iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** V **Month of publication:** May 2023

DOI: https://doi.org/10.22214/ijraset.2023.52288

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

Automated Attendance using Face Recognition and Automated Marking in ERP System

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Abstract: ***Every institution like educational institutions, government agencies, or private businesses needs to control attendance. Institutions will need to keep track of individuals within the organization, such as employees and students, in order to maximize their performance. Facial Recognition in Real-time is a practical method for managing the daily attendance of several students. Our program is focused mainly on implementing Web automation for all the institutions which use Web app ERP (Enterprise resource planning) or like ERP system for marking the attendance. Our model automates the complete task from taking attendance, logging in into ERP , marking attendance in ERP / similar web app with an acknowledgement email regarding the attendance status to each student/ user. Also creating Database of attendance of each session. Which is implemented in python using OpenCV, Selenium, smptlib and MongoDB.***
Keywords: face-recognition, face-detection, selenium, web-automation, mongoDB, smtplib, Python

I. INTRODUCTION

Many institutions to this day still use ledgers and registers to record and mark the attendance. In a normal face-to-face (F2F) classroom setting, faculty staff should have a proper procedure in place to maintain accurate and precise student attendance records. They must regularly check, keep up with, or keep an eye on that attendance record. They face difficulties, especially in classes where there are many kids. The average attendance for each registered student must also be reported manually, which takes more time. On the other hand, implementing an automated attendance system might ease the administrative burden on staff members. As a result, this study describes how we could employ digital images taken in a classroom setting to automatically control student attendance using a facial recognition algorithm. The technology is quicker than conventional methods and is simple to customize. This aids in preventing incorrect participation as well. Additional biometric strategies, like those listed below, may also be used to computerize the attendance process:

1) Log book entry
2) Finger Print based system
3) IRIS detection
4) RFID based system
5) Facial Recognition

All of the aforementioned methods are distinctive, effective, precise, and economical, but facial recognition is the most distinctive, effective, precise, and economical. There are numerous issues with the scheme, which are discussed in greater detail below.

a) Lightning conditions affects the results
b) Problem with individuals with similar faces
c) No-depth detection in normal cameras
d) requires high-end parent machine to run on

The ability to recognize faces is one that the human brain is capable of. The individuality of faces can be recognized by computer, thus we must teach or train the machine to recognize faces based on their distinctive qualities. The use of web-automation to perform the monotonous task of marking the attendance of present students can also be achieved. Also implementation of Selenium for web automation achieves the task of marking attendance on vierp.in or any other ERP-like web based system which uses a table and checkboxes to mark the attendance also involving automated login for saving further time of the professor.

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Python is a general-purpose, high-level programming language. Its design philosophy maximizes code readability by using significant indentation and simpler syntax. It focuses on logical aspect of programming rather than syntactical difficulties. It is a dynamically typed language with a garbage collector. It supports multiple programming paradigms, like object-oriented, structured(procedural) and functional programming. Selenium is an Open-source tool to automate web-browsers like Chrome or Mozilla. Selenium scripts can be written in Python. It uses a driver version of the browsers and executes the issued commands one-by-one. It is mostly used for the testing of websites. It will automate the task of manually checking and marking the attendance of each student one by one along with it often involves the task of taking the attendance physically.

MongoDB is a cross-platform and open-source software document-oriented database application. MongoDB is database storing application that makes use of documents that resemble JSON format/NoSQL format and may or may not include schemas. We can create, read, update or delete data in the database. There are many tools available that are compatible with mongoDB for data analysis/interpretation and visual representation. We can easily use MongoDB for storing the collective base-database which will contain all the attributes related to students such as name, roll-no, email, unique-id.

To send email to any internet-connected device that has an SMTP or ESMTP listener daemon, utilize the SMTP client session object defined by the smtplib module. It can also be used with gmail account to send the emails

The automated process of taking attendance will in return save the class/office time and reduce the workload on the teacher/employer. The Web-automation part used to mark the attendance is specialized to be used in the institutions which uses ERP based system / any other web-based system which uses tables-checkbox for marking the attendance.

Many of the popular educational institutions in India use ERP system for management purposes like VIT Pune, PCCOE, VIIT Pune and 20+ prestigious institutes, also many organizations use similar apps for business management. In all of them, the system for attendance management is one of the most crucial parts.

