**CHAPTER THREE**

**DESIGN METHODOLOGY**

**3.1 OVERVIEW OF THE PROPOSED SYSTEM**

Student sttendance tracking is a crucial aspect of organizations, educational institutions, and workplaces. Traditional methods such as manual attendance registers or RFID card-based systems are prone to errors, inefficiencies, and fraudulent practices like proxy attendance. The advancement of facial recognition technology has paved the way for an automated and highly accurate attendance system that enhances security and efficiency. This project explores the development and implementation of a facial recognition attendance system.

3.1.2 OBJECTIVE OF THE SYSTEM

The objective of the system is to develop facial detection system for student to take attendance during class session. Here are the few objectives

1. To develop an efficient and contactless attendance system using facial recognition technology.
2. To reduce errors and fraudulent activities such as proxy attendance.
3. To enhance security and ease of access by integrating AI-based face authentication.
4. To create a scalable system applicable to workplaces, schools, and other institutions.
5. To provide real-time attendance tracking and reporting features.

**3.1.3 METHOD OF DATA COLLECTION**

Having achieved the software requirements, the next step was to source for information relative to the subject. This process of information gathering was achieved through so many sources including:

1. File downloads from the Internet
2. Textbooks in the library
3. Newspaper, Journals and articles
4. Other publications
5. Personal observations.
6. Institution websites
7. Government education portals

**3.1.4 FEATURES OF THE APPLICATION**

1. Automated Attendance Marking: Uses face recognition to authenticate users and record attendance.
2. Real-Time Verification: Captures and processes facial data instantly.
3. Anti-Spoofing Mechanism: Detects fake images or videos to prevent fraudulent attendance.
4. Cloud-Based Data Storage: Ensures scalability and remote access.
5. User-Friendly Dashboard: Provides analytics, reports, and attendance trends

**3.1.5 INPUT ANALYSIS**

The input to the new system is student’s login form, student’s forum dialogue space, question setting form, and answer form. These forms are captured online and contain details of the user, the questions and answers.

**3.1.6** **PROCESS ANALYSIS**

The answer supplied by the user is processed by accessing the institutions details and jobs details, and get more information about the institution and jobs.

**3.1.7 OUTPUT ANALYSIS**

The output from the system is to let the student know their career and how they can get started. The Career Guide system also forms part of the output.

**3.1.8 PROBLEM OF THE CURRENT SYSTEM**

Manual and traditional attendance tracking methods present challenges such as time consumption, human error, and the possibility of manipulation. There is a need for an automated, contactless, and reliable system that ensures accuracy in attendance tracking while minimizing fraud and administrative burden.

**3.1.9 JUSTIFICATION FOR THE NEW SYSTEM**

The need for an advanced student attendance tracking system is driven by inefficiencies and security concerns in traditional methods. The facial recognition attendance system offers several advantages over conventional approaches:

1. Accuracy and Reliability: Eliminates human errors and ensures precise identification of individuals.
2. Time Efficiency: Automates attendance tracking, reducing the time spent on manual record-keeping.
3. Elimination of Proxy Attendance: Prevents fraudulent activities such as buddy punching and attendance manipulation.
4. Contactless Operation: Enhances hygiene and safety, especially in post-pandemic environments.
5. Security Enhancement: Uses AI-based authentication to prevent unauthorized access.

**3.1.10 CHALLENGES AND LIMITATION**

1. Lighting Conditions: Poor lighting can affect facial recognition accuracy.
2. Time Efficiency: Automates attendance tracking, reducing the time spent on manual record-keeping.
3. Facial Changes: Variations in expressions, aging, or accessories like glasses can impact recognition.
4. Privacy Concerns: Storing facial data requires adherence to data protection policies.
5. Hardware Requirements: High-quality cameras and computational resources may be needed for optimal performance.

**3.1.11 FURTURE ENCHANCEMENT**

1. AI-driven Accuracy Improvement: Enhancing recognition models to handle various facial variations.
2. Mobile App Integration: Allowing attendance marking via mobile applications.
3. Facial Changes: Variations in expressions, aging, or accessories like glasses can impact recognition.
4. Multi-Factor Authentication: Combining facial recognition with fingerprint or voice recognition for higher security.

**3.1.12 DATA PROCESSING**

Data processing involves the manipulation and processes involved in taking student attendance and keep record for student so that institution or school can have good record keeping for student attendance. These processes start from the administrators, follow by lecturer (staff) to the student. All resources are uploaded to the system by the admin into the system where the student can take attendance from lecturer portal. All vital records are stored in the database for future purpose. All the processes are being strictly authenticated and validated to ensure data integrity.

**3.1.13 SYSTEM LAYER**

**Presentation Layer (Frontend)**

User Interface (Web App)

Login (Authentication)

Dashboard & Statistics, Captures live images or video frames using a camera.

Manages school, department, course, lecturer etc

Programming Language

(HTML, CSS & JAVASCRIPT)

**Application Layer (Backend)**

Facial recognition model extracts unique facial features

Data Processing & Analytics Module

Compares captured faces with stored face templates in the database

API Gateway

Programming Language

(PHP)

**Data Layer (Database & External Services)**

View Student & Attendance Record

Stores attendance records in a database

Displays attendance status on a dashboard

Generates reports and analytics for administrators

Database

(MySQL)

**FIGURE: 1.2 SYSTEM ARCHITECTURE**

**3.1.14 ADMIN SYSTEM FLOWCHART**

**Admin Login**

**Login**

**Successful**

**NO**

**YES**

Add &Update School or Faculty

Assign Course for Lecturer

Add & Update

Course

Add & Update

Department

Add & Update Event

Add & Update

Student

Settings

**FIGURE: 1.4 ADMIN SYSTEM FLOWCHART**

**3.1.15 LECTURER SYSTEM FLOWCHART**

Back to Capture Student Image

**Admin Login**

**Login**

**Successful**

**NO**

Request Re-capture

**YES**

Display Error

Capture Student Image

**NO**

Take Attendance

Extract Facial Features

Preprocess Image (Resize, Grayscale, Noise Reduction)

Store to Database

**YES**

Generate Report

Mark Attendance

**FIGURE: 1.4 LECTURER SYSTEM FLOWCHART**