ABSTRACT

This project presents a real-time hand tracking and finger counting system utilizing OpenCV and MediaPipe. The primary objective is to accurately detect hand landmarks and count the number of raised fingers using video frames captured from a webcam. The system leverages MediaPipe's robust hand detection and landmark extraction capabilities to identify 21 key points on each hand, followed by custom logic to analyze the spatial relationships between these landmarks.

The implemented solution converts each captured frame from BGR to RGB, processes it through MediaPipe for hand detection, and extracts the necessary landmark points. By comparing the y-coordinates of finger tips with their corresponding joint coordinates, the system determines which fingers are raised. The thumb's position is evaluated based on x-coordinates to account for its unique movement. The results are visually represented on the video feed, displaying hand landmarks, connections, and the total finger count in real-time.

This hand tracking and finger counting system demonstrates practical applications in various fields, including human-computer interaction, gaming, virtual reality, and assistive technologies. The developed system is optimized for real-time performance, ensuring smooth and responsive user interactions. This report elaborates on the design, implementation, and potential applications of the system, highlighting its effectiveness and versatility in recognizing and counting finger gestures.

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