CONTROL SYSTEM FOR A 5 DoF ROBOTIC ARM BASED ON HAND GESTURE RECOGNITION USING MEDIAPIPE

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ABSTRACT

In the field of robotics, visual-based robotic arm control has gained increasing interest due to its ability to enable intuitive interaction between humans and machines. This study develops a control system for a 5-degree-of-freedom (DoF) robotic arm using real-time hand gesture recognition powered by the Mediapipe framework. The system captures user hand movements through a camera and processes them using visual algorithms to generate commands sent to an ESP32 microcontroller. The robotic arm then responds by actuating six servo motors according to the interpreted hand gestures. Test results show that the system can accurately recognize and translate hand gestures with a 100% success rate, and the average servo movement error is only 1.92%. This implementation demonstrates the significant potential of Mediapipe as an efficient solution for visual-based robotic control systems.

Keywords: 1) Mediapipe, 2) hand gesture, 3) visual control, 4) robotic arm, 5 DoF.