

Automatic Face Recognition Attendance System using Python and OpenCv

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Abstract

The conventional attendance system consists of registers marked by teachers which leads to human error and a lot of maintenance. Time consumption is an important point of concern in this system. We have thought of revolutionize it using available digital tools in the modern era i.e. FACE RECOGNITION. Our project will ensure more precision and negligible manual work. The project is revolutionized in order to overcome the problems of conventional system. Face recognition and then marking the attendance is our project all about. The database of all the students in the class is stored in a folder and when the face of the individual student matches with one of the faces stored image, attendance is marked else the face is ignored and attendance not marked. In our project, face recognition (Machine Learning) technology is used. Inside this Histogram of Oriented Gradient for face detection and SVM Classifier for name recognition is used. The model has an accuracy of 99.38% on the Labelled Faces in the Wild benchmark.[2].

Keywords- Face Detection, Face Recognition, OpenCV, Tkinter etc

I. INTRODUCTION

Attendance plays an important role in any organisation whether it be educational institutions or companies. So it is very important to keep record of the attendance. The problem arises when one has to manually take the attendance which is not only time consuming but exhausting as well.

So an automatic attendance system can solve such problem.

Basically, there are two kinds of system:

- 1) Manual Attendance System (MAS)
- 2) Automated Attendance System (AAS)

One of AAS system is biometric technique using finger prints, though it is automatic and a step ahead of traditional method it fails to meet the time and hygiene constraint. But using the biometric features of face solves such problem.[1] Our projects emphasizes on the features of the face like ears, nose etc.

We used a method invented in 2005 called Histogram of Oriented Gradients (HOG) for face detection.

For identifying the name of person simple linear SVM Classifier is used. All we need to do is train a classifier that can take in the measurements from a new test image and tells which known person is the closest match. The result is the name of person which is used to mark attendance.

A. Project Objective

- 1) Reduce manual process errors by provide automated and a reliable attendance system uses face recognition technology.
- 2) Admin can manage student (CRUD operations).
- 3) Produce monthly reports for students (Attendance Sheet).
- 4) Flexibility, Lectures capability of editing attendance records.
- 5) Send Email to students regarding important information. (if wanted).

II. LITERATURE SURVEY

- Approach for Face Detection and Attendance Using Opencv and Machine learning

The Face detection has been implemented Using a Method Called Histogram of Oriented Gradients In this system students images are stored in database folder With Students name. when Any person comes in front of camera it captures the image of person and compares the captured image with images present in database Folder if images matches with any of the image in database folder then the attendance of the student will be marked and stored in CSV file.

- Marking attendance using face recognition

Automated Attendance system using Face recognition proposes that the system is based on face detection and recognition algorithm which is used to detect the student face when he/she come in front of camera and then compare the face with the images present in the folder if the match is found it will mark the attendance. This system has advantage over the traditional system as it saves time and there is no chance of proxy (that is no other student will mark the attendance of his/her friends).

- Email notification for any Information

Attendance System proposes a feature of Email notification by which users can get details about their attendance through Email on their respective google account.

S. no.	Existing System	Features	Benefits	Limitations
1.	Automated attendance management system using face recognition ^[1]	Use Eigen faces for Recognition	High accuracy	Multiple faces were not recognized.
2.	Face recognition attendance system by nevon ^[2]	Stores the faces that are detected and automatically marks attendance	Used for security purposes in organizations	Don't recognize properly in poor light.
3.	Smart Attendance System using OPENCV based on Facial Recognition ^[3]	Takes pictures through the webcam and create a dataset for users using m images. Takes real-time images and mark attendance	Used for marking attendance in schools and colleges.	Cannot mark attendance of the student on a remote sever database.
4.	Smart Attendance Management System Using Face Recognition ^[6]	Student Registration Face Recognition Addition of subject with their corresponding time. Attendance sheet generation and import to Excel (xlsx) format.	In this the data is stored in sorted manner so that it can easily accessible	Required high definition camera
5.	Face Recognition - A Tool for Automated Attendance ¹	Face detection, Pre-processing, Feature extraction, and Classification stages	High accuracy	Camera should be attached at a specific position
6.	Smart Application For AMS Using Face Recognition ^[8]	Uses CCTV and Android mobile	3D face recognition algorithm is used	Android phone is expensive and detect one face at time
7.	Student Attendance System in Classroom Using Face Recognition Technique ^[9]	Use of Discrete Wavelet Transform and Discrete Cosine Transform.	Multiple face detection was possible	Success rate is only 82%
8.	Attendance System based on Face Recognition using Eigen face and PCA Algorithms ^[10]	In this Illumination invariant algorithm is used	The problem of light intensity problem and head pose was overcome.	Masked faces were not recognized.
9.	Attendance System Using Face Recognition and Class Monitoring System ^[11]	Open CV python library is used and Mysql is used for database	This method is fast and secure and have low false positive rate.	Recognition rate is lower
10.	Algorithm for Efficient Attendance Management: Face Recognition based approach ^[12]	Median filter and skin classification is used	Multiple faces can be detected at a time and no special hardware is needed	Accuracy is low only 50% faces were recognized

