SMART ATTENDANCE SYSTEM USING FACE RECOGNITION

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled **Smart attendance system using face recognition**, submitted by **Rupak Bairagi**, **Md. Sabiqul Islam**, **Remon Ahmed** and **Sadia Afrin Tisha** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **18 January, 2021.**

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Mohammad Jahangir Alam, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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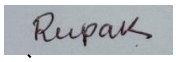

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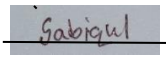

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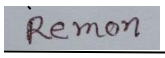

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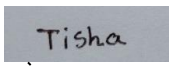

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ABSTRACT

Taking attendance of students is one of the foremost tasks in a class for teachers at the same time pretty much complicated. The manual attendance system takes an enormous amount of time over the number of students and has a prospect of being a proxy. Day by day it's getting really intimidating as the number of students is increasing. Last few years automated biometric like a fingerprint, QR-code technology has developed. However, time makes the difference here with facial recognition technology

The proposed attendance system can take attendance by detecting and then recognizing the face. This system can make a crystal clear concept to the machine whether it's a legal attendance or proxy. More secured and hassle-free system. In this system, all the student's data with time and class-wise will be saved in the database. So that teacher can easily evaluate his/her students in marking on attending. Also, help the teacher to inform individuals' parents whether or not their son/ daughter regular in the class.

In this proposed system we used an effective machine learning-based object detection method Haar feature-based cascade classifiers proposed by Paul Viola and Michael Jones for classifying extracting images and for recognizing LBPH used in this system.

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CHAPTER 1

Introduction

1.1 Introduction:

Making attendance and keeping the record is the most complicated thing in the manual attendance system. Taking attendance manually is much laborious and causes a lot of productive class time loss as well. Manual attendance like put name and id in a paper is a frightening system to ever take attendance. It takes an enormous amount of time to take attendance one by one and has a huge chance of being a proxy. In the last few years, some automated systems have been developed significantly like fingerprint, QR-code technology. However, time makes the difference here with facial recognition technology. Face recognition based attendance systems have less time consuming and fewer chances of being a proxy for overcoming this problem. Face recognition based attendance systems can be the best.

In our proposed method we used a machine learning-based Haar cascade technique for detecting and recognizing face for its robustness in detecting image with Haar Cascade we use LBPH algorithm for face recognition.

With this system, no one can make a proxy for another who does not present in the class. Using this technology along with face recognition the proxy will be significantly reduced and a huge amount of time could be saved.

1.2 Motivation:

The motivation for this program is big. This is not for only a university or school this system can be used in every sector where we need attendance. By implementing this system, we will be able to reduce manual process errors while taking attendance and be able to come out of the slow and inefficient traditional manual attendance system. In the exam hall students have to sign an attendance sheet for getting attendance. This is irritating and makes students irritate. Mainly we will be able to control the proxy.

1.3 Objectives:

The main goal of this system is to make the attendance system automated, easy, and user friendly.

i. To focus on an automated attendance system.
ii. Manage students' attendance more efficiently way than before.
iii. To get out of the traditional time-consuming process.
iv. Teachers can easily evaluate a student by seeing his/her attendance from the record sheet.
v. To reduce proxy.

1.4 Expected Outcome:

Students and teachers can save a lot of time by using this attendance system. The record can be saved with date and time in the database. So, that will be easy for teachers to evaluate a student by his/her attendance. This system is based on face recognition so every student must be present in the class if the individual wants to get attendance in the class. The proxy will be significantly reduced.

1.5 Report Layout:

Chapter-1, we discussed Introduction, Motivation, Objectives, and Expected Outcome.

In chapter-2, we discussed the background of our related work, the scope of problems, and the defined challenges.

In chapter-3, will be about our proposed methodology, implementation, dataset create and process of the project.

In chapter-4, will be covered with experimental results and discussion.

And lastly in chapter-5 will be about the conclusion and future works.

CHAPTER 2

Background

2.1 Introduction:

In this part, the background of this study will be discussed. A lot of work with facial recognition and detection has done already but every system has some drawbacks and challenges we will discuss these.

For making this project which problem we faced and which challenges we have to overcome will be in this part.

2.2 Related Works:

The main approach of the [1] paper which needs fair images of a student and stored in the database, further used for recognizing by matching the input images in real-time.

This paper also using biometrics for taking attendance [2] in this, the authors used fingerprint technology for taking attendance. there is a biometrics sensor that can extract the feature. the main problem of this problem is that students have to go to the place where this device is located to give attendance.

MuthuKalyani et al [3] by using Android Devices to accomplish this task. After the picture being captured in the camera, it was then exposed to 3D modeling and canonical techniques were used on the pictures for the comparison.

In [4] an attendance system based on RFID proposed by the authors. in this system, the RFID tag uses energy from the tag reader. the main drawback of this approach is that even an unknown individual can make use of an ID card and enter the University.