II. METHODOLOGY/EXPERIMENTAL

A. Synthesis/Algorithm/Design/Method

Synthesis: The program is made completely in Python and involves the use of multiple libraries like:

1) OpenCV
2) face-recognition
3) selenium
4) pymongo
5) pickle
6) smtplib

The use of above mentioned libraries along with many inbuilt libraries along with hardcoded (that is set by the backend side of the program) photos of students and the face-encoding file that will be used for detecting and recognizing the faces in the current frame of the real time webcam feed. Use of face-recognition library has inbuilt function to detect/recognize the faces in the camera feed. It may be used with Python or from the command line to recognise and alter faces. developed using the most advanced facial recognition technology available from dlib. On the Labeled Faces in the Wild benchmark, the model has an accuracy of 99.38%.

Use of webcam to get real-time camera feed from which program will recognize the faces in real-time.

There will also be a mongoDB database which will contain the personal information of all the students in document (NoSQL) format for easier access and management. The web-automation part will involve the use of selenium for browser automation. smtplib is included to send personalized emails containing the attendance status to each student.

B. Algorithm

- Developer will add the images of each student in the database and create the face-encodings
- Inside the camera module, the system will display the real time camera input feed on the screen
- Program will check every frame and search for any match in the face-encodings
- When a match is found, it will mark the attendance and record the particular attendance in the database for that current running session.
- The smtplib module will send an email to every student regarding their attendance status.
- The Selenium i.e. the browser automation module will automatically open vierp.in - log in - (teacher will manually select the particular batch and division) - will mark the check box of all present students.
- The control of the final submission of the attendance sheet will be on the teacher, so it can be verified whether the marked attendance sheet is correct or not.

C. Design:

The program consists of main 3 modules

1) face-recognition module

2) DB / web / mail sending module

There's also a centralized database in mongoDB which can be used for the further operations and tasks. The database consists of basic personal information about each student.

The database looks like this in MongoDB compass:

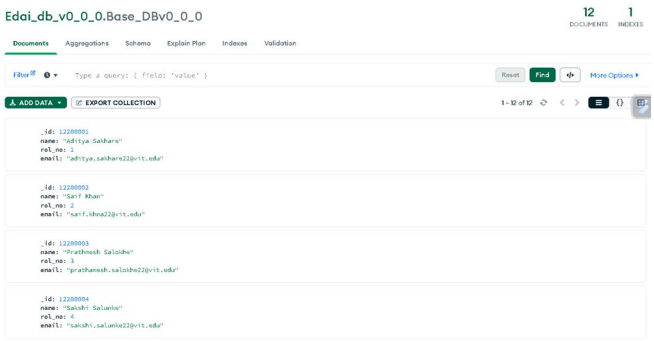


Fig 1: Base database of all students.

The images of registered students are also stored in separate folder:

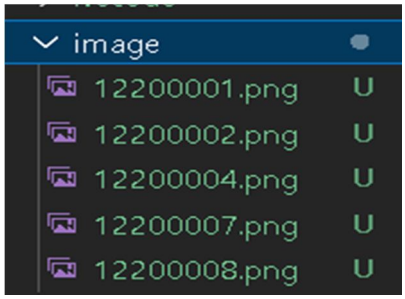


Fig 2: Images of students

D. Method

The flow up to marking the attendance of a student as present in the database i.e. the flow of the complete module which recognizes the face and marks as present:

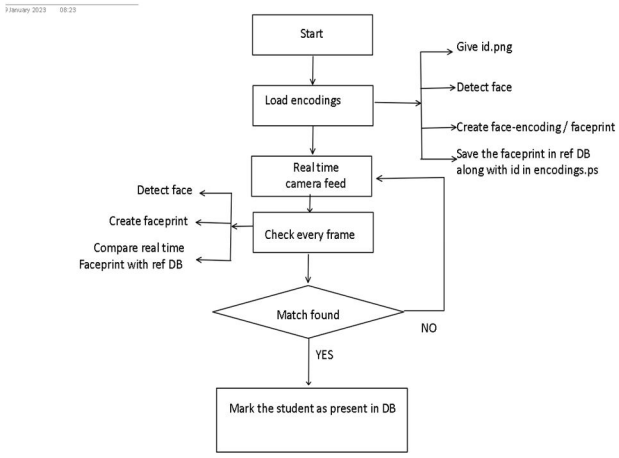


Fig 3: work flow of face-recognition module

The rest of the workflow is given as i.e. the use of created database :