III. PROPOSED SYSTEM

The main task of our proposed system is to detect and recognize the image of the student and mark the attendance accordingly in the excel file. Also can capture the new entries if needed. Further our system can perform all the basic operations like create, read, delete, edit, search etc. The proposed system is divided into major 3 modules which are as follows:

A. Admin Module

In this module, one has to provide the login credentials which involves id and password which will be matched with the one that is stored in database.

B. Student Detail Module

Student details like enrollment, name etc can be edited, added, update, delete and can search student based on details.

C. Attendance Module

This will mark the attendance if the face of student match with the database else not.

D. Diagrams

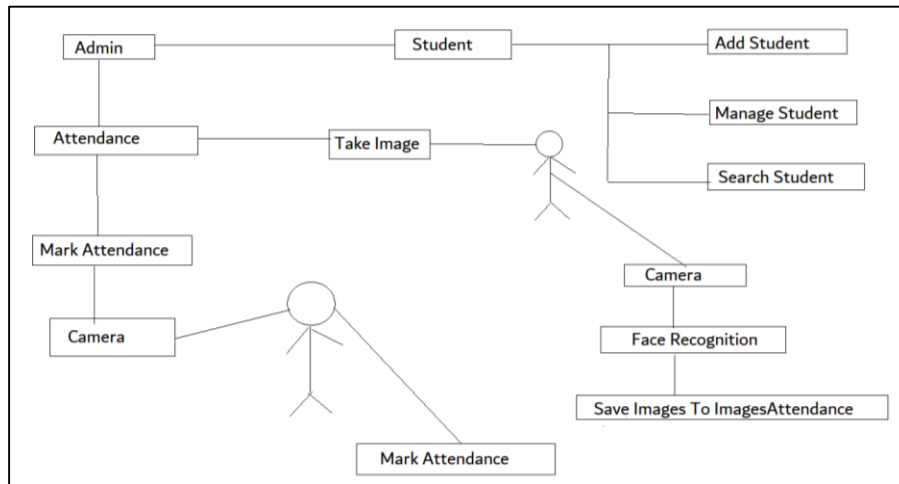


Fig. 1: Block Diagram

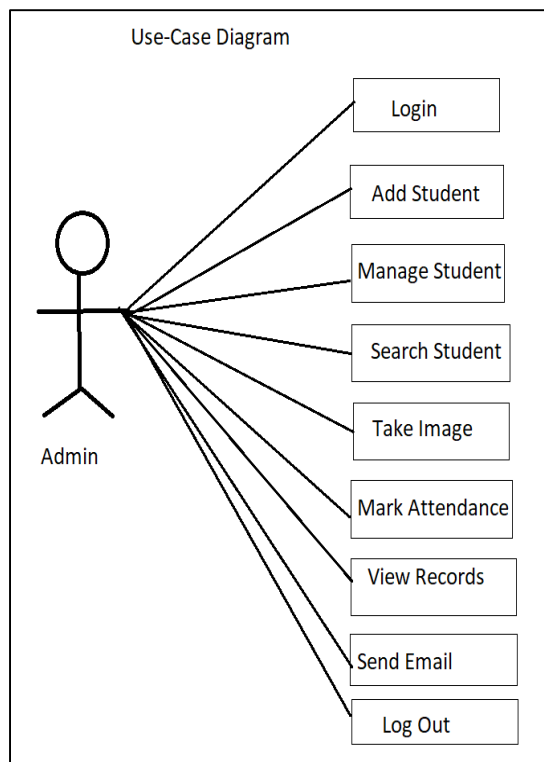


Fig. 2: Use Case Diagram

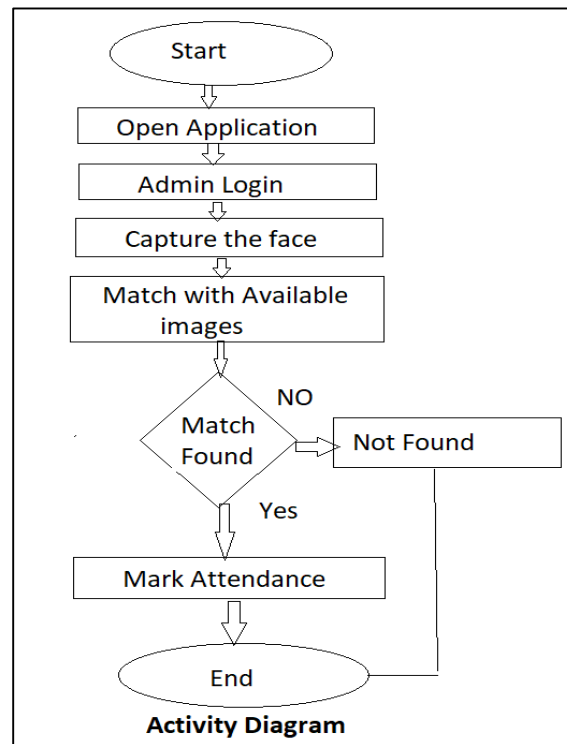


Fig. 3: Activity Diagram

E. Deployment Requirements

There are various requirements (hardware, software and services) successfully deploy the system. These are mentioned below:

1) Hardware

- 32-bit, x86 Processing system
