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An Adaptive Approach to Real-Time Classroom Attendance System Using Deep Learning

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Abstract: The Oxford Dictionary defines a face as the part of a person's head from the forehead to the chin or the corresponding part of an animal. In human interactions, the face is the most significant factor because it contains important information about an individual. All humans will acknowledge people from their faces. The proposed solution is to develop an operating prototype of a system that may facilitate class attendance management for the lecturers within the lecture rooms by detecting the faces of scholars from an image taken in a classroom.

Keywords: Deep Learning, face detection, preprocessing, tktools, numpy, matplotlib.

I. INTRODUCTION

Maintenance of attendance is incredibly necessary altogether at the institutes for checking the performance of employees/students. Some institutes take attendance manually using paper or file-based approaches and a few have adopted ways of automatic attendance using some biometric techniques. The recent methodology for taking attendance is by calling out the name or roll number of the scholar to record attendance. Every biometric system consists of the enrolment process during which distinctive features of someone are stored within the database and then there are processes of identification and verification. These 2 processes compare the biometric feature of someone with previously stored biometric details captured at the time of enrolment. Biometric templates are of many varieties like Fingerprints, Eye Iris, Face, Signature, and Voice. Our system uses the face recognition approach for the automated Attendance Management System

The rest of this paper is organized as follows. The next section composes a review of similar researches that have been implemented and tested for real time attendance detection. In Section III, the proposed algorithm is described. The stages of the proposed real time attendance detection algorithm. In Section IV, experimental results are reported. Finally, some conclusions are given and future work is proposed.

II. REVIEW OF OTHER METHODS

Literature Survey is most important step in the software development process. Before developing the tool, it is necessary to determine the time factor, economy and company strength. Once these things are satisfied, the next step is to determine which operating system and language can be used in developing the tool.

In [1] "Automated Attendance System Based on Facial Recognition using Viola-Jones Algorithm". N.Dhana Lakshmi, Pranavi Nagubandi, Muralidhar Yeleti, and K.Vishnu Vardan (April-June 2022) are the authors. Viola-Jones Eigenfaces Eigen Vectors are the technique employed. inadequacies are Instead of faces gazing up, down, sideways, or any other direction, this algorithm performs best for frontal faces. Each subject was photographed 150 times to construct the face databases for this study. In [2] "Smart Classroom Attendence System Using Face Recognition and Raspberry Pi." Author information and year of publication Harish G, Aishwarya B.R., Bhadri Narayan S, Smitha Shekar B, and Chinmayeshree K.B (2021). utilised Viola-Jones LBPH Raspberry Pi MySQL database technique.

In [3] "Implementation of Face Recognition based Attendance System using LBPH.". Author Information and Year of Publication Ajimi.S (March-2019). Cascade Classifier Local Binary Pattern Histogram Algorithm was the technique employed. Shortcomings. The student's attendance status cannot be seen in the system.

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In [4] "Attendance Monitoring using Face Recognition and Machine Learning". Author Information: Prajwal More, A.R. Kamble, Anirudh Joshi, Alankar Patil, Priya K.P., and Prajwal More. (July-2022). employed Viola-Jones and LBPH techniques. Shortcomings unable to take numerous fine-grained pictures of the kids and upload them to the cloud. Unable to recognise faces that are rotated or inclined.

III. METHODOLOGY

The most important aspect of the project is its design phase. This chapter gives the overall design of the project. System design is a process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirement.

Smart attendance system with Face Recognition has the architecture as the following step. The camera needs to install in the front which can capture an entire face of the student inside the class. In the first phase after the camera has been captured; the captured image is transferred into the system as an input. The image capture from the camera sometimes comes with darkness or brightness which needs to do an enhancement on it such as convert to a grey image.

