

Precision Control of Robotic Hand Using Real-Time Finger Tracking

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Abstract

In hazardous environments such as bomb disposal, medical treatment in contaminated zones and handling dangerous chemicals, the need to perform tasks with human precision without risking harm to human operators is paramount. Thus, this research presents the development of a teleportation system, featuring a master hand that controls a robotic hand through real-time hand gestures, offering a solution that leverages advancements in robotics and image processing technology. The system employs a Raspberry Pi as the central control unit, utilizing Open CV to detect images and recognize hand gestures, which are then translated into precise actions performed by the robotic hand. Hand gesture recognition is achieved using advanced image processing algorithms, ensuring accurate and responsive control. The real-time performance of the system was rigorously tested, demonstrating an average response time of approximately two seconds. This capability allows for immediate and intuitive control, enhancing the safety and efficiency of operations in dangerous scenarios. The findings of this research highlight the potential for robotic hands to replace human hands in perilous tasks, significantly reducing the risk to human operators while maintaining the dexterity and functionality required for complex operations. The integration of robotics with real-time gesture recognition represents a significant step forward in the development of safe and effective tools for hazardous environments.

Keywords: *teleoperation system, real-time, hand gestures, raspberry pi, OpenCV*