- Internet connection
- High- definition Camera

2) Software

- Windows 7 or later operating system or digital device for showing page
- Xampp server

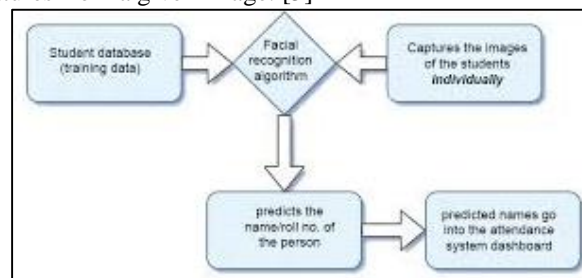
IV. IMPLEMENTATION AND RESULTS

One of OpenCV's goals is to provide a simple-to-use computer vision infrastructure that helps people build fairly sophisticated vision applications quickly. The primary technology behind Face recognition is OpenCV. [4]The user stands in front of the camera keeping a minimum distance of 50cm and his image is taken as an input. The frontal faces are extracted from the image then save to the file.

A. Technique Used

1) Data Science

Face recognition is a computer technology being used in a variety of applications that identifies human faces in digital images. The most advanced face recognition method, which is also employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image. [5]



B. Approach

- Take an images from the webcam using Open CV.
- The face recognition model detects the face and save it into the folder.
- At the time of attendance it compares the current faces with the faces saved in the folder.
- If the match is found attendance was marked.