The facial detection model proposed by Kruti Goyal et al. [5], is a facial detection model that is built using different types of algorithms like AdaBoost, Haar Cascades.

Nusrat Mubin Ara et.al [6] in their paper they used the Histogram of Oriented Gradients (HOG) method for face detection, for estimating face landmark they used face alignment, using Convolutional Neural Network for extracting feature and generating embedding.

In the papers [7] and [8] the authors proposed attendance system that is iris-based. but here the main problem is that it is sensitive to environmental factors

[9] This automated face recognition attendance system is based on face recognition and face detection algorithm. This system can make attendance automatically when a student enters the classroom. They used Viola-Jones as a face detection algorithm, for feature selection they used the PCA algorithm and SVM for the classifier.

In [10] the author proposed the Eigenfaces recognition system. In these images convert into Eigenfaces and then recognize by comparing the Eigenfaces form the input image with the database. But this proposed system is sensitive to the background of faces and cannot recognize when someone is wearing glasses. But our system is not sensitive to the background and can recognize when someone is wearing glasses.

In the paper [11] they proposed a facial detection and recognition-based student attendance system using a convolution neural network. They used faster R-CNN for face detection and then used the SeetaFace algorithm for recognizing and take attendance

2.3 Scope of problems:

This system is not all good there is some scope of problems. Though it is a facial recognition-based attendance system so the students should keep the same faces that have been saved in the database. When someone keeps his beard long it's hard to recognize these faces so that this system needs to update the database very often. And this system will work when it is day time. Lack of light performance of the system will reduce.

2.4 Challenges:

i. This is an internet-based system. In the lack of the internet, this is not possible.
ii. We have to update the database frequently.
iii. We should give this system a device form
iv. The Webcam is not a good quality camera so train data sometimes cannot be recognized
v. If somehow internet connection is lost attendance for that day will not be possible.

CHAPTER 3

Research Methodology

3.1 Introduction:

This system has two parts: The first part HaarCascade algorithm used for face detection and converting the RGB image to the grayscale and then LBPH algorithm used to recognize the face and make attendance.

3.2 Proposed methodology:

i. Input: live video capture with the camera

ii. Convert RGB images to grayscale

iii. To get the ROI and detect the face applying the HaarCascade method

iv. LBPH applying for recognizing the face with the dataset

v. Output: get the attendance with an excel sheet with date and time.

3.3 Research Subject and Instrumentation:

Python IDE:

Python is easy to learn and an incredible programming language. It is an effective object-oriented programming that has a simple high-level data structure. Python's easy syntax and a lot of libraries make this better than other object-oriented programming languages.

OpenCV:

Open-source computer vision library mainly aimed at real-time computer vision. That package includes a few shared libraries. It includes linear and non-linear image filtering, histograms, color space conversion, and a lot of things that we need for image processing. Here our project has libraries like LBPH face recognizer, Haar cascade face detection.

Numpy:

It is a very popular scientific computing with python. It is an open-source module for python. which gives quick precompiled capacities to numerical and mathematical routine. Moreover, NumPy advances the programming

language Python with incredible data structures for effective calculation of multi-dimensional matrix

Table 3.1: required instrumentation

Language	Python
Library	openCV
Feature extractor	Haar Cascade
Face recognizer	LBPH
Scientific computing with python	Numpy
GUI design	Tk-tools

Another required instrumentation:

i. opencv-contrib-python
ii. opencv-python
iii. datetime
iv. pytest-shutil
v. python-csv
vi. pillow
vii. pandas
viii. times
ix. Anaconda
x. Windows 10 operating system

Hardwar requirement:

i. RAM 8GB
ii. Processor speed 2.8GHZ
iii. Processor i5 8^{th} gen or above.
iv. SSD 256 for better performance
v. Webcam

GUI:

We make our Graphical User Interface(GUI) with the help of python module Tkinter. this module is very easy to make GUI in python.

