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SMART ATTENDANCE SYSTEM

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ABSTRACT: University attendance is usually done on paper, which might lead to mistakes. Manually taking attendance takes longer. In the past we were using methods such as roll number calling and circulating attendance sheets to the students which used to cause some issues such as proxy attendance and it used to take so much of time and effort. So, to make this easier, In this project, we used the Raspberry Pi to create an Attendance System.

KEYWORDS: Attendance, Face Recognition, Raspberry Pi, OpenCV.

1. INTRODUCTION

The project's goal is to create a Face Recognition-based Smart Attendance System. In this day and age of technology and automation, the same old classroom management strategies are still in use. Because attendance is linked to students' academic performance, it is the most important component in the classroom. Some students have recently concentrated on doing better in class only when tight classroom management is present. The higher the degree of interaction and learning in class, the more effective the attendance system is. Previously, we used roll no calling and signing against a specific roll number as techniques. These methods are time consuming and have a high chance of being a proxy.

We're utilizing the Raspberry Pi to develop an Attendance System with Face Recognition that may be utilized in any field where an attendance system is present and plays an important function. The goal was to create an automated attendance system utilizing the Raspberry Pi, OpenCV/Python modules, and a recognizer algorithm. We came up with the concept of using modern technology to automate this process.

2. LITERATURE SURVEY

Omar Abdul Rahman Salim and others collaborated to create a comprehensively embedded class attendance system [1], that uses facial recognition as well as controlling the door access technology based on a Raspberry Pi camera, where the camera is fixed on the door to acquire and handle the student's face. If the student's face matches the trained dataset of images already obtained, the door opens with the help of the servo motor attached to it, and attendance for the student is marked in the

attendance database as the door opens. The HAAR Cascade, Local Binary Pattern has been used to track student attendance.

In second system [2], Overlapping of captured faces in an image is a common factor in face detecting applications. Initially, a face image is extracted from the database for feature extraction, and the extracted faces are compared to previously obtained test images. The face is identified and used in extracting the overlapped faces using the Dominant Rotated Local Binary Pattern algorithm, and finally the attendance is recorded.

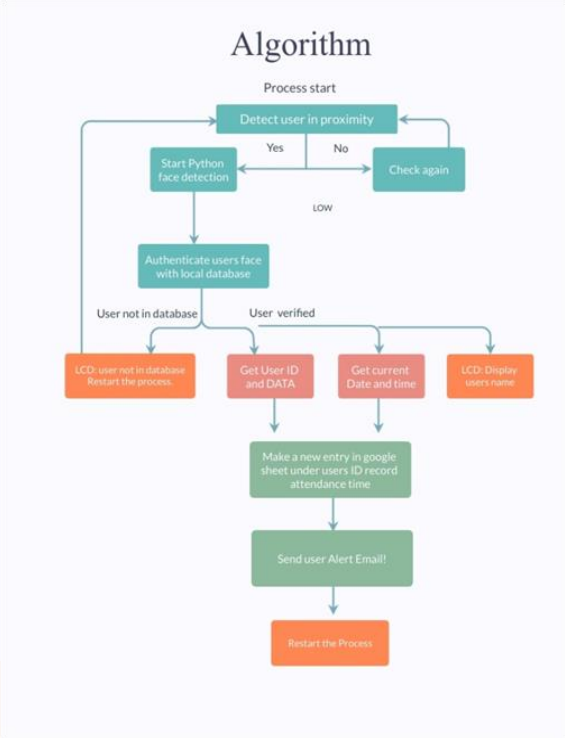
In third system [3], Jomon Joseph and K. P. Zacharia proposed a system based on Matlab that uses image processing, PCA, Eigen faces, and a microcontroller. Their system only works with front-facing images, so a suitable method that works with the system's orientation is required.

In fourth system [4], They proposed a face recognition approach for attendance marking using the Viola jones algorithm, Haar cascades to detect faces in images, and Eigen face method to perform recognition.

The author of [5] introduced an eigen face approach along with a PCA algorithm for marking face recognition attendance systems; they also mention a comparison of different face recognition algorithms in their paper. Overall, it was a good strategy for keeping track of attendance.

3. METHODOLOGY

Our proposed system comprises a proximity sensor and a camera connected to a Raspberry Pi. The proximity sensor will detect the user and start the system. The user's video will be captured by the camera, after which the footage is transferred to the Raspberry Pi and processed frame by frame with an image processor. This user's face is then compared to the local database, which contains the faces of all users; when a match is found, the system records the current time, date, and user's id and creates an entry in the database; this entry is also sent to the server.



The algorithm explains how the project's program works. To complete all of the tasks, we must choose a single programming language to run the entire process, which includes detecting the user's face using the provided camera, verifying the user's face, controlling the Raspberry Pi's GPIO pins, interacting with Google Sheets via Google Cloud, and sending the user's email. While C is faster than Python, the code is substantially larger due to C being a low-level language. Python is also in-built in Raspbian and has all the essential libraries built-in, such as for using the camera and controlling the Raspberry Pi GPIO.