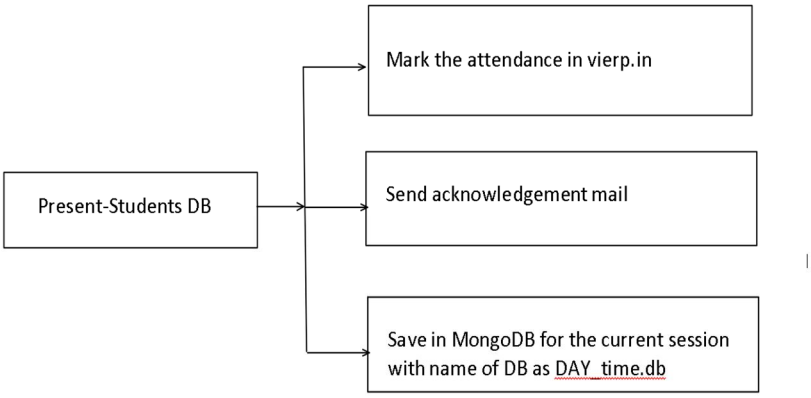


Fig 4: Tasks performed by using the databse

III. RESULTS AND DISCUSSIONS

The Face detection module works like shown and marks the attendance:

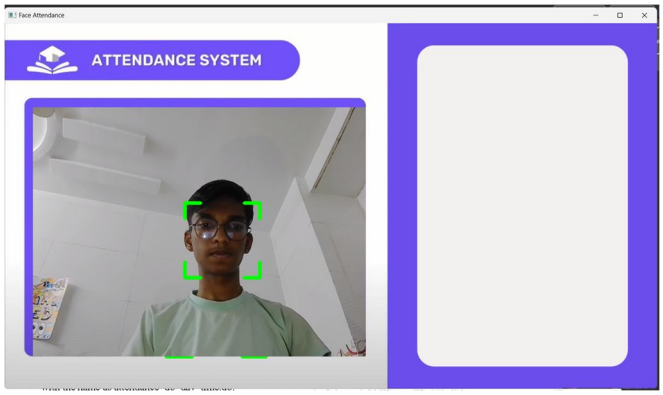


Fig 5: Live webcam feed



Fig 6: console log

The next module will create a DB of the present students with the name as attendance_db_day_time.db:



Fig 7: Newly created database storing the present student information

The email will be sent to the registered email address telling the student about his/her attendance status in the most recent session: Here's the console output:

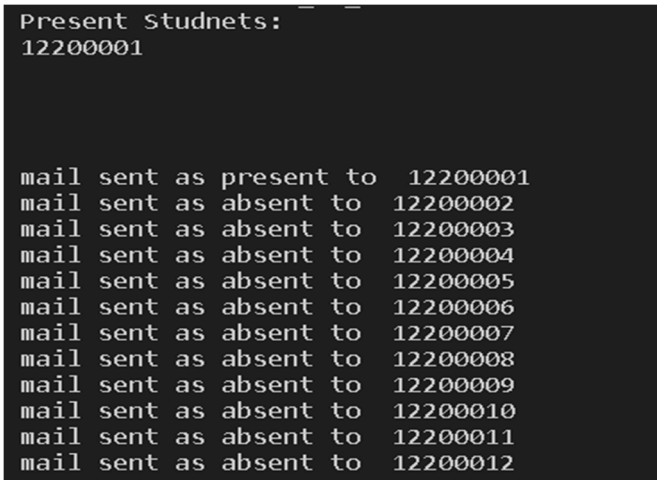


Fig 8: Console log for email sending

Here's the gmail inbox of each student:

Fig 9.A :gmail inbox of present student

Fig 9.B:gmail inbox of absent student



Fig 10.A: mail received to absent student



Fig 11.B: mail received to present student

Then the Selenium that is the browser automation part will mark the checkbox of all the present students in the session:

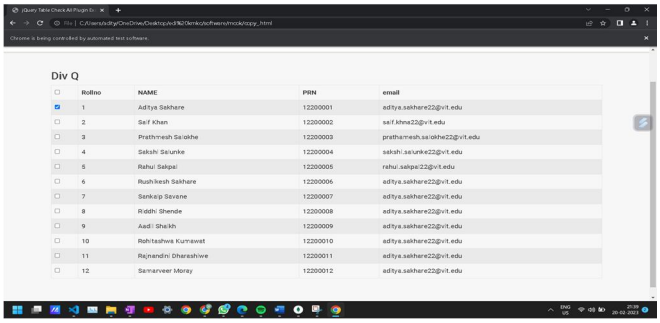


Fig 11: Automated marking on ERP attendance page

In this way the program will automatically:

- Mark the attendances using face-recognition
- Store the record of each session in separated database
- Send an attendance status email to each student

Check and marks the attendance in ERP page on chrome

IV. FUTURE SCOPE

The complementary feature will be a completely independent system for attendance monitoring and analysis. We can use the previously generated Attendance databases for analysis purposes like sending a special notice to the students whose monthly attendance is not greater than or equal to 75% or so. We can also visually represent the data using Plots and Graphs.

