonstrate the features and characteristics of the original image.

D Post Processing

For identifying the person's image, the new histogram is matched with the old ones that are stored in the training dataset with the use of Euclidean distance. Histogram with the least distance, alsoknown as lowest confidence is selected because the higher confidence captures college ID as well and thus is better. Then there are 3 events:

- Attendance Marked: When confidence > 75, as details are from the ID extracted. (figure 6)
- To avoid redundancy, the student's name is updated in the database if it is not already there. (Figure 5)
- On the database it isdisplayed:

1. "Face Not Matched", or
2. "Face Not Found In Database".

fname	lname	pno	email	branch	collegeid
Abhinav	Verma	9634337014	abhinav.av.111.av@gmail.com	Electronics And communications	18gcebec014
Anjali	Mehta	8171977552	anjalimehta896@gmail.com	Electronics And communications	18gcebec130
Aditi	Karsouliya	6396624739	karsouliya.aditi@gmail.com	Electronics And communications	18gcebec131

Fig 7: Attendance System Database

This is helpful in reducing the error of students of a class being identified as an unknown person and their segregation from actually unknown persons.

V. EXPERIMENTAL RESULTS

Automated attendance is thus used to save time and protect identity. This system can also be used to identify an unknown person. We considered 1.5 feet as the standard distance of an object from the camera as shown in fig 8.

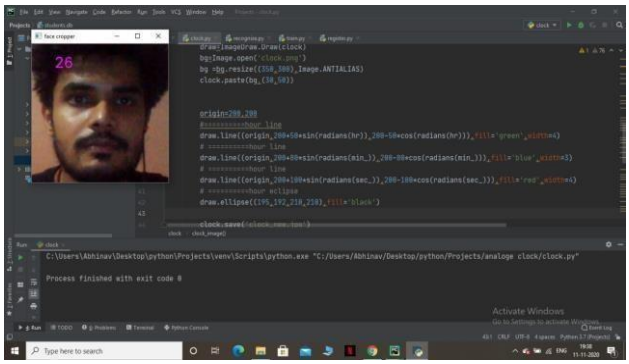

Fig 8: Scanning Face Data

The accurate face recognition rate of the candidate is 85% and the system gives false-positive rate to be 8%. It does not matter if the candidate is wearing specs and having beard or has some uncertain external features changed. This Face Recognition system existing or proposed till now are known to be only 60% accurate, the reason may be detection of unwanted random objects in the background image or decline in image quality.

Poor lighting conditions may affect image quality which demeans system performance. Its false positive rate is 14% for the proposed system and 8% for the existing model. Only the false positive percentage of an unknown person is affected by the threshold value. In The systems which are already existing when in the video a candidate turns his head slightly up then the system experiences a rise in confidence value for that frame which maybe greater than the favorable filter value . Normally, Favorable filter value is considered to be 60. Whereas, in the proposed system, if confidence happens to be higher than 75, then only attendance is successfully marked as shown in fig 9.

Performance Evaluation	Percentage
Student Recognition Rate	85%
False positive rate	20%
Unknown people Recognition rate (existing model)	60%
Unknown people false-positive rate (existing model)	18%
Unknown people Recognition rate (Proposed model)	60%
Unknown people false-positive rate (proposed model)	30%

Table 1: Evaluation of performance

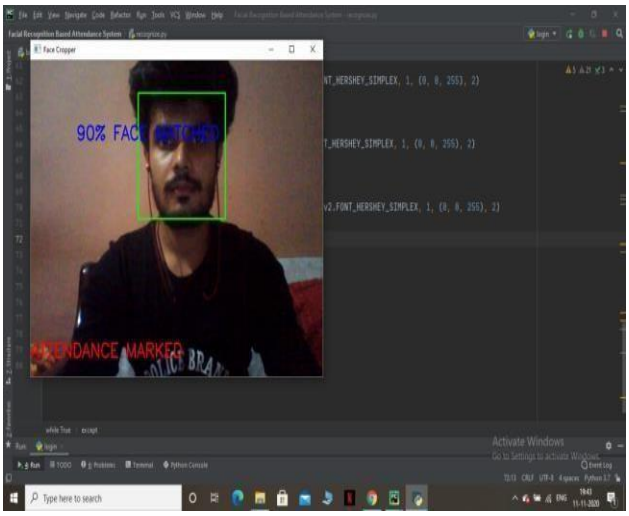

Fig 9: Recognizing Face from Dataset

VI. CONCLUSION AND FUTURE SCOPE

Facial recognition based attendance system automatically detects the distinct face image amongst the other natural elements (such as walls and other backgrounds) of the students and maintains a record of those collected data by extracting unique characteristics of a face beneficial in face recognition. In this project, we have worked on time complexity and hence reduced it resulting in increased accuracy. The system takes 50 samples to recognize, and reduce the time complexity. It uses the data from the collected samples to recognize the person. Face detection using Haar cascades is utilized here which is a machine learning based approach where we have to train a cascade function with a set of input data. It is used as the object detection algorithm. The Local Binary Pattern Histogram (LBPH) algorithm can solve the problem of face recognition in a very simple way by recognizing both front and side angle of the face. An effort could be made to built a better version.

In further works, we can also work on the development of certain alerts in the system that becomes active if an intruder is discovered in the class. Bad lightning conditions may also happen to influence the picture quality which accidentally reduces the performance of the system, an effort could be made to make it better .And we will try to contain the system in a mobile application or website

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