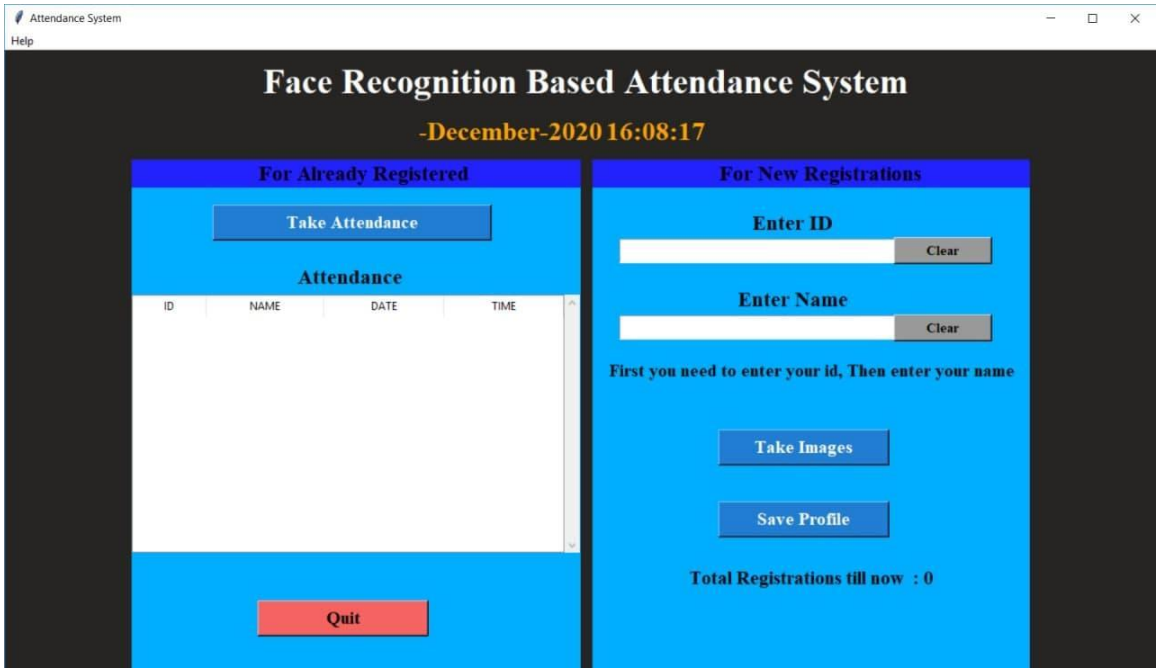

Fig 3.1: GUI for the attendance system

3.4 Data collection procedure:

First in this process need some data to train the machine. Everyone has to go in front of the camera, it takes more than 90 pictures for a single student then this data has to be saved with the ID and name of the individual.

Then Haar Cascade method extracts the face and converts it into the grayscale. And store the data to the dataset.

Fig 3.2: image in grayscale

3.5 System model:

Registration of a new student in the system:

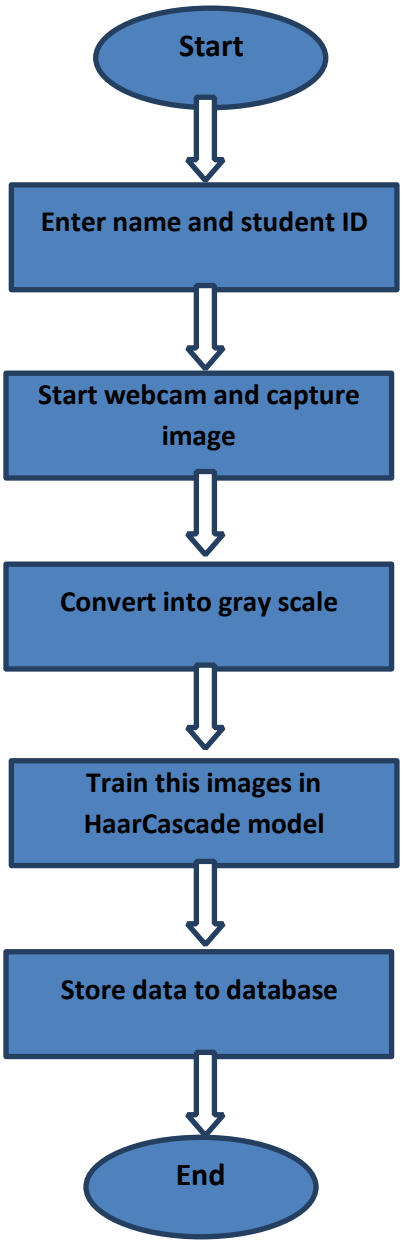

Fig 3.3: the process of registration of a new student

Take attendance:

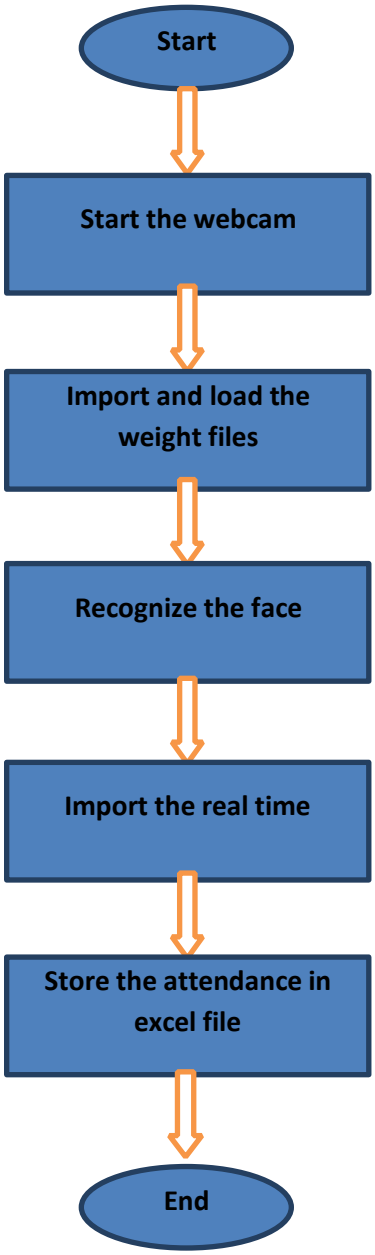

Fig 3.4: process of taking attendance

3.6 Face detection:

When a student needs to register in this system he/she stands in front of the camera and the camera starts capturing the image of the individual after taking more than 90 images the camera automatically turns off and then the registrar sets the id and name and saves the profile.

Then Haar classifier extracts the features from the RGB images sets the ROI and takes it to the grayscale and saves to the database.

