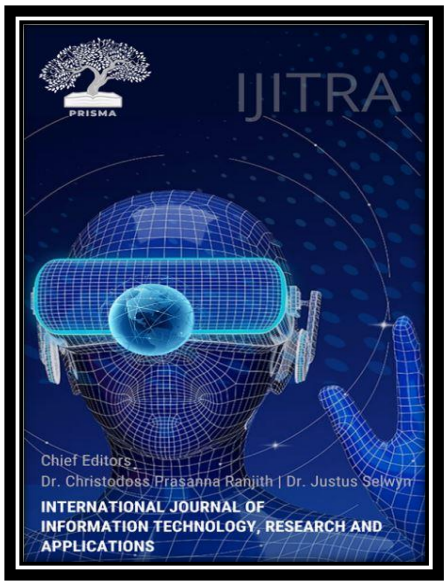

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Attendance Monitoring System Using Face Recognition

Shashikala H K[1], Abhinav Singh Upreti[2], Shreya Nupur Shakya[3], Shaik Dadapeer[4], Pooja Panjiyar[5]

[1]Assistant Professor, Dept. of Computer Science and Engineering, Faculty of Engineering and Technology, Jain University, Bangalore, India, hk.shashikala @jainuniversity.ac.in

[2, 3, 4, 5]Dept. of Computer Science and Engineering, Faculty of Engineering and Technology, Jain University, Bangalore, India,

[2]17btrcs135 @jainuniversity.ac.in, [3]17btrcs141 @jainuniversity.ac.in

[4]17btrcs020 @jainuniversity.ac.in, [5]17btrcs076 @jainuniversity.ac.in

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ABSTRACT

In today's tech-savvy academic establishments, attending is taken into account as a crucial issue for each student and institutional authorities. However, professors are still compelled to bear manual procedures to record attendance data, which is very slow and inefficient. Among all biometric ways, the machine-driven personality authentication systems supported face recognition is understood to be the foremost reliable one. With the rise within the development of face recognition systems, there are many proposals for varied applications, together with the attending management system. In addition, problems concerning proxy attending, inaccuracy, and students' unconsciousness of their attending standing arise undeniably. The projected project aims at developing a system that may facilitate professors' present watching of a classroom. This project additionally aspires to create flexibility for college kids to look at their data, attending standing, college data, and timetable. Once totally enforced, we tend to believe the system can assist in dynamic the standard attending management system into associate degree correct and economical system. Moreover, the system can utilize and implement ideas of deep learning to create a much better system compared to the present ones.

Corresponding Author:

Shashikala H K
Assistant Professor
Dept. of Computer Science and Engineering
Faculty of Engineering and Technology,
Jain University,
Bangalore, India,
hk.shashikala @jainuniversity.ac.in

1. INTRODUCTION

As the digital era is uplifting at a very high rate, biometrics technologies have begun affecting our daily life. These technologies seem to be prevalent in many systems that we use regularly. In biometric systems there exist different types of biometrics such as thumb recognition, palm recognition, face recognition, and iris recognition. We have been using some of these systems in our daily lives. For an instance, we use face recognition and thumb recognition to unlock our smart phones. Similarly, these recognition systems are used in a myriad of areas as security options. Face recognition systems are one of the most popular and mature biometrics systems used in the field of automated personal identification. It makes use of mathematical analysis of the random patterns of the frontal faces of individuals for the real-time recognition of a person's identity.

Due to its widespread use, face recognition is a significant application of biometric artificial intelligence. One application of face detection is that the identification of people during a facility for the aim

of attending. The upkeep and analysis of attending records play a big role in the analysis of any organization's success. With growing security issues and rapid advances in networking, communications, and mobility, the demand for secure user authentication techniques has increased.

Biometrics is the science of identifying someone based on their legal means of deciding their identity. Biometric authentication, also known as biometrics, is the process of verifying a person's identity using biometrics. Biometric authentication is the process of verifying an individual's identity using physiological and behavioral features (also known as traits or identifiers) such as their face, fingerprints, hand geometry, iris, keystroke, signature, speech, and so on. Biometric authentication systems have a number of benefits over conventional authentication methods. Biometric traits cannot be lost or forgotten, are difficult to duplicate, exchange, or transmit, and enable the individual being authenticated to be present at the time and point of authentication, making them inherently more accurate than password-based authentication. As a result, biometrics-based authentication is a strong alternative to conventional authentication methods. For various applications, a variety of biometric characteristics have been used. The following are some of the most commonly used biometrics today:

1.1 Face Recognition

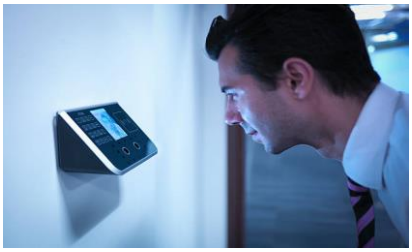

Figure 1. Use of face recognition device.

Face has been used to differentiate one individual from another throughout human history. Facial recognition is a software program that utilizes a video frame or a digital image from a video source and automatically identifies or verifies an individual's frontal face. Comparing the given example to the examples in the database is one way to do this.

1.2 Fingerprint Scanning

Fingerprinting is one of the oldest and most widely used biometric tools today. The method of comparison of two samples of friction ridge skin impressions from human fingers, palms, or toes is thought of as fingerprint identification, conjointly called dactyloscopy or hand identification.

Figure 2. Fingerprint scanning on a mobile device.

1.3 Hand Geometry

The use of the geometric form of the hand for identification is known as hand geometry. This method was popular ten years ago, but it is now rarely used. The method is founded on the idea that one person's hand shape varies from another person's hand shape and does not alter after a certain age. It is, however, not original.

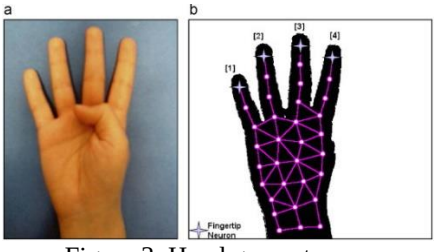

Figure 3. Hand geometry

1.4 Voice Recognition

The voice, like many other features used in biometric methods, is one-of-a-kind. Analyzing the voice and identifying the individual takes very little time, similar to gait style. In biometrics, a numerical model of the sound is provided as a "voice print."

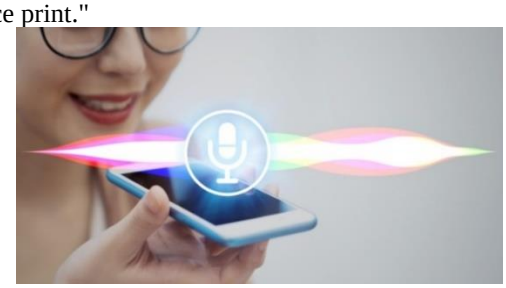

Figure 4. Voice Recognition

1.5 Iris Recognition

Processing iris images is difficult due to the fact that the iris area can be obscured by eyelids or lashes. As a result, we decided to separate the effects of the eyelid and the effects of the eyelashes through iris recognition using only the left and right parts of the iris region. The majority of methods extract the entire iris image, but we only extract a portion of the iris image for identification. Trim the iris area above the upper boundary of the pupil and the area below the lower boundary of the pupil for extraction. Then, to compensate for the effects of image contrast and illumination, we use histogram equalization to improve the normalized iris image.

Figure 5. Iris Recognition

2. RELATED WORKS

This section discusses various works related to attendance monitoring features or face recognition models, as what is needed to be implemented by the proposed system.

2.1 Smart Attendance Management System Using Face Recognition

This method uses a facial recognition technique to eliminate the shortcomings of the current system using machine learning. This needs a high-quality camera to take the images of student faces, and the detection process is performed using the histogram of the focused gradient. Deep learning is used to conduct recognition. An IPC (Inter-Personal Communication) bridge is built to communicate these two stacks on the frontend side (client-side), which consists of a Graphical User Interface based on JavaScript, and the backend side, which consists of logic and Python (server-side).

2.2 Face Recognition-Based Mobile Automatic Classroom Attendance Management System

This paper aims to propose a face recognition-based mobile machine-controlled room attending management system that does not require any extra hardware. Face recognition has been developed using a filtering scheme based on Euclidean distances determined by three face recognition techniques, namely Fisherfaces, Eigenfaces, and Local Binary Pattern. Three separate mobile applications for lecturers, students, and oldsters to put in on their sensible phones to watch and execute the period attendance-taking method square measure enclosed within the projected theme. Furthermore, the device is divided into three layers: Application, Communication, and Server.

2.3 Face Detection in Real Time Based on HOG

This paper proposes a style to discover faces in real-time mistreatment HOG descriptor, taking HOG of the image and calculate the weights that contribute to the countenance. Positive weights with a countenance like eyes, nose, and mouth square measure marked utterly to check a face. This algorithmic program endlessly detects the face from +90 degree to -90 degree rotations even for occluded faces with a high detection rate.

HOG technique uses half a dozen basic parameters recalling: range of orientation bins, vary of orientations to be thought of, cell size, block size, overlap, and normalization rule.

2.4 FaceTime – Deep Learning Based Face Recognition Attendance System

The primary goal of this analysis was the smart employment of these progressive deep learning approaches for face recognition tasks. because CNN's win the only results for larger datasets, that may not the case within the production atmosphere, the foremost difficulty was applying these ways in which on smaller datasets. a replacement approach for image augmentation for face recognition tasks is projected. the overall accuracy was 95. 02% on a little dataset of the initial face pictures of workers within the period atmosphere. The projected model using face recognition may be integrated into another system with some minor alternations as a supporting or a main part for observance functions in the system.

2.5 Face Recognition Attendance System Based on Real-Time Video Processing

This article aims to vogue a face recognition human activity system supported by amount video method. this text primarily sets four directions to trust the problems: the accuracy rate of the face recognition system at intervals the particular arrival, the stableness of the face recognition human activity system with amount video method, the non-attendance rate of the face recognition human activity system with amount video method and so the interface settings of the face recognition human activity system victimization amount video method. By analyzing the case of these problems, the conception of human activity system supported face recognition technology is projected, and so the analysis on face recognition human activity system supported amount video method is distributed. Experimental data shows that the accuracy rate of the video face recognition system is up to 82.

3. OBJECTIVES

The three main objectives of the proposed project are as follows:

- To study various face recognition systems; preferably that are built for attendance monitoring systems used in academic institutions.
- To find out the limitations of the currently existing systems and address them in our proposed project.
- To design and implement a face recognition system for academic institutions with reduced human interactions.

4. METHODOLOGY

a. Register

A user-friendly GUI will have an option through which new users can register their name and USN and take an image of their frontal face. The system will store almost 60 images of each individual in grayscale, under various scales so that later, the face can be detected under a wide range of lighting conditions.

b. Training the module

After the images are taken, there will be an option through which we can train the AI module for the new user such that the “studentdetails.csv” file stores the new student’s information. The database file will store the user’s name and USN.

c. Face recognition and attendance marking

Each student will face the web camera and scan their frontal face. If the scanned face matches the faces in the database, then the attendance for that particular student will be automatically updated in the attendance database along with the timestamp. If it does not match, the attendance database will not be updated.

d. Viewing student details, attendance data, and other information

A web application is also developed, through which, users can easily view the registered students’ details, the attendance database, and other information available on the web application.

e. Notifications and reports

The attendance data will be sent to faculty members via email.

f. Feedback/Contact

All users are eligible to give feedback regarding the system and to contact the admin for any further improvements.

5. FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

a. Functional Requirements

The operations and facilities that must be provided are referred to as system functional requirements.

- Student records must be manageable by the user. The device must only be accessible to registered members.
- Face recognition must be consistent and the system must be connected to a webcam.
- Before using the device, the user needs to ask the administrator or the person who created it. Those who would be granted access to the system must first log in.
- The data must be correctly entered and handled.

b. Non-functional Requirements

Non-operational Requirements are features or properties of a system that can be used to evaluate its performance. The following points highlight the non-functional requirements:

- To avoid issues, the system's operation should be carried out with accuracy and precision.
- The system is to be simple for any alterations, and any bugs ought to be corrected.
- The system is to be safe and stable, protecting the private data of students.
- The device is to be simple to work with and easy to understand.
- If an issue arises unexpectedly, the maintenance department should be able to handle it.

6. SYSTEM DESIGN

a. System Architecture

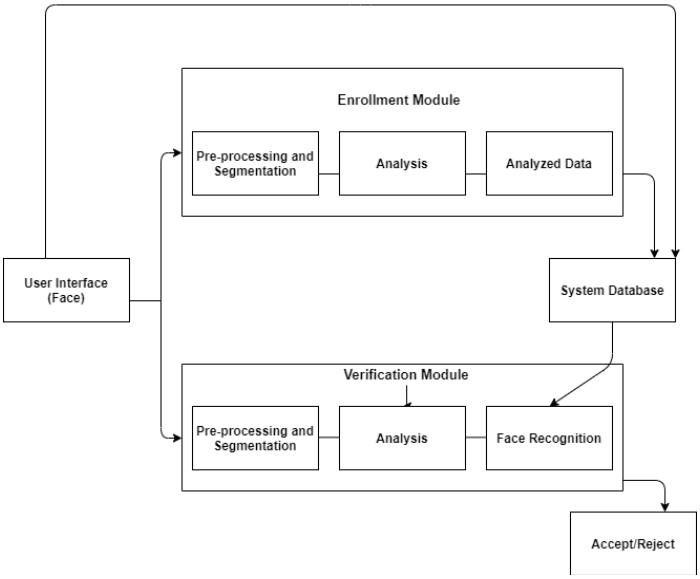

Figure 1. System Architecture

b. Data Flow Diagrams

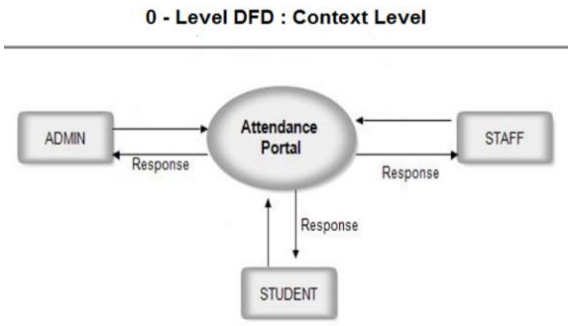

Figure 2. 0-Level DFD: Context Level diagram.

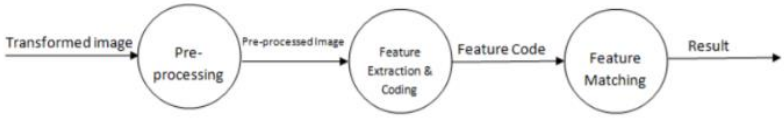

Figure 3. Level-1 DFD diagram.

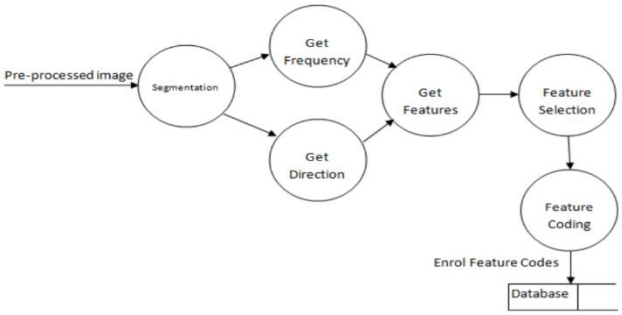

Figure 4. Level-2 DFD diagram for feature extraction.

c. Sequence Diagram

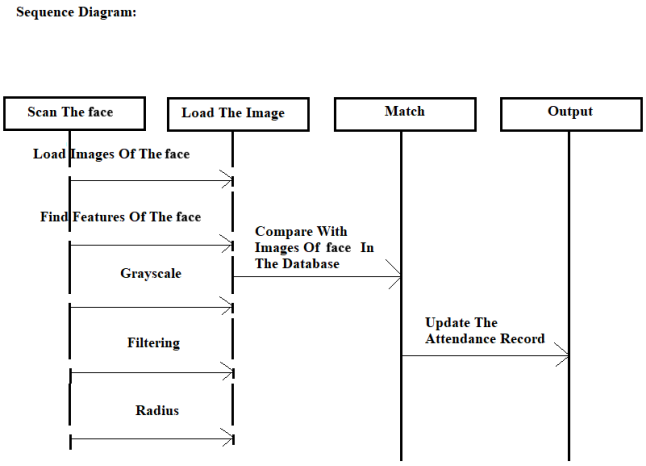

Figure 5. Sequence diagram for attendance monitoring system using facial recognition.

d. Use Case Diagram

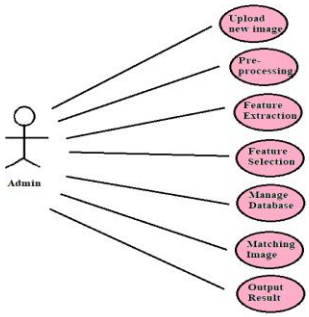

Figure 6. Use case diagram for attendance monitoring system using facial recognition.

e. Activity Diagram

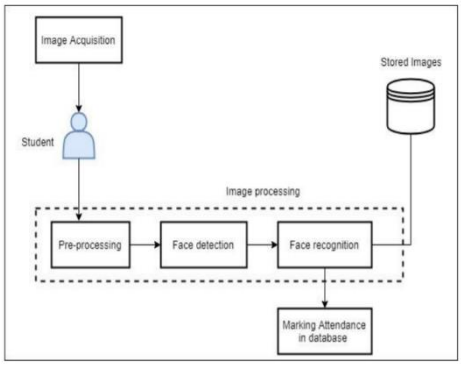

Figure 7. Activity diagram for attendance monitoring system using facial recognition.

7. TESTING TYPES AND RESULTS

Table 1. Testing types and results

S. No.	Activities	Input	Expected Output	Actual Output	Test Result (Pass/Fail)
1	Taking an image	A student faces towards the web camera	The images are captured and stored.	The images are captured and stored.	Pass
2	Training the images taken	The stored images of a student's face.	AI module trained with the images (around 60).	AI module trained with the images (around 60).	Pass
3	Detect and recognize face	Frontal face of a student.	Detection of the face and recognition if records match in the database.	Detection of the face and recognition if records match in the database.	Pass
4	Take attendance	Frontal face of a student.	If the face is recognized, the student's USN and name must be notified in the GUI.	If the face is recognized, the student's USN and name must be notified in the GUI.	Pass
5	Information retrieval	Web-application linked to the database with students' and attendance data.	Student details and attendance data for the selected day is displayed.	Student details and attendance data for the selected day is displayed.	Pass
6	Recognition of faces under low lighting conditions	Frontal face of a student under low lighting conditions.	The system will recognize the face under low level of lighting conditions too.	The system will recognize the face under low level of lighting conditions too.	Pass
7	Recognition of faces with and without spectacles	Frontal face of a student with and without spectacles.	The system will recognize the face with or without spectacles.	The system will recognize the face with or without spectacles.	Pass

8. CONCLUSION AND FUTURE SCOPE

In this project, straightforward and sophisticated background pictures are used to detect faces. The Haar cascade classifier will show rattling performance for the pictures with straightforward backgrounds. It will handle the massive databases well. The Haar cascade classifier is also the best detector in terms of speed and responsibility. Albeit the image is also plagued by illumination, the results once face detection square measure extra correct victimization of the Haar cascade classifier. There will not be restrictions on sporting glasses. By victimization, this method, the probabilities of fake attending and proxies may be reduced.

In the future, for denser school rooms, we can create use of a lot of cameras (or pictures) and method every image on an individual basis. The results of those are often combined to get higher results and accuracy.

we can additionally alter the system and create it a lot of economical by taking advantage of multiple face detections to mark the attending of all the visible faces in a very single try. this can be economic and a lot of economical in use. Moreover, observing the advantage of the Haar cascade classifier, that is most suitable for the implementation of amount face detection, we will merge our system with security systems at the entrance of institutions to filter intruders in amount and increase security.

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