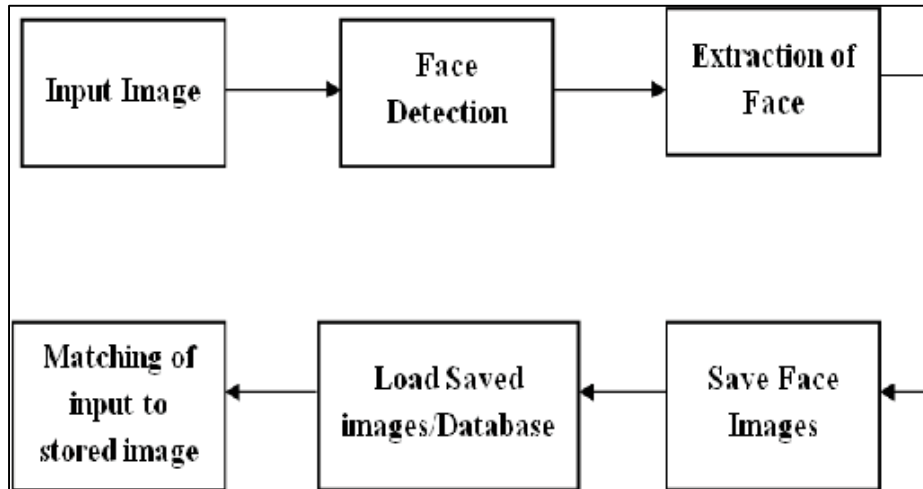


Fig. 4: Face Recognition Approach

C. Image Folder Name

Studentname.jpg

D. Tools Used

1) OpenCV Python

OpenCV (Open Source Computer Vision Library) Used for Face Recognition and detection

2) Tkinter

Tkinter is the standard GUI library for Python. Python when combined with Tkinter provides a fast and easy way to create GUI applications.

3) Xamp Server

XAMPP is a free and opensource webserver developed by Apache Freiens .It is one of the widely used platforms which helps developers to devlope and test the applications.

4) Numpy

NumPy is a python library used for working with arrays.It also has functions for working in domain of linear algebra, fourier transform, and matrices.

E. Steps for Face Recognition

- First, look at a picture and find all the faces in it.
- Second, focus on each face and be able to understand that even if a face is turned in a weird direction or in bad lighting, it is still the same person.
- Third, be able to pick out unique features of the face that you can use to tell it apart from other people - like how big the eyes are, how long the face is, etc.
- Finally, compare the unique features of that face to all the people you already know to determine the person's name.

F. Mathematical Model

$$\Psi = \frac{1}{M} \sum_{i=1}^M \Gamma_i$$

Where, Ψ = average image,

M = number of images, and Γ_i = image vector.

$\Phi_i = \Gamma_i - \Psi$

Where, $i = 1, 2, 3, \dots, M$.

