

The Future of Touchless Interfaces in Human-Computer Interaction

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Abstract: *This paper aims to explore the evolution and implementation of touchless human-computer interaction (HCI), focusing on systems that eliminate the need for physical contact through gesture, voice, gaze, and proximity sensing. These touchless interfaces offer hygienic, intuitive, and accessible interaction with digital environments. A prototype of a multimodal system was developed, combining gesture, voice, and gaze input, and evaluated in real-time conditions. The study investigates core enabling technologies such as computer vision, speech recognition, and sensor fusion, along with performance metrics and implementation challenges. The results contribute to the understanding of context-aware and privacy-preserving touchless systems. Furthermore, a novel adaptive interaction framework is proposed, with potential applications in healthcare environments, virtual reality systems, smart home setups, and accessibility solutions.*

Keywords: Touchless Interaction, Human-Computer Interaction, Multimodal Interfaces, Gesture Recognition, Voice Interfaces, Gaze Tracking, Context-Aware Systems

