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FACE DETECTION AND RECOGNITION STUDENT / EMPLOYEE ATTENDANCE

M. Thangamani

M.E Student, Computer Science and Engineering, Akshaya College of Engineering and Technology, Coimbatore, Tamil Nadu, India

ABSTRACT

A face recognition system can be used to develop a presence review system. This system measures the presence of each student by taking a picture using a portable computer webcam. The captured image is processed via a personal computer, allowing an instructor to automatically verify a student's attendance with no additional effort and cost.

The system updates whether a student is present or absent in an Excel sheet, which is continuously overwritten while the system is in use. This ensures that the attendance data is stored in memory for future reference. Based on data obtained from the website, it can be concluded that the presence-based system works satisfactorily.

The current system demonstrates better performance in terms of speed, a lower false positive rate, and higher accuracy. In this implementation, facial recognition is achieved using the Principal Component Analysis (PCA) and Eigen face techniques. The system effectively detects a person's face and works well with various facial expressions.

KEYWORDS: *Face Recognition, Attendance System, Principal Component Analysis (PCA), Eigenface, Image Processing, Student Attendance, Automatic Attendance System, Webcam, Personal Computer, Facial Expressions*

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INTRODUCTION

Faces in surveillance videos often suffer from image blur, posture changes, and occlusion, making video-based face recognition (VFR) challenging. Ding C has proposed a comprehensive framework based on convolutional neural network (CNN) to address these challenges. The approach includes artificially blurring clear still images to create training data, enabling the CNN to learn robust face representations that are insensitive to blur. Additionally, the framework features a trunk branch CNN model (TBE-CNN) to enhance robustness against pose changes and occlusion by extracting complementary information from the overall face image and specific facial patches.

The significance of VFR is underscored by the growing integration of Information and Communication Technologies into everyday life, leading to environments responsive to user presence. This evolution, known as Ambient Intelligence, envisions smart objects providing customized, user-friendly services. In this context, face recognition serves as a non-intrusive biometric identifier, essential for adapting services to individual user preferences.

Biometric recognition, utilizing unique physiological and behavioral characteristics, has gained traction for its potential applications in security and access control. Despite advances, face detection remains complex due to variations in

pose, occlusion, orientation, lighting, and expression. Various methods like template matching, feature invariant approaches, and appearance-based methods have been developed, but integrating them effectively remains challenging. Fortunately, the images in this project exhibit uniformity, allowing simpler detection algorithms focusing on color segmentation, image segmentation, and template matching.

Overall, face recognition technology has emerged as a crucial tool in pattern recognition and computer vision, widely used in biometrics, information security, law enforcement, surveillance, and smart cards. Despite its broad applications, it presents numerous challenges for researchers to address.

Related Work

1. System Overview: The face recognition system uses a portable computer webcam to capture images of students, which are then processed by a computer to check attendance automatically.

2. Benefits: No additional effort or cost for the instructor. Automatic updates to an Excel sheet indicating student attendance. Improved performance with higher speed, lower false positive rates, and higher accuracy.

3.Technical Details: The system employs Principal Component Analysis (PCA) and Eigen faces techniques for facial recognition. It can effectively detect faces and is robust to different facial expressions.

4.Evaluation: Based on data obtained from the website, the system works satisfactorily, providing reliable attendance tracking.

Existing System: In the Fingerprint based existing attendance system, a portable fingerprint device need to be configured with the students fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students.

Disadvantage

- The system don’t recognize properly in poor light so may give false results.
- It can only detect face from a limited distance.

Resource Methodology

Module Description

- Dataset collection
- Data Preprocessing.
- Data cleaning.
- Visualization

Module 1: Dataset Collection

Collecting data for training an ML model is the foundational step in the machine learning pipeline. The quality of predictions made by ML systems is directly influenced by the quality of the training data. Here are some common problems that can arise during data collection:

Inaccurate Data: Collected data might not be relevant to the problem statement, leading to poor model performance.

Missing Data: Portions of data might be missing. This can manifest as empty values in columns or missing images for certain prediction classes.

Data Imbalance: Some classes or categories may have a disproportionately high or low number of samples. This imbalance can lead to under-representation of certain classes in the model, affecting its accuracy and fairness.

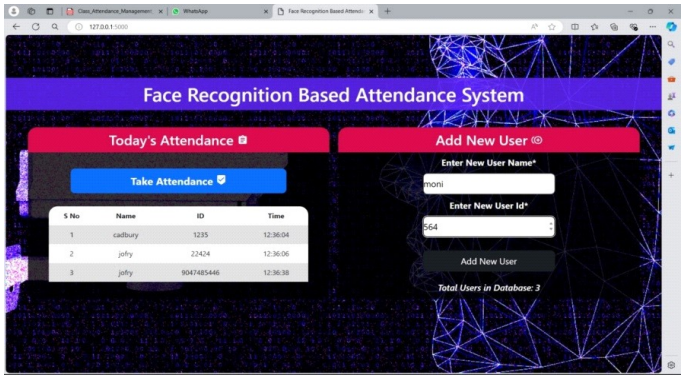


Figure 1.1.

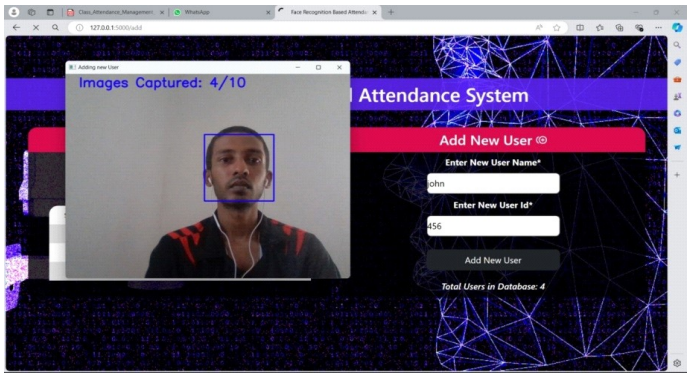


Figure 1.2.

Module 2: Pre-Processing

Real-world raw data and images are often incomplete, inconsistent, and may lack certain behaviors or trends. They are also likely to contain many errors. Once collected, this data needs to be pre-processed into a format that a machine learning algorithm can use for the model. Pre-processing includes a number of techniques and actions:

Data Cleaning: Techniques, both manual and automated, are used to remove data that has been incorrectly added or classified.

Data Imputation: Most ML frameworks include methods and APIs for balancing or filling in missing data. Common techniques for imputing missing values include:

Using the standard deviation, mean, or median of the data in the given field.

Employing k-nearest neighbors (k-NN) to estimate and fill in missing values.

Effective pre-processing ensures that the data is clean, consistent, and ready for training machine learning models.

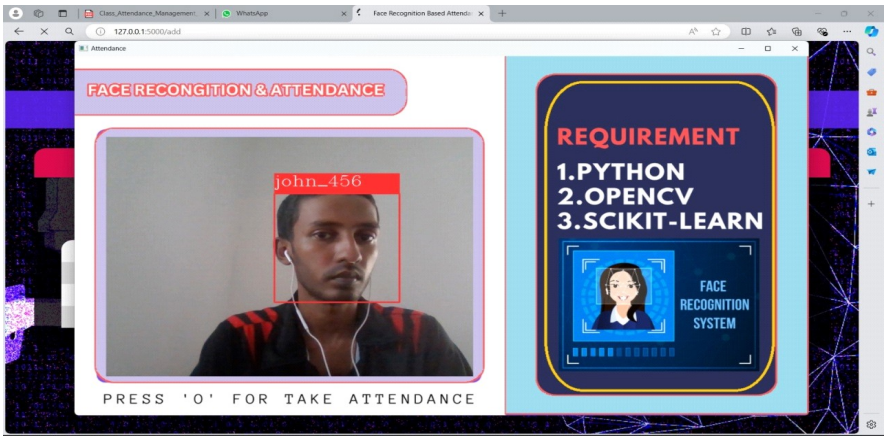


Figure 2.

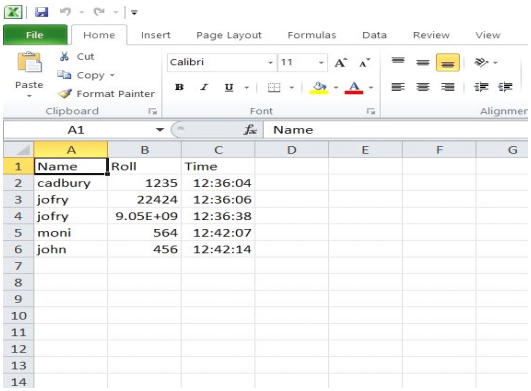
Module 3: Data Cleaning

Data cleaning is one of the important parts of machine learning. It plays a significant part in building a model. It surely isn't the fanciest part of machine learning and at the same time, there aren't any hidden tricks or secrets to uncover. However, the success or failure of a project relies on proper data cleaning. Professional data scientists usually invest a very large portion of their time in this step because of the belief that "Better data beats fancier algorithms".

Figure 3.

Module 4: Visualization

Data visualization is the graphical representation of information and data in a pictorial or graphical format(Example: charts, graphs, and maps). Data visualization tools provide an accessible way to see and understand trends, patterns in data, and outliers. Data visualization tools and technologies are essential to analyzing massive amounts of information and making data-driven decisions. The concept of using pictures is to understand data that has been used for centuries. General types of data visualization are Charts, Tables, Graphs, Maps



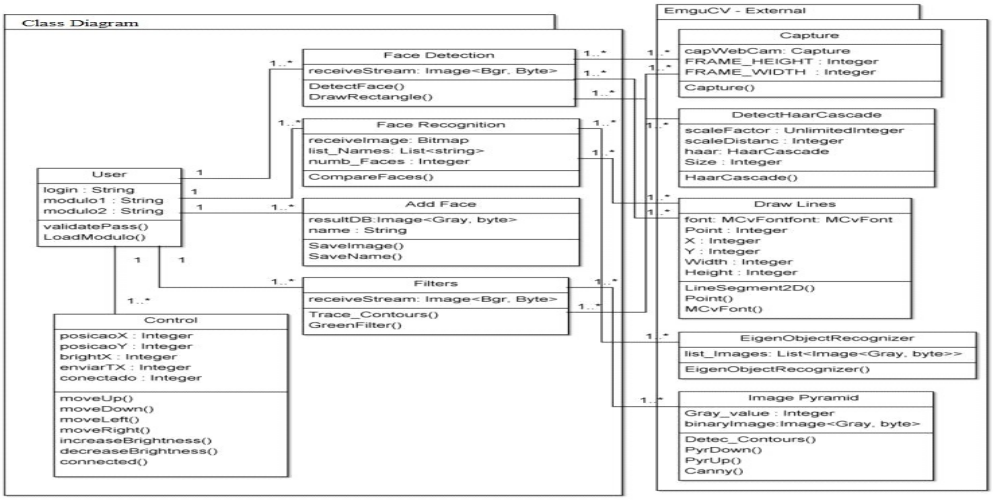
	A	B	C
1	Name	Roll	Time
2	cadbury	1235	12:36:04
3	jofry	22424	12:36:06
4	jofry	9.05E+09	12:36:38
5	moni	564	12:42:07
6	john	456	12:42:14

Figure 4.

SYSTEM ARCHITECTURE

Classic Diagram

2nd Diagram



Benefits of Proposed System

- The software can be used for security purposes in organizations and in secured zones.
- The software stores the faces that are detected and automatically marks attendance.
- The system is convenient and secure for the users.
- It saves their time and efforts.

Conclusion

Managing college attendance has become a significant issue in society, necessitating stronger management practices. Despite technological advancements, many colleges still rely on traditional manual attendance methods, such as paper signatures or roll calls. However, with the rise of technology, some colleges and universities are beginning to adopt modern methods like punch card fingerprints and smart attendance systems.

Although these new methods aim to improve attendance tracking, they share a common shortcoming: the potential for fraud, which can increase absenteeism. This issue negatively impacts students' psychological and physiological well-being, disrupts the normal order of university teaching, and hinders the quality of education. Additionally, it undermines efforts to instill university spirit and discipline.

Effective attendance management systems are crucial to address these challenges, reduce absenteeism, and enhance the overall quality of education and student experience.

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