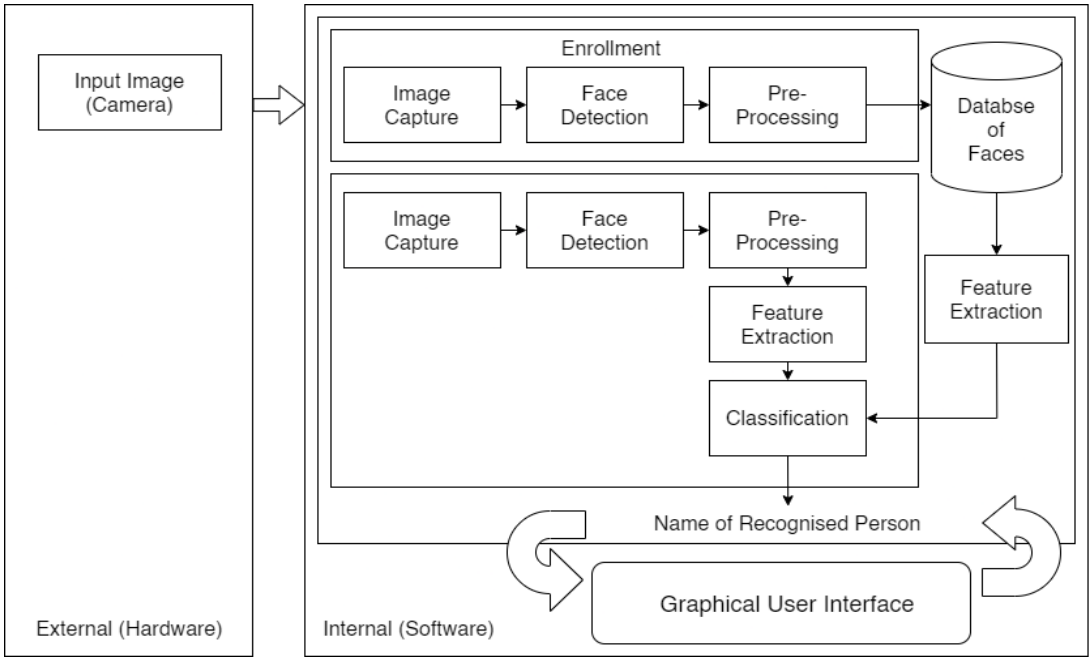

Figure 1: System Architecture

Face detection performs locating and extracting face image operations for face recognition systems using the d8-points shape predictor. The model design of this system will from a blueprint for the implementation that will be put together to achieve the project objectives and best performance for the final product. This system design consists of activities that fit between software requirements analysis and software construction.

Our project problem statement is "A Real Time Smart Attendance System with Face Recognition using OpenCV" The followings are the expected work to be done: The targeted groups of the attendance monitoring system are the students and staff of an educational institution.

1. Users should be able to register through their already existing accounts.
2. The user's face should be sensed and captured by the camera.
3. The database of the attendance management system can hold an individual's information.
4. The detected face's data should be matched with the database.
5. The facial recognition process can be done for one person at a time.

The four steps to implement real time attendance is as follows:

1. Image Processing: The facial recognition process can be split into two major stages: processing which occurs before detection involving face detection and alignment and later recognition is done using feature extraction and matching steps.

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2. Face Detection: The primary function of this step is to conclude whether the human faces emerge in a given image, and what is the location of these faces. The expected outputs of this step are patches which contain each face in the input image. In order to get a more robust and easily designable face recognition system. Face alignment is performed to rationalize the scales and orientation of these patches.

3. Feature Extraction: Following the face detection step the extraction of human face patches from images is done. After this step, the conversion of face patch is done into vector with fixed coordinates or a set of landmark points.

4. Face Recognition: The last step after the representation of faces is to identify them. For automatic recognition we need to build a face database. Various images are taken foe each person and their features are extracted and stored in the database. Then when an input image is fed the face detection and feature extraction is performed and its feature to each face class is compared and stored in the database.

The first step in the Attendance System is the creation of a database of faces that will be used. Different individuals are considered and a camera is used for the detection of faces and the recording of the frontal face. The number of frame to be taken for consideration can be modified for accuracy levels. These images are then stored in the database along with the Registration ID.

- Training of Faces: The images are saved in gray scale after being recorded by a camera. The LBPH recognizer is employed to coach these faces because the coaching sets the resolution and therefore the recognized face resolutions are completely variant. A part of the image is taken as the center and the neighbors are threshold against it. If the intensity of the center part is greater or equal than it neighbor then it is denoted as 1 and 0 if not. This will result in binary patterns generally known as LBP codes.
- Face Detection: The data of the trained faces is stored in .py format. The faces are detected using the Haar cascade frontal face module.
- Face Recognition: The data of the trained faces are stored and the detected faces are compared to the IDs of the students and recognized. The recording of faces is done in real time to guarantee the accuracy of the system. This system is precisely dependent on the camera's condition.