Python offers image recognition and processing library called OpenCV, which may be combined with other support libraries like SMTPlib, which can be used to send emails, data visualization library Matplotlib, and mathematics library NumPy. Python has a plethora of benefits. As a result, Python is the best language for this project.

3.1 Installing Raspbian on the Raspberry PI:

Software requirements: Raspbian Imager, Latest Raspbian Distro, SD card formatter.

Tools required: SD card 8gb or above, SD card reader.

Step 1: Download and install the Raspbian Imager from the official raspberry pi website.

Step 2: Download the appropriate version of the Raspbian OS available.

Step 3: Download and install SD card formatter software.

Step 4: Plug SD card using SD card reader and format the SD card using SD card formatter software. Select FAT32 file configuration.

Step 5: Open Raspbian Imager select the formatted SD card select the recently downloaded OS at the OS option and press OK.

Step 6: After completion put the SD card in the raspberry pi and wait for the boot.

3.2 Google Cloud setup:

Because the project uses Google Sheets, interfacing between the Raspberry Pi and the Google Sheets requires the use of an API. Fortunately, this functionality is available in the GCP in the form of the Google cloud platform API area, where the Google Sheet API and the Google Drive API are combined.

This is done after starting a project in the Google Cloud Console. To access the Google Sheet, you'll need credentials, which can be downloaded from the credentials page in the API and services area in json format.

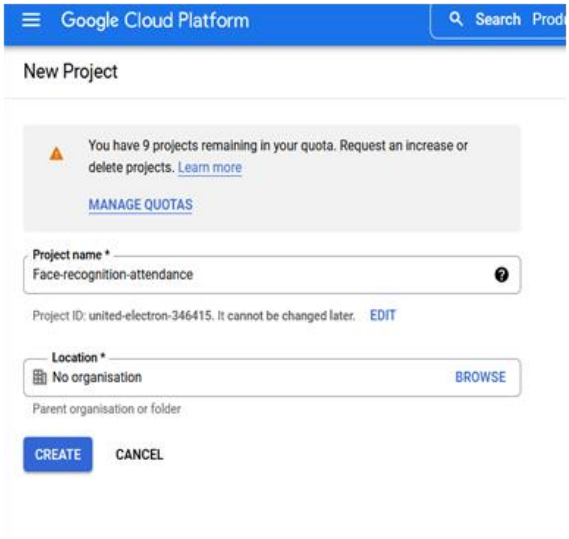


Fig. Creating a new project

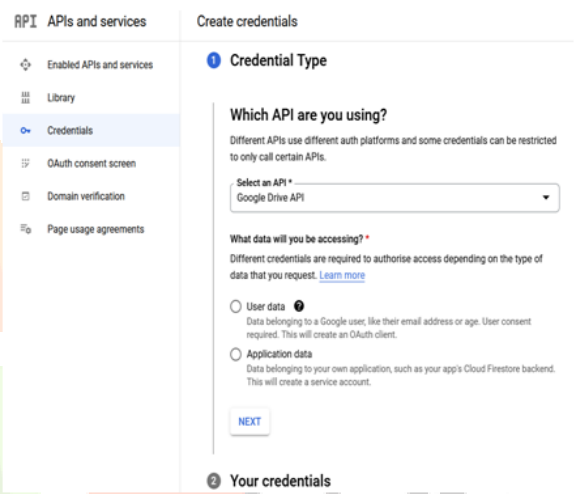


Fig. Creating credential for the project

The downloaded json file is used as an API key in the python project code; the file can be read with a text editor such as a notepad and contains valuable information such as API KEY, API URL, HOST EMAIL, and so on.

3.3 Final Project code explanation:

The program is divided into two parts:

a) Enrolling program: This program is used to enroll new attendee into the system,

b) Recognition program: This program is responsible for the recognition of the user and updates the google sheet.

A) Enrolling program Algorithm:

1)Start the Pi camera & set the appropriate resolution.

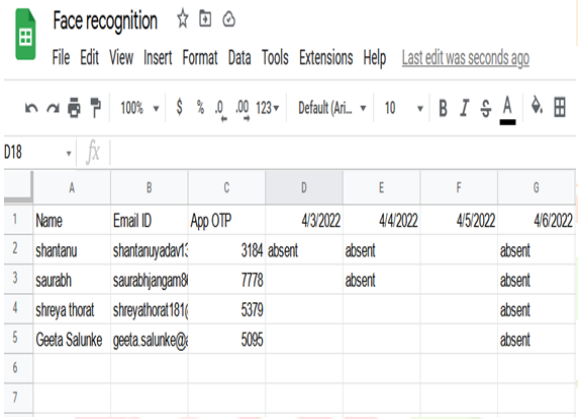
2)Taker user's name and email address.

3)Display the current video feed using an application window.

4)Set a keyboard interrupt for the user so that the user can pause video to take the snapshot.

