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Gesture Based Presentation Controller Using Hand Gestures

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Abstract- — The project proposes a Gesture-Based Presentation Controller that allows users to control slides using hand gestures through a webcam, eliminating the need for keyboards or remote controllers. It uses computer vision and hand- tracking techniques to detect real-time hand movements and identify key landmarks such as finger positions and hand orientation. Predefined gestures are recognized by analyzing spatial relationships between fingers and joints, ensuring accurate interpretation of user actions. Recognized gestures are mapped to presentation commands like next/previous slide, slideshow control, and pointer movement by simulating keyboard and mouse inputs. The system includes gesture stabilization mechanisms to improve accuracy and is lightweight, cost-effective, and suitable for classrooms, corporate meetings, and professional presentations.

Keywords – Gesture recognition, Hand tracking, OpenCV, Machine learning.

I. INTRODUCTION

The rapid advancement of technology has transformed human-computer interaction, shifting from traditional input devices to more intuitive methods. The Gesture-Based Presentation Controller is an innovative system that allows users to control presentation slides using simple hand gestures, eliminating the need for devices like a mouse, keyboard, or remote.

In conventional systems, presenters depend on physical input devices, which can restrict movement and reduce interaction with the audience. This limitation becomes more significant in environments such as classrooms and seminars, where mobility and engagement are important..
To overcome these challenges, the proposed system uses computer vision techniques to detect and recognize hand gestures in real time through a webcam. The recognized gestures are mapped to presentation commands such as next slide and previous slide. Technologies like OpenCV and MediaPipe ensure accurate hand tracking and smooth system performance..

Overall, the system provides a touchless, efficient, and user-friendly solution that enhances presentation flexibility and improves user experience.

II. LITERATURE SURVEY

Many researchers have explored the use of digital twin technology, simulation models, and immersive tools in disaster management. The following studies provide useful insights into existing approaches and highlight their limitations.

A. Thushara et al. (2025)

This study focuses on gesture-based cursor control using hand and head movements. It demonstrates that hand gestures provide better accuracy and user experience. However, it is limited to cursor control and does not address presentation slide navigation.

B. Liu et al. (2025)

This research proposes a lightweight gesture recognition model for ARM devices, improving performance on low-power systems. While efficient, it mainly focuses on model optimization and not on real-time application in presentation systems.

C. Deepa et al. (2025)

This work presents a gesture-based system for digital interaction such as drawing and tool selection. It enhances user interaction but does not explore gesture-based presentation control.

D. Dixit et al. (2024)

This study uses deep learning techniques for gesture recognition, improving classification accuracy. However, it focuses on model development rather than real-time system implementation.

E. Kim et al. (2024)

This research improves gesture recognition under varying lighting conditions. Although it enhances robustness, it does not integrate the system with practical applications like presentation control.

III. SYSTEM ARCHITECTURE

The proposed system follows a structured architecture consisting of a camera input module, hand detection module, gesture recognition module, command execution module, and output display.

The system begins with the camera input module, where a webcam captures real-time video of the user's hand movements. These video frames are continuously sent to the processing system for further analysis.

The captured frames are processed by the hand detection module, which uses computer vision techniques to identify the presence of a hand and extract key landmarks such as finger positions and joints. This module plays a crucial role in accurately tracking hand movements in real time.

The detected hand landmarks are then passed to the gesture recognition module, where predefined gesture patterns are analyzed. Based on finger positions and movement, the system identifies specific gestures such as open palm or thumb gesture.

Once a gesture is recognized, it is sent to the command execution module, which maps the gesture to corresponding presentation actions. For example, an open palm gesture triggers the next slide, while a thumb gesture moves to the previous slide. This module interacts with presentation software using automation tools.

Finally, the output display module provides visual feedback to the user by showing the video feed along with gesture detection indicators. The system ensures real-time response, allowing smooth and efficient control of presentation slides.

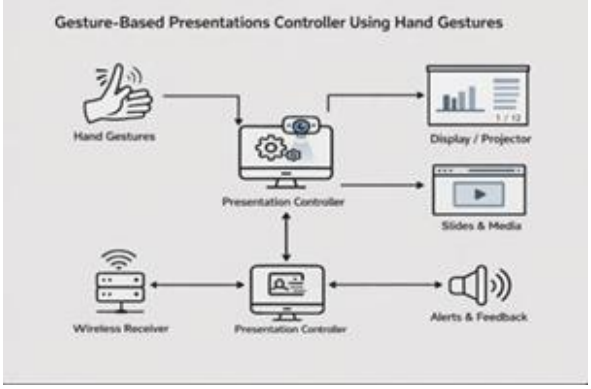

Figure 1: System Architecture for Gesture Based Presentation Controller Using Hand Gestures

IV. PROPOSED METHODOLOGY

The proposed methodology consists of multiple stages for detecting and recognizing hand gestures to control presentation slides.

First, the system captures real-time video input using a webcam. The video stream is divided into frames, which serve as input for further processing.

Next, the captured frames are processed using computer vision techniques to detect the hand region. Using frameworks like MediaPipe, key hand landmarks such as finger positions and joints are identified and tracked accurately.

Each frame is then analyzed in the gesture recognition stage, where predefined patterns are used to identify specific gestures based on finger configurations. These gestures are mapped to corresponding presentation commands.

Finally, the system executes the commands using automation tools to control presentation software, such as moving to the next or previous slide. The system also provides real-time visual feedback, ensuring smooth and efficient interaction.

V. EVACUATION ALGORITHM

- Initialize the webcam for video capture.
- Capture real-time video frames from the camera.
- Preprocess each frame (flip image, convert format if required).

- Detect the hand in the frame using hand detection module.
- Extract hand landmarks such as finger positions and joints.
- Determine which fingers are raised using landmark positions.
- Compare finger pattern with predefined gesture conditions.
- Identify the corresponding gesture (e.g., open palm, thumb).
- Map the recognized gesture to a presentation command.
- Execute the command (next slide / previous slide).
- Apply delay mechanism to prevent repeated triggering.
- Continue processing frames until the user exits the system.

VI . RESULTS AND DISCUSSION

The proposed Gesture-Based Presentation Controller system was tested under different real-time conditions such as varying lighting, hand positions, and gesture patterns. The system effectively detected hand landmarks and recognized gestures using computer vision techniques.
The results show that the system successfully identified predefined gestures such as open palm and closed hand. When an open palm gesture was detected above the threshold line, the system triggered the next slide command. Similarly, when a closed or specific finger gesture was detected, it executed the previous slide command.

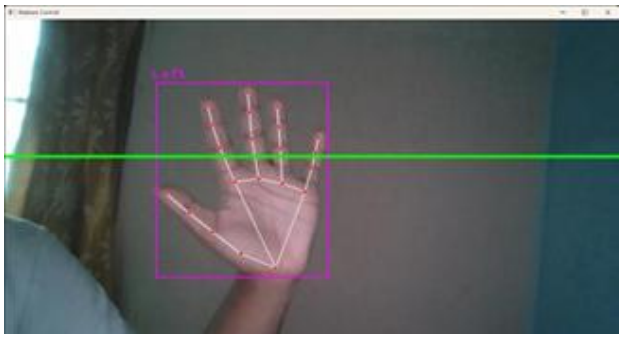

Figure2: Hand Gesture for Next Slide

The green threshold line ensured that gestures were recognized only within a defined region, reducing unintended inputs. The hand tracking module accurately detected finger landmarks, and the gesture recognition module correctly interpreted finger patterns in real time.

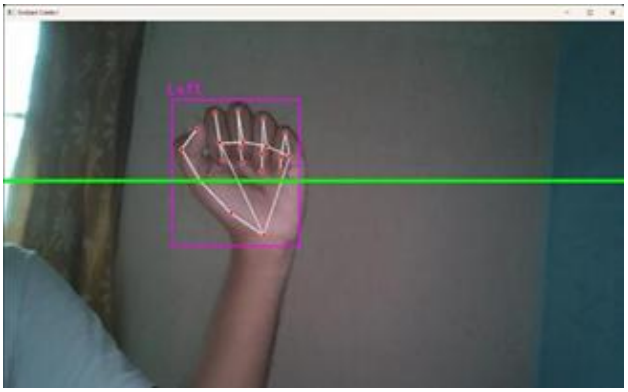

Figure 3: Hand Gesture for Previous Slide

VII. CONCLUSION

This paper presented a Gesture-Based Presentation Controller system for improving human-computer interaction in presentation environments. The system enables users to control slides using hand gestures, eliminating the need for physical input devices.

The proposed approach effectively detects hand movements, recognizes gestures, and maps them to presentation commands in real time. The results demonstrate smooth and accurate slide navigation, enhancing user convenience and interaction compared to traditional methods.

The system also provides real-time visual feedback, which helps users understand gesture recognition and improves usability. Future work can focus on integrating advanced machine learning models, supporting dynamic gestures, and extending the system to web and cross-platform environments for better scalability and performance.

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