V. CONCLUSION

In the proposed program the task is to implement a face-recognition attendance system for an already existing ERP system without direct manipulation of the ERP database or any other alterations to the already well functioning system. the program will not affect the working of the ERP system instead it will be like an additional functionality.

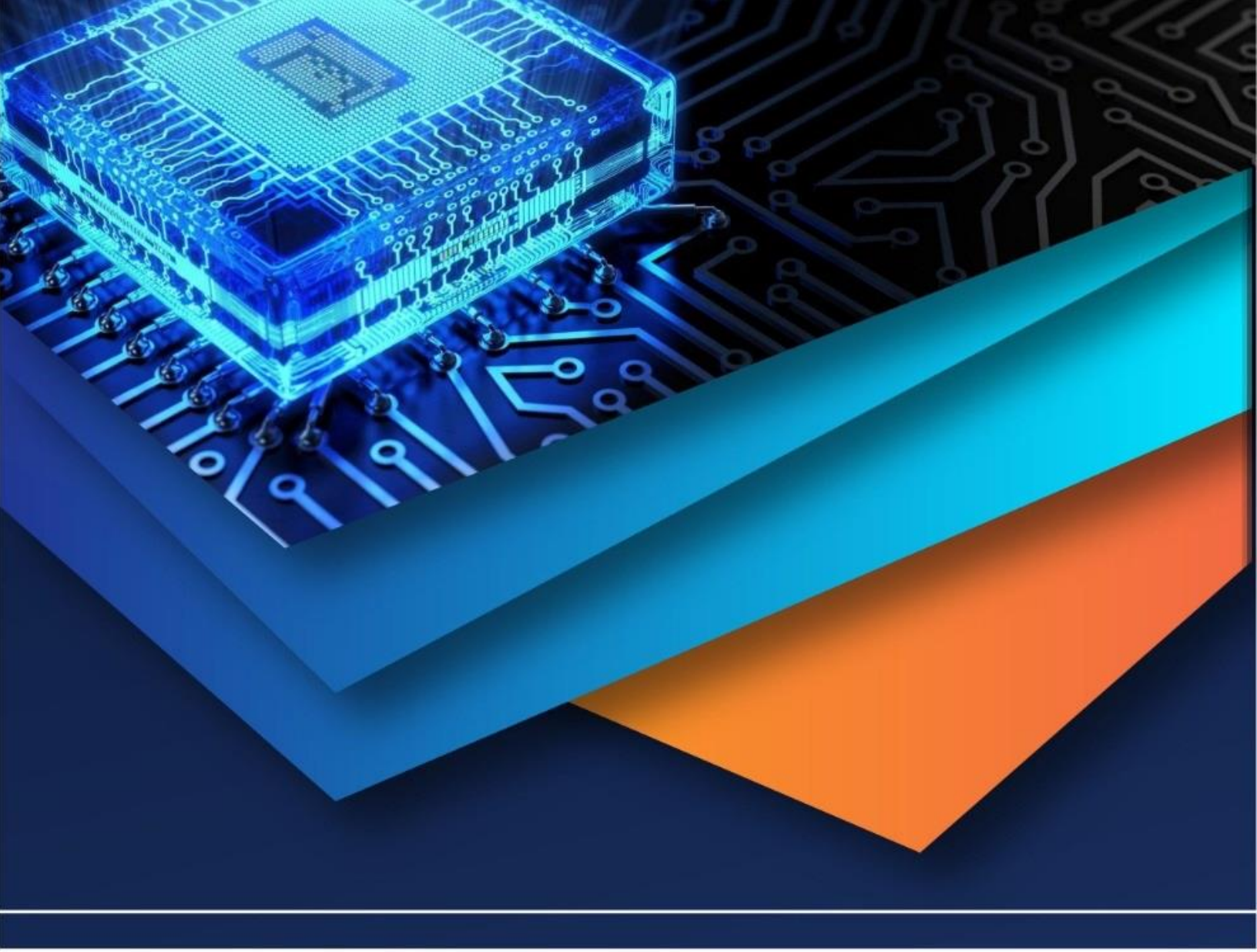
VI. ACKNOWLEDGMENT

All the professors have provided us extensive personal and professional guidance and taught me a great deal about Project development/debugging and team management. We would also like to thank our Project guide Prof. Mayuri Gawade for great guidance on technical aspects of our project along with the help for research paper writing .

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