IV. EXPERIMENTAL RESULTS

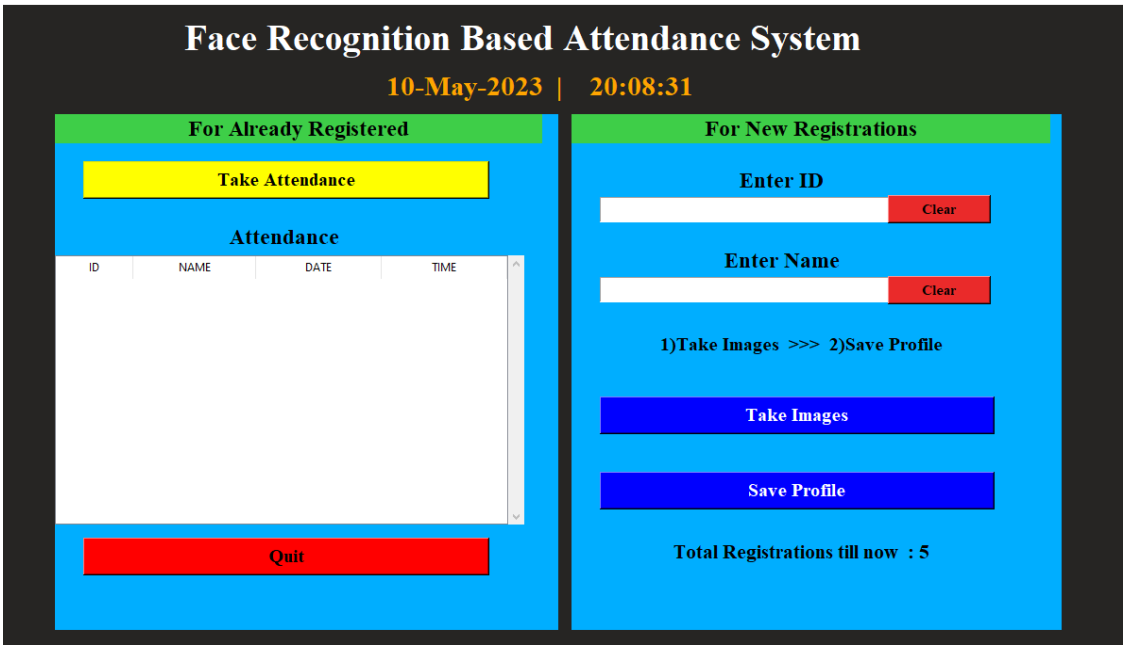

Figure 1: Homepage of Face Recognition System

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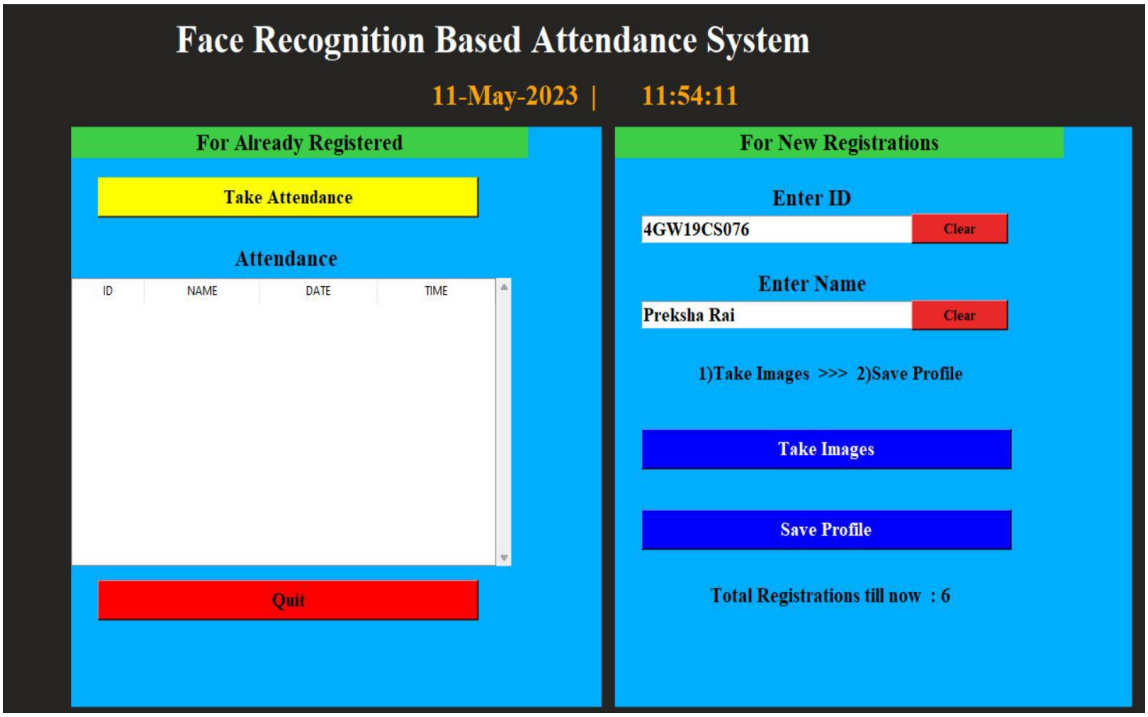

Figure 2: New Registration

Figure 3: Training Images

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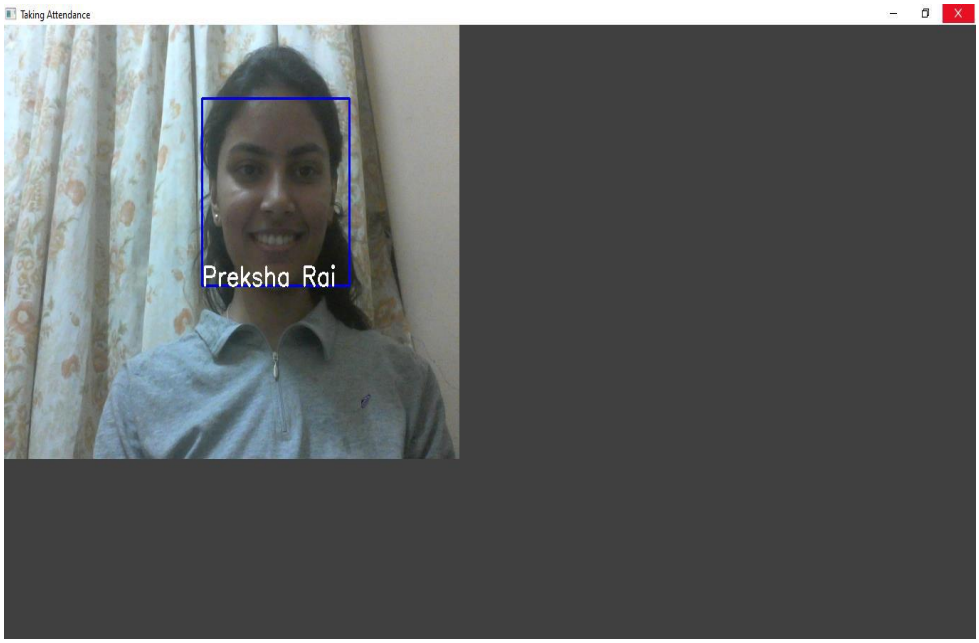

Figure 4: Recognizing face 1 for Attendance

A1 SERIAL NO.

	A	B	C	D	E	F	G	H
1	SERIAL NO.		ID		NAME			
2								
3								
4								
5								
6								
7	1		4GW19CS085		Sahana Edigar			
8								
9	2		4GW20CS404		Pooja C			
10								
11	3		4GW19CS081		Kavya B G			
12								
13	4		4GW19CS076		Preksha Rai			
14								
15	5		4GW19CS079		Rakshitha J			
16								
17								
18								
19								
20								

Figure 5: Database of Student Details in Excel Sheet

V. CONCLUSION

Now a days, various attendance and monitoring tools are used in practice in different places although these solutions are mostly automatic, they are still prone to errors. In this Face Recognition based student attendance system, we have used OpenCV, a Python open-source library, which is used for computer vision in Artificial intelligence, Machine Learning, face recognition, etc. Face recognition technology can accurately identify individuals based on their unique facial features. It eliminates the need for manual data entry or physical identification cards, reducing the chances of errors and fraudulent attendance. The system can process attendance quickly, making it more efficient than traditional methods.

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In conclusion, text to image generation is a promising area of research that has the potential to revolutionize the way we create and consume visual content. With further research and development, text to image generation can become a valuable tool for businesses, artists, and individuals alike.

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