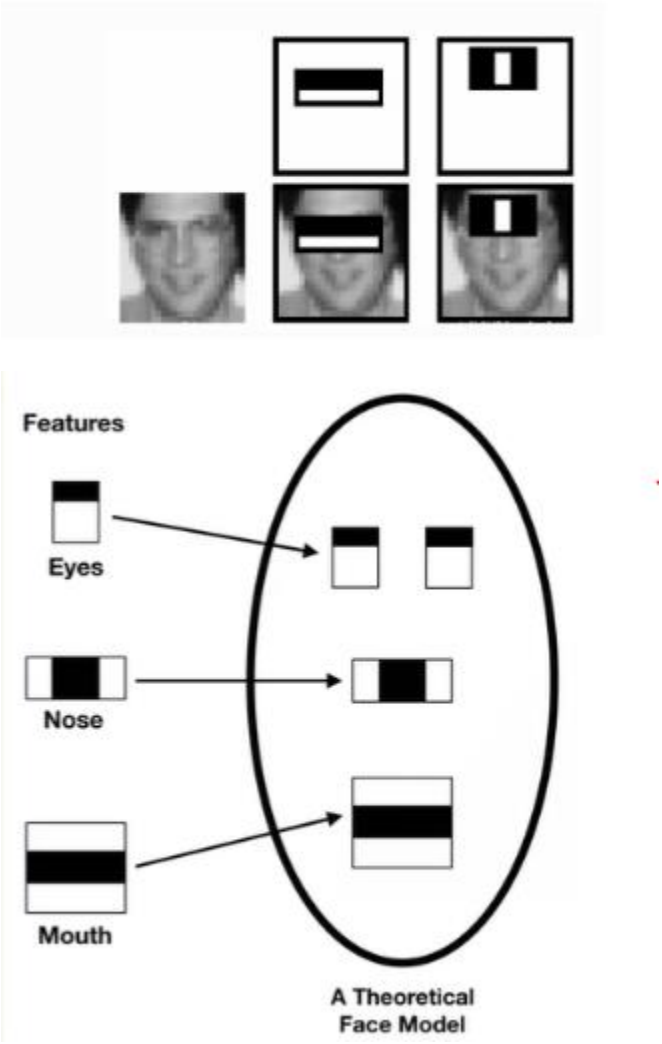

Fig 3.5: Haar features detection

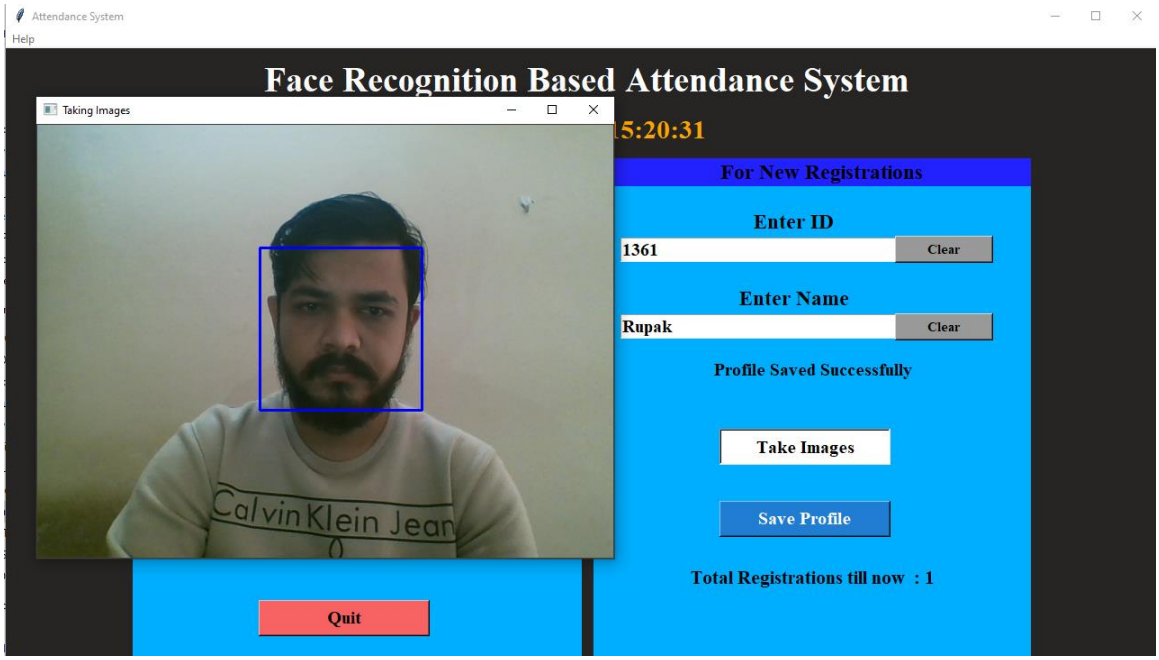

Fig 3.6: ROI generated by Haar classifier

3.7 Face recognition:

LBPH is very popular face recognition and effective face recognition model and it is a significant improvement over Eigenfaces and Fisherfaces.

Once we have identified a face and we know what a face looks like now we're trying to pinpoint who this face belongs to. LBPH works by looking at every single point of an image.

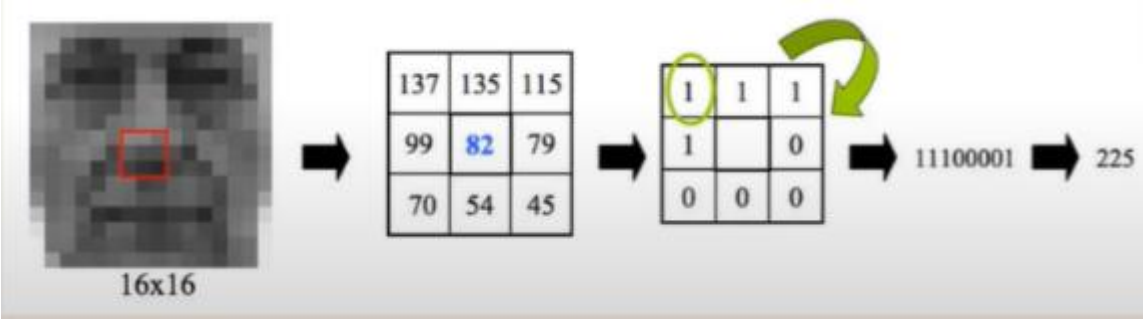

Fig 3.7: the process of LBP on a 3X3 matrix

We can see from the picture some pixels that are being generated from each local point and there is a central pixel comparing this with its neighboring pixels. If neighboring pixel values are lower than the central pixel then it's going to be written 0 and the is greater or equal with the central pixel value, then it's going to be written 1.

There will be a binary pattern out of each individual pixel matrix. This is a local binary pattern.

Then converting these binary patterns into decimal patterns. These decimal patterns are plotted on a histogram. Every single image generates a lot of decimal numbers and these numbers are going to be plotted on a histogram.

Characteristics of original images are indicated by the histogram. Each histogram represents the facial image from the dataset.

CHAPTER 4

Experimental Results and Discussion

4.1 Introduction:

We have discussed our project in the previous chapter massively. While simulating our algorithm, we create a different environment so that we can analyze our algorithm for different cases.

In this system, LBPH algorithm with the Haar cascade method works tremendously better than other classifier methods. This system can classify accurately even in a low light condition and when the head is tilted.