$A = [\Phi_1, \Phi_2, \Phi_3 \dots \Phi_M]$

G. Admin Module

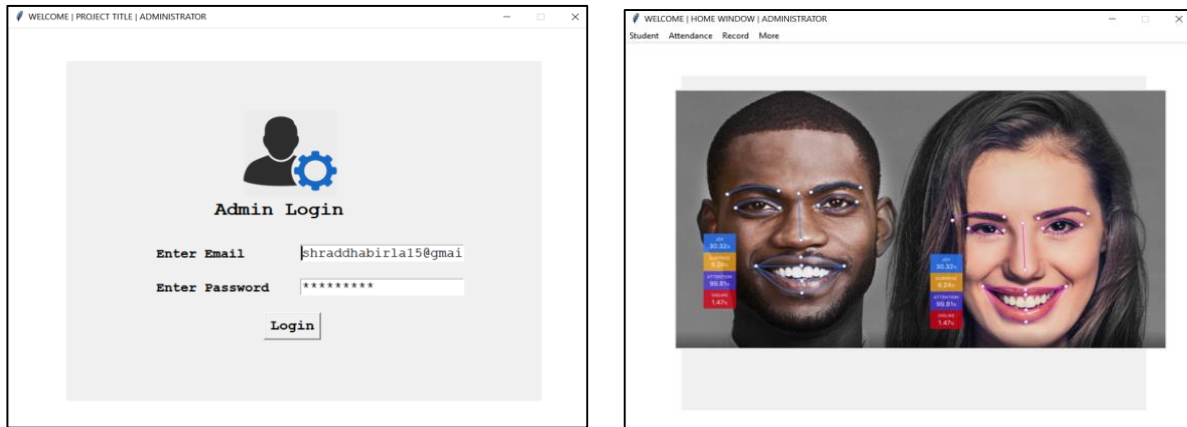


Fig. 5: Admin Module

H. Student Detail Module

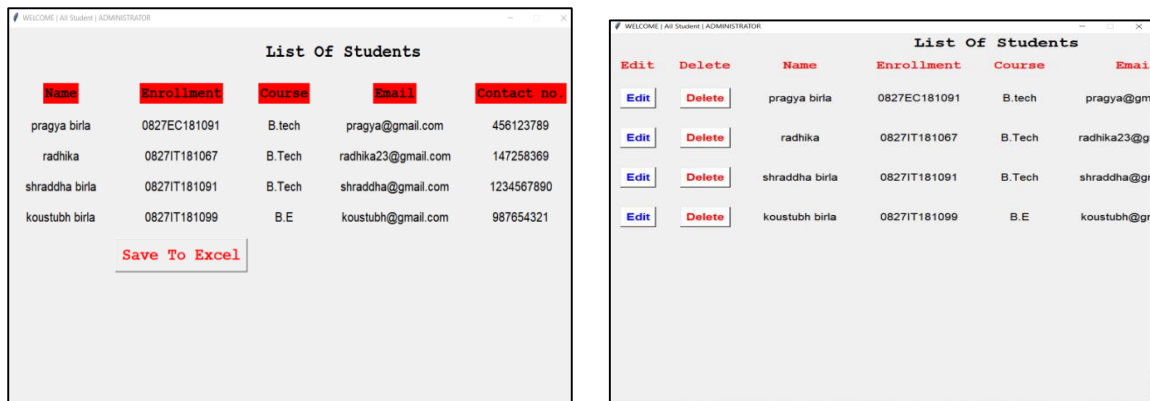


Fig. 6: Student Details Module

I. Attendance Module

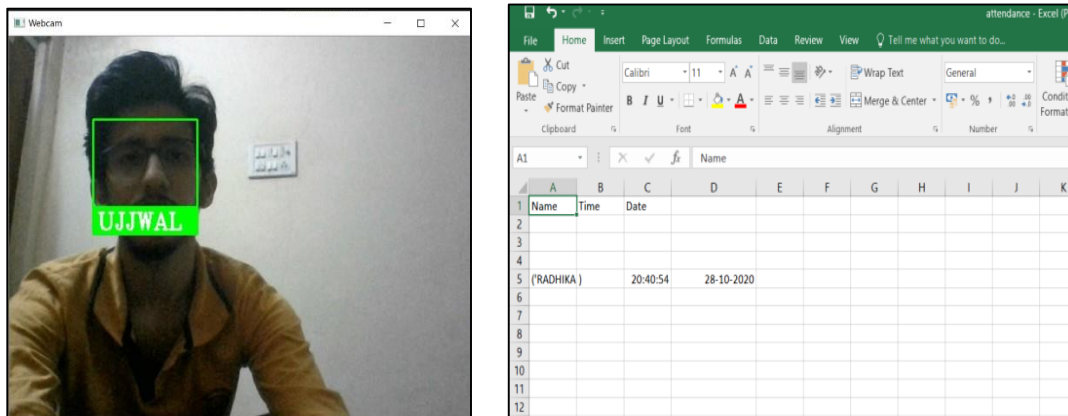


Fig.7: Attendance Module

V. CONCLUSION

In this approach, a face recognition based automated attendance system is thoroughly described. The proposed approach provides a method to identify the individuals by comparing their input image obtained from image in folder. From this model we can recognize the faces of students and can mark their attendance automatically in real time without human intervention. The feasibility of the model can be increased if a cloud can be hired to store details.

A. Limitation of our Work

- The working of this project would become a tedious task for the working on identical twins or we can say that the proposed idea will not work for two identical twins.

- In the system, scanning of genuine person is done using camera, so sometimes it may take large amount of time for configuring the genuine identity due to the lack of server issue or the failure of the database.
- Unable to recognize face with different angles, image quality, size and light intensity.

VI. FUTURE SCOPE

- The face recognition model would be done more precisely so that maximum accuracy can be achieved.
- Adding each student manually can be a tedious task, despite of this fetching data from excels would be efficient.
- The marked attendance is stored in only one excel, rather different excels for different date can be created.

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