**Virtual AI Mouse Using Hand Gestures**

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**Abstract**:   
The development of virtual AI-based mouse using hand gestures represents a significant advancement in human-computer interaction (HCI). This paper explores the technological framework, algorithms, and user experiences associated with implementing a virtual mouse system controlled via hand gestures. The study highlights the potential applications, advantages, and challenges in deploying such systems.

The mouse is one of HCI's (Human Computer Interaction) incredible inventions. A wireless mouse or a Bluetooth mouse still uses devices because a battery is needed for power and a dongle is needed to connect the mouse to the PC. Therefore, they are not totally device-free. The proposed AI virtual mouse system can solve this problem by using a webcam or built-in camera to record hand motions and identify hand tips using computer vision. The system's algorithm makes use of the machine learning algorithm. The computer can be controlled digitally and can do left-click, right-click, scrolling, and computer cursor functions based on hand motions without the need for a physical mouse. Deep learning is the basis for the hand detection method. As a result, by eliminating human contact and the requirement for external devices to operate the computer, the suggested strategy will stop the spread of COVID-19.

**eywords**: virtual mouse, AI, MediaPipe, OpenCV.

**Introduction:**

The evolution of Human-Computer Interaction (HCI) has led to the exploration of more intuitive and natural methods of interacting with computers, overcoming the limitations of traditional input devices like mouse and keyboards in terms of accessibility and ergonomics. Hand gesture recognition systems, combined with

Artificial Intelligence (AI), offer a promising alternative, enabling users to interact with computers using natural hand gestures, and providing a more accessible, ergonomic, and expressive interaction experience.

Traditional input devices have been the cornerstone of HCI for decades, but they have significant limitations. For individuals with disabilities, such as those with motor impairments, arthritis, or other dexterity-limiting conditions, traditional input devices can be challenging or even impossible to use. Furthermore, prolonged use of mouse and keyboards can lead to repetitive strain injuries, carpal tunnel syndrome, and other musculoskeletal disorders.

In contrast, hand gesture recognition systems offer a more natural and intuitive way of interacting with computers. By using AI-powered algorithms to recognize and interpret hand gestures, these systems can enable users to control computers with simple and expressive movements. This can be particularly beneficial for individuals with disabilities, as well as for those who want to reduce their risk of repetitive strain injuries.

The applications of hand gesture recognition systems are vast and varied. In the field of gaming, these systems can enable players to control games with natural hand movements, providing a more immersive and engaging experience. In virtual reality (VR) and augmented reality (AR) environments, hand gesture recognition can provide a more intuitive and interactive way of navigating and interacting with virtual objects. In healthcare, these systems can assist individuals with disabilities, enabling them to interact with computers and access information more easily. Additionally, hand gesture recognition can be used to control smart home devices, such as lighting, temperature, and entertainment systems.