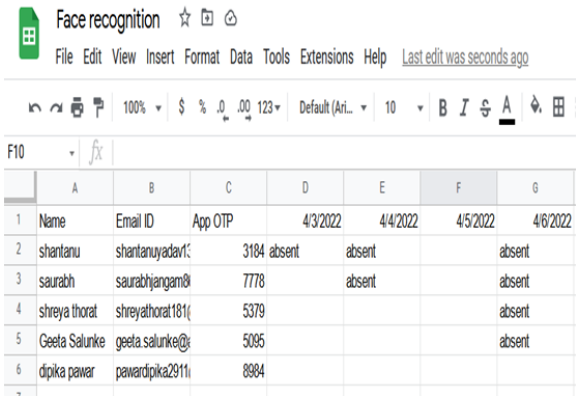
5) Save the snapshot and the user's face encoding which is extracted from the snapshot using the face recognition library.

6)Enroll the user's data on the google sheet using the Spreadsheet library.



	A	B	C	D	E	F	G
1	Name	Email ID	App OTP	4/3/2022	4/4/2022	4/5/2022	4/6/2022
2	shantanu	shantanuyadav1	3184	absent	absent		absent
3	saurabh	saurabhjangam8	7778		absent		absent
4	shreya thorat	shreyathorat181	5379				absent
5	Geeta Salunke	geeta.salunke@	5095				absent
6							
7							

Fig. Google sheet before enrolling



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3	saurabh	saurabhjangam8	7778		absent		absent
4	shreya thorat	shreyathorat181	5379				absent
5	Geeta Salunke	geeta.salunke@	5095				absent
6	dipika pawar	pawardipika2911	8984				

Fig. Google sheet after enrolling.

B) Recognition Program:

1) Start the Pi camera & set the appropriate resolution.

2) Display the current video feed using an application window.

3) Set a keyboard interrupt for user so that user can pause video to take the snap shot.

4) The snapshot is saved and processed upon, the face encoding of the person present in the snapshot is extracted.

5) The encoding is compared with every available encoding in the database using a for loop.

6) Upon finding a match, fetch the name of the matched face, find the name within the google sheet and fetch the data like email.

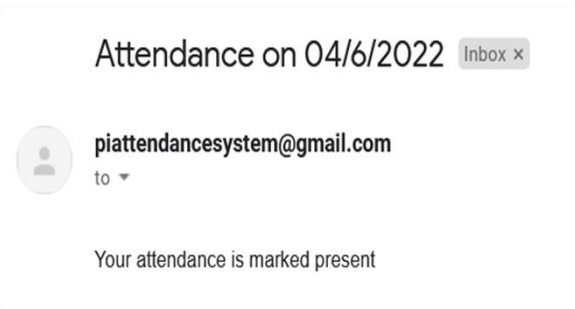
7)Send the email notification to user using SMTP library.

	A	B	C	D	E	F	G
1	Name	Email ID	App OTP	4/3/2022	4/4/2022	4/5/2022	4/6/2022
2	shantanu	shantanuyadav1	3184	absent	absent		absent
3	saurabh	saurabhjangam8	7778		absent		absent
4	shreya thorat	shreyathorat181	5379				absent
5	Geeta Salunke	geeta.salunke@	5095				absent
6	dipika pawar	pawardipika2911	8984				absent
7							

Fig. Sheet before face recognition

Name	Email ID	App OTP	4/3/2022	4/4/2022	4/5/2022	4/6/2022
shantanu	shantanuyadav1	3184	absent	absent		absent
saurabh	saurabhjangam8	7778		absent		absent
shreya thorat	shreyathorat181	5379				absent
Geeta Salunke	geeta.salunke@	5095				absent
dipika pawar	pawardipika2911	8984				present

Fig. Sheet after face recognition



4. ADVANTAGES & APPLICATION

a. Automobile Protection:

Although you probably don't give them much thought, you've definitely noticed an armored truck cruising about town from time to time. Face recognition technology is used in these trucks to prevent theft and keep the driver's eyes on the road. Ride-sharing apps may also use facial recognition technology to verify that a passenger is who they say they are. Alternatively, the passenger can be sent to the correct driver using the same technology.

b. Controlling Access:

Facial recognition can be used in the home to allow access to certain IoT devices as well as admission into the house, in addition to automobiles and cellphones.

c. Immigration:

As a branch of the government's more well-known departments, immigration offices exist. Facial recognition technology is being used to strengthen border security, particularly when criminals and persons of interest attempt to cross the border.

d. Education:

Apart from federal and local security, facial recognition applications may be most common in the education sector. A growing number of schools are employing face recognition software to detect students, employees, unauthorized individuals, and even possibly dangerous behavior. This is only one of the numerous new technological developments that are reshaping schooling. The main benefit that schools find from this technology is that it allows them to manage student attendance as well as maintain campus security. Regrettably, technology has the potential to be extremely harmful.

5. CONCLUSION

After evaluating the demands of society's day-to-day needs and wants, we chose the Automated Attendance Monitoring System project. We are more inclined to think outside the box and come up with a game-changing proposal as technology develops. Education is the most important thing that everyone should receive since it lays the groundwork for a better lifestyle and will surely raise the standard of living in a society. In our educational system, student participation in schools, colleges, and universities is weak. They would rather remain away from class and keep themselves amused with these devices than attend lectures and study. Students that are not present have a low attendance rate.

6. REFERENCES

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