

Design and Development of a Custom Machine Vision System for Fanuc Industrial Robots using AI-Enhanced Depth Sensing

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Abstract

This paper presents the design and development of a custom machine vision system integrated with FANUC industrial robots to enhance vision-based recognition for material handling and inspection applications. The proposed solution leverages the ZED stereoscopic depth and motion sensing camera in combination with the NVIDIA Jetson Orin Nano Super Developer Kit, supported by solid-state memory expansion for robust data storage and processing. The system architecture integrates advanced depth sensing, motion tracking, and AI-driven object recognition, enabling more reliable robotic performance in dynamic industrial environments.

Details of the hardware configuration, software pipeline, and integration methodology with FANUC robotic platforms are provided, alongside experimental testing results that demonstrate improved accuracy and efficiency in vision recognition tasks. The research emphasizes reproducibility and practical implementation, offering a scalable framework that can be adopted by other educational institutions to strengthen hands-on training in artificial intelligence, machine learning, and robotics. By sharing design specifications and testing outcomes, this work supports broader efforts to integrate state-of-the-art vision and AI technologies into robotics curricula and industrial applications.

Keywords

Fanuc iR-Vision 2D system, AI, Machine learning, robotic vision-based object recognition.