

AI-Based Virtual Mouse System Using Hand Gesture Recognition and Voice Control

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Abstract: *In recent years, Human–Computer Interaction (HCI) has evolved beyond traditional input devices such as keyboards and physical mice. This paper presents the design and implementation of an AI-based Virtual Mouse system that allows users to control computer operations using hand gestures and voice commands. The proposed system uses a standard webcam to detect real-time hand movements and gestures through computer vision techniques, eliminating the need for physical contact with input hardware. Additionally, voice control is integrated to perform specific actions such as application navigation and command execution, making the system more interactive and accessible.*

The system is developed using Python, leveraging libraries such as OpenCV, MediaPipe, PyAutoGUI, and AutoPy for gesture recognition and cursor control. Hand gestures are used to perform operations like cursor movement, left click, right click, drag-and-drop, and scrolling, while voice commands enhance usability by enabling hands-free control. This solution is especially beneficial for users with physical disabilities and in environments where touchless interaction is required. Experimental results show that the system operates smoothly with high accuracy and minimal latency, proving it to be an efficient alternative to conventional mouse devices.

Keywords: Artificial Intelligence, Virtual Mouse, Hand Gesture Recognition, Voice Control, Computer Vision, Human–Computer Interaction