4.2 Testing and result:

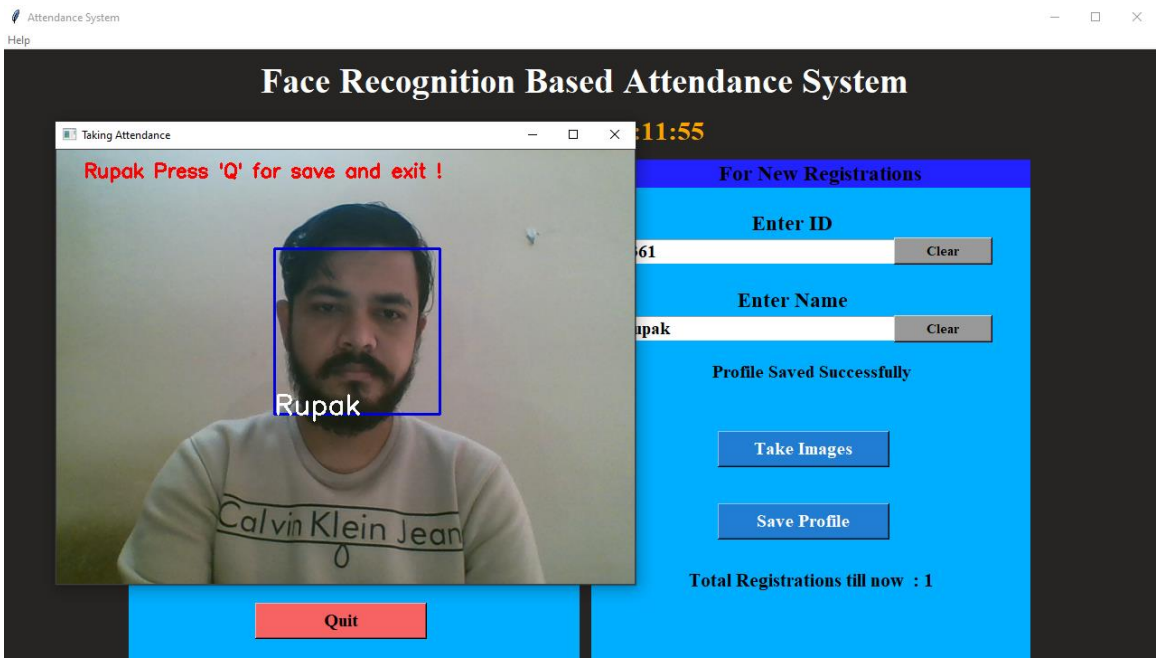

Fig 4.1: face recognized by the system

Here are some of the test results we have. We can see the system can easily recognize the existing face accurately even at night time in low light condition. But if we want to get the maximum recognition rate then we have to take it in the daytime. In the daytime, this system provides 93% accuracy for recognizing images that are already saved in the dataset.

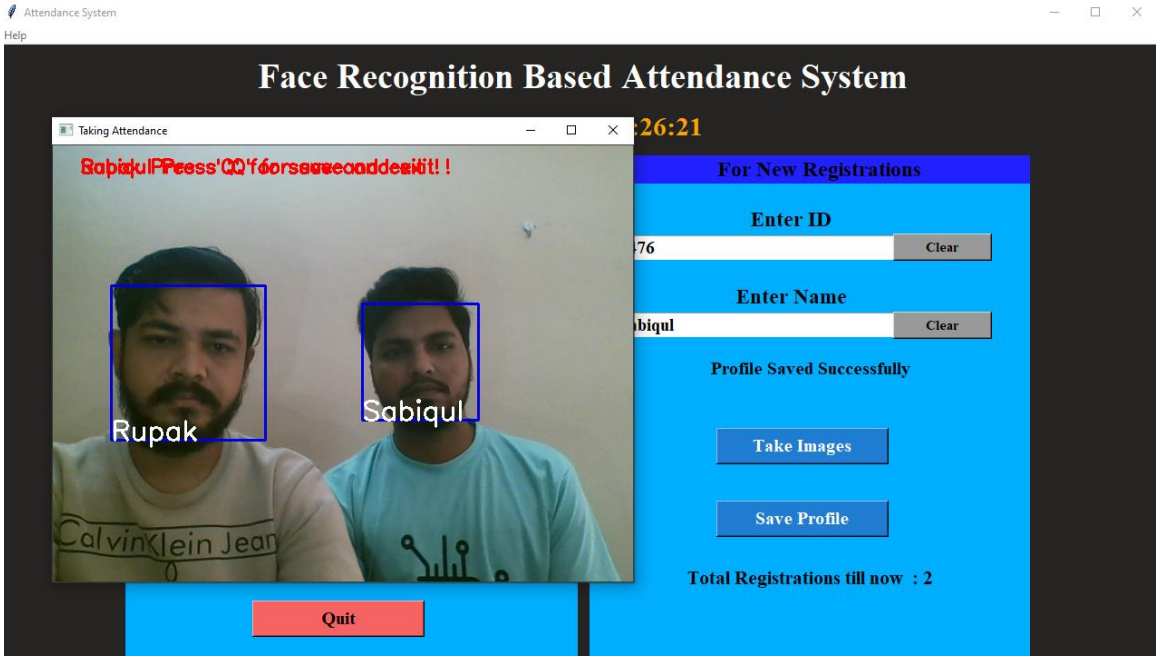

Fig 4.2: recognizing multiple faces

In this picture, we can see the system can capture multiple faces at a time and the system recognizes even a face is not at a 90-degree angle with the camera.

Press the Q button to end the process and the id name with date will show in the GUI in the attendance section.

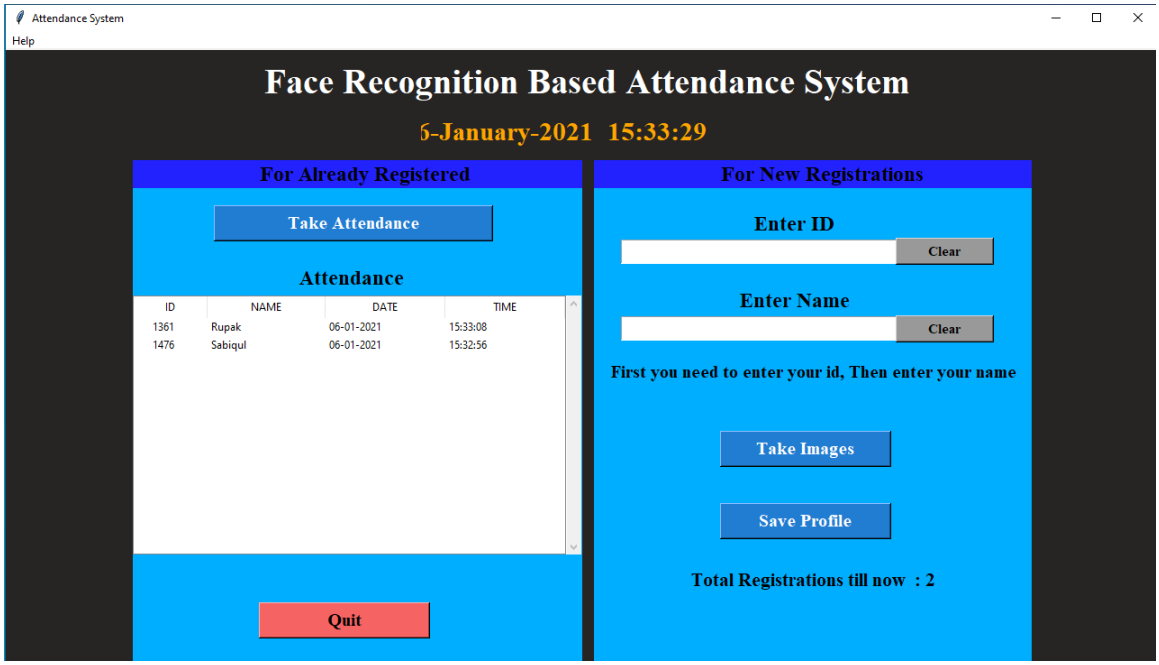

Fig 4.3: take the attendance with id name and time

This saved name and id will be stored in the excel sheet that is located in the attendance folder of the project.

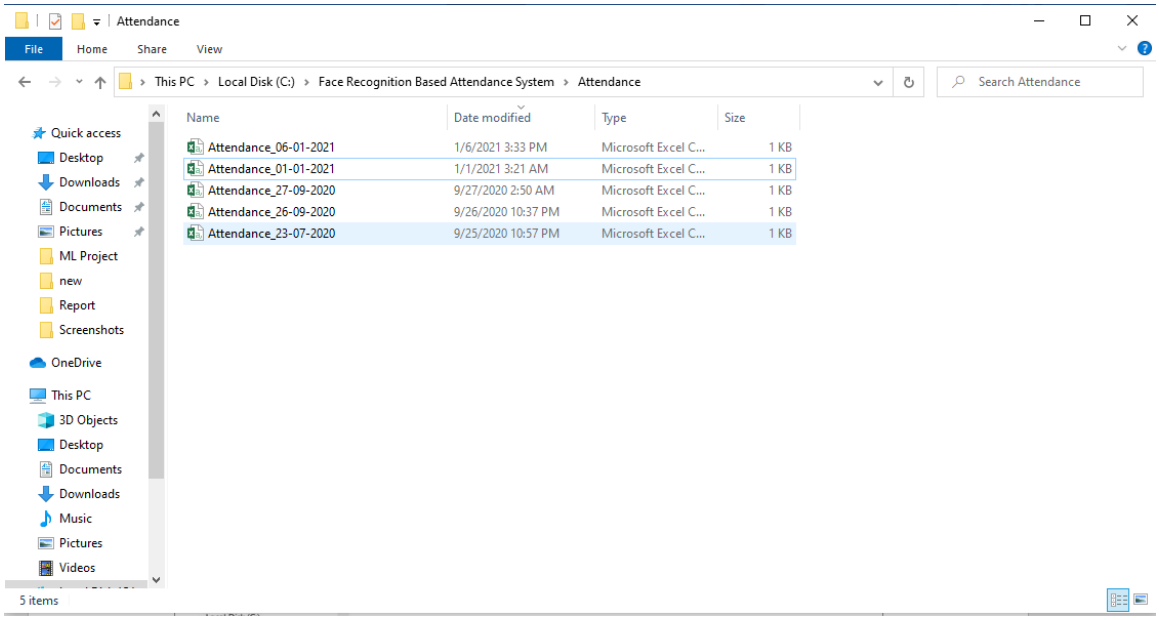

Fig 4.4: attendance sheet saves in a folder over the date

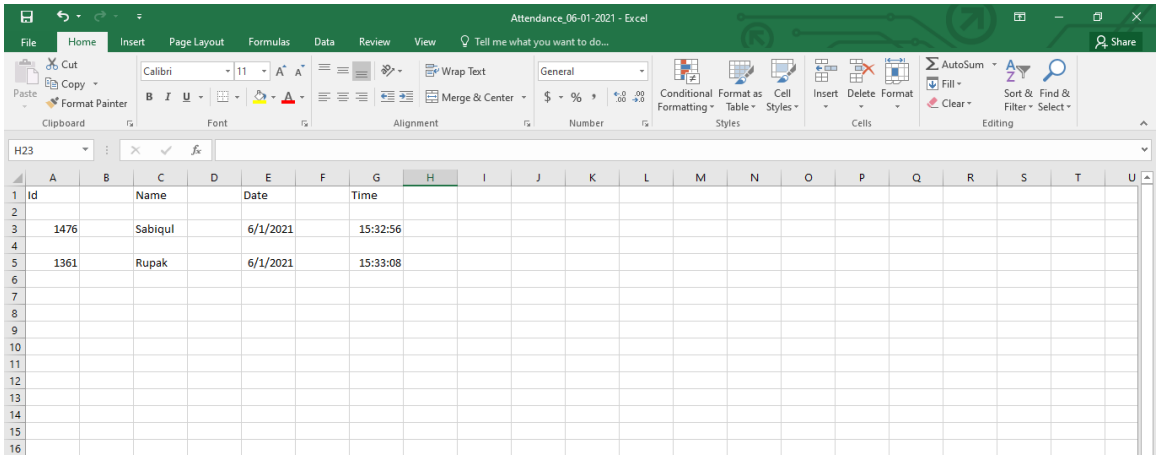

Fig 4.5: attendance sheet in the excel file

CHAPTER 5

Conclusion and Future Scope

5.1 Conclusion:

LBPH classifier is an accurate face recognizer. The accuracy of this algorithm is very high. It can detect accurately even if the head tilts.

The accuracy can be varying with lighting conditions and the quality of the webcam. For getting utmost accuracy the room light and camera quality should be better.

By using this system, a lot of time and human error can be reduced. All the records will be saved in the database. Students can easily make their attendance without doing anything. No one can do a proxy anymore.

5.3 Scope for future development:

i. Some interesting features can be added for making the system more attractive.
ii. We will try to make this happen at night time as well.
iii. We will modify this to use some secured place like Airport, Train station, Seaport and so on for security issue.
iv. In the future, we will use it for crime investigations.

References:

[1] N. Khan and Balcoh, "Algorithm for efficient attendance management: Face recognition based approach," in JCSI International Journal of Computer Science Issues 9.4, 2012.

[2] O. Shoewu, PhD, O.A. Idowu, B.Sc., "Development of Attendance Management System using Biometrics.", The Pacific Journal of Science and Technology(2012)

[3] MuthuKalyani.K, "Smart Application For AMS using Face Recognition," in CSEIJ 2013, 2013.

[4] Ononiwu G. Chiagozie, Okorafor G. Nwaji, "Radio-frequency identification (RFID)based Attendance System with Automatic Door Unit", Academic Research International (2012).

[5] K. Goyal, K. Agarwal and R. Kumar, "Face Detection and tracking using OpenCV," in International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017, 2017.

[6] N. M. Ara, N. S. Simul and M. S. Islam, "Convolutional Neural Network Approach for Vision Based Student Recognition System," in 2017 20th International Conference of Computer and Information Technology (ICCIT), 22-24 December, 2017, Sylhet, 2017.

[7] A. Khatun, A. K. M. F. Haque, S. Ahmed and M. M. Rahman," Design and implementation of iris recognition based attendance management system", 2015 International Conference on Electrical Engineering and Information Communication Technology (ICEEICT), Dhaka, 2015, pp. 1-6.

[8] Kadry, Seifedine Smaili, Mohamad. (2010)." Wireless attendance management system based on iris recognition". Scientific Research and Essays. 5. 1428-1435.

[9] Akshara Jadhav, Akshay Jadhav, Tushar Ladhe, Krishna Yeolekar, "Automated Attendance System Using Face Recognition", International Research Journal of Engineering and Technology (IRJET), Volume 4, Issue 1, Jan 2017.

[10] Jomon Joseph1, K. P. Zacharia, "Automatic Attendance Management System Using Face Recognition", International Journal of Science and Research (IJSR), 2013.

[11] Dan Wang, Rong Fu, Zuying Luo, "Classroom Attendance Auto-management Based on Deep Learning", Advances in Social Science, Education and Humanities Research, volume 123, ICESAME 2017.