Attenue

Provisional Patent Document

Title of the Invention:

Attenue: A Real-Time Facial Recognition System Using OpenCV and Face Encoding Technology for smart attendance

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Abstract:

The present invention, "Attenue", is a real-time facial recognition system that utilizes machine learning and image processing techniques to encode and recognize faces from a database and compare them with real-time images from a webcam. The system employs the OpenCV and Face Recognition libraries to ensure accurate and efficient facial detection and recognition, leveraging a database of pre-encoded face images. This invention aims to enhance various applications' security, identification, and tracking systems, providing an effective and scalable solution to real-time face recognition challenges.

Background of the Invention:

Field of the Invention:

The invention relates to computer vision, image processing, and biometric identification, specifically to real-time facial recognition systems for security and identification purposes. The proposed system has applications in surveillance, user authentication, and automated attendance systems.

Problem or Need:

There is an increasing need for accurate, efficient, and scalable real-time facial recognition systems in today's security and surveillance industries. Existing systems often need to improve processing time and accuracy, especially in real-time environments. Moreover, many current solutions need to effectively balance real-time processing with large-scale database comparisons, leading to latency and recognition errors.

Attenue addresses these challenges by providing a facial recognition system capable of encoding known faces and comparing them with live webcam data, all in real time. The invention improves the speed and accuracy of facial recognition by utilizing advanced encoding and comparison techniques.

Summary of the Invention:

The present invention, "Attenue," introduces a system designed to detect, encode, and recognize faces from a pre-existing database in real time. The invention uses a camera feed to capture live images and compare them against the database of encoded facial images. The system integrates OpenCV for image capture and processing, alongside the Face Recognition library to compute face encodings and distances between faces for comparison. It aims to offer a lexicographically efficient method to identify individuals, reducing false positives and improving speed and accuracy in recognition.

Detailed Description of the Invention:

1. **Image Capture**: The system begins by capturing images from a webcam in real time. Using the OpenCV library, the camera feed is accessed, and images are processed by resizing and converting them to an appropriate color space (RGB).
2. **Face Encoding**: The known faces are pre-encoded using a database of images stored in a specified directory. Each face in the directory is converted into a feature vector using the Face Recognition library, which maps facial landmarks and computes encodings that represent the unique facial characteristics of the individual.

   The invention also includes a function `findEncodings()` to convert images into encodings. This method ensures accurate face comparison with a high processing speed.
3. **Real-Time Recognition**: Once the webcam feed is live, the system continuously scans for faces in the current frame, finding face locations and generating encodings for detected faces. It compares the current frame encodings with the known database encodings using the `compare_faces()` and `face_distance()` methods. The closest matching face is identified, and the individual's name is displayed on the webcam feed in real time.
4. **Output Display**: A graphical overlay on the webcam feed marks the location of recognized faces using rectangles, and their associated names are displayed below each face, allowing users to easily identify individuals.

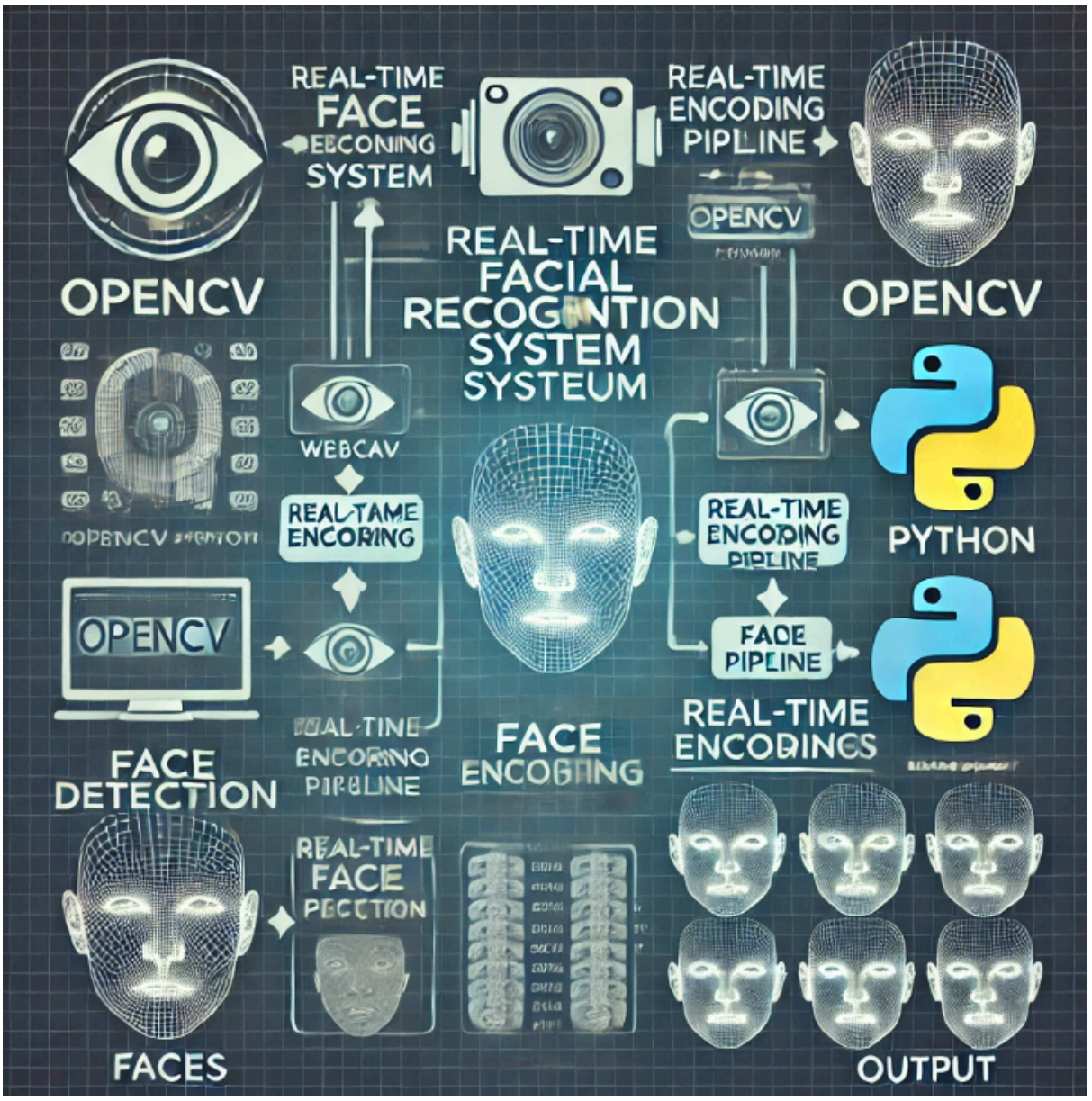
5. **Performance**: The system is optimized to handle real-time recognition efficiently, utilizing image resizing and encoding processes to reduce computational load while maintaining high accuracy.
6. **Scalability**: The invention is designed to scale with larger databases of face images. It maintains performance even as the number of known faces increases, making it suitable for large-scale applications like public surveillance or corporate security.

Claims:

- **Claim 1**: A method for real-time facial recognition comprising:
    - Capturing images via a webcam using OpenCV,
    - Encoding known face images into feature vectors using the Face Recognition library,
    - Detecting and encoding faces in real-time from a camera feed,
    - Comparing real-time face encodings with pre-encoded faces in a database, and
    - Displaying recognized faces with corresponding names on a live feed.
- **Claim 2**: The method of Claim 1 wherein the face encoding is performed using RGB image conversion and face landmark extraction.
- **Claim 3**: The method of Claim 1 further comprises resizing input images for improved real-time processing efficiency.
- **Claim 4**: The method of Claim 1 wherein the system optimizes comparison using face distances to identify the closest match among known faces.
- **Claim 5**: The method of Claim 1 wherein the system is designed to support scalability, handling large databases of known faces without a decrease in recognition accuracy or processing speed.

Examples and Preferred Embodiments:

1. **Example 1**: An embodiment of the invention involves using the system in a corporate security setting, where employees' faces are pre-encoded, and the system continuously monitors for real-time entry and exit of individuals. The system efficiently recognizes employees, ensuring only authorized personnel have access to secure areas.
2. **Example 2**: Another embodiment of the invention is deployed in an automated attendance system for educational institutions, where students' faces are automatically recognized upon entering a classroom, allowing real-time tracking of attendance without manual intervention.



Brief Description of the Drawings:

- System architecture showing image capture, encoding, detection, and comparison steps.
- Flowchart showing step-by-step face recognition process.
- Screenshot of the graphical output of the system, showing detected and recognized faces in a live feed.

Picture that our Model can take: (Expectation)

Result of the process:

Results we are getting:

Conclusion:

Attenue offers an innovative, real-time facial recognition system that efficiently captures and encodes facial images using OpenCV and Python-based libraries. The system leverages pre-encoded face data and compares it against live webcam feeds, providing accurate recognition with minimal latency. Its scalability and real-time processing capabilities make it suitable for diverse applications, including security, surveillance, and automated attendance. By optimizing computational load while maintaining high accuracy, Attenue delivers an effective, reliable, and scalable solution for modern facial recognition challenges.

Team Member:

1. Ishan Kanodia
2. Dhruv Anil Rai
3. Nishul Kumar Kadam
4. Dev Bawari
5. Saket Kumar Singh
6. Vishal Kumar Kochar