AI -Powