Laboratory Practice 5 Mini Project Report DL

Title: Human Face Recognition and Unknown Person Alert System using OpenCV and Face Recognition

Group Members:
Nimish Agarwal (41)
Yash Aher (42)
Chetan Dabbe (43)
Shreekrushna Dongare (44)

Introduction: Face recognition is a biometric technology used to identify or verify individuals based on their facial features. It has become increasingly popular due to advancements in computer vision, artificial intelligence, and deep learning. Unlike traditional security systems, face recognition allows for non-intrusive and contactless identification, making it suitable for a wide range of applications.

The primary goal of this project is to build a real-time face recognition system that can accurately detect and recognize known individuals using a webcam. It leverages the face_recognition and OpenCV libraries in Python to compare live face data with a pre-encoded database of known faces. When a known face is identified, the system displays the name on the screen. For unknown faces, it highlights them, stores a video segment, and plays an alert sound to notify the user.

This system is designed with practical use in mind, particularly in areas such as surveillance, office attendance, and home security. It enhances monitoring by automatically detecting unfamiliar individuals and saving relevant video clips for further analysis. With the ability to update the face database dynamically, it also ensures long-term usability and adaptability in real-world environments.

Problem Statement: Security systems often lack dynamic real-time alert mechanisms for unknown person detection. A system that not only identifies known individuals but also alerts the user and records unknown appearances is highly valuable. This project addresses the problem of identifying unknown persons in real-time and providing prompt alerts along with a visual record.

Objectives:
- To implement a real-time human face recognition system using OpenCV and face_recognition libraries.
- To detect and differentiate between known and unknown faces.
- To play an alert sound when an unknown face is detected.
- To record short video clips of unknown person appearances.
- To allow user identification and database update post-analysis.

Tools & Technologies
- Programming Language: Python
- Libraries: OpenCV, face_recognition, winsound, threading
- Platform: Windows
- Hardware: Webcam-enabled system

System Requirements:
- Python 3.x installed
- Webcam for real-time video capture
- Sound driver support for audio alert
- Adequate disk space to store images and videos

Methodology:
- Initialize Face Recognition System: Load and encode known faces from a local folder.
- Real-Time Frame Capture: Start webcam and continuously read frames.
- Face Detection & Recognition: Detect all faces and recognize if they are known or unknown.
- Alert Mechanism: If unknown face is detected, play an alert sound and log the face.

- Video Recording: Record a 5-second clip for each unknown detection.
- Post-Processing: After the session, display all unknown faces for manual tagging and storage.

Implementation Snapshot:

Key Functionalities:

- Real-time video feed from webcam
- Facial recognition using face_recognition module
- Unknown face logging using timestamp-based filenames
- Alert sound using winsound.PlaySound()
- Video clip recording and storage in "unknown_faces_videos" folder
- Post-session face labeling by user and database update

Performance & Testing:

The system was tested with known and unknown individuals under various lighting conditions:

- Known Faces: Recognized accurately in under 1 second
- Unknown Faces: Alert triggered and video recorded instantly
- Performance: System works smoothly at ~20 FPS on standard hardware

Conclusion:

This mini project successfully implements a practical human face recognition and alert system using Python. It not only distinguishes known and unknown faces in real time but also records the appearances of unknown individuals and allows post-session database updates. This model has potential real-world applications in surveillance, smart home security, and access control systems.