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Advanced Eye Tracking System for Real-Time Visual Control and Interaction

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Abstract: *The "Advanced Eye Tracking System for Real-Time Visual Control and Interaction" seeks to revolutionize users' interaction with digital spaces through the introduction of a smooth, natural, and gesture-free interface based on eye motion. The system combines computer vision, infrared (IR) lighting, and sophisticated machine learning algorithms to record and analyze high-precision real-time gaze data with low latency. By using advanced pupil and corneal reflection detection algorithms, the system properly projects eye positions onto screen coordinates or environmental reference points, facilitating dynamic interaction without physical input devices*

Advances in eye-tracking technology have greatly facilitated human-computer interaction (HCI) by tracking eye movement in real time. This thesis project explores state-of-the-art eye-tracking systems and their use in real-time visual control in different fields such as virtual reality (VR), computer games, robots, and assistive technology. The research follows the evolution in hardware and software aspects, how machine learning techniques are implemented to simulate the user's gaze, and how calibration, latency, and data protection matters are of concern. Through exhaustive literature reviews, prototype implementations, and empirical analysis, the present research reveals contemporary limitations and potentialities, thereby sketching out proposals of design enhancement and ethical guidelines towards easier dissemination of eye-tracking technology for broader use in real-time interactive systems...

Keywords: Eye-tracking technology ,Real-time visual control, Human-computer interaction (HCI)Gaze estimation, Virtual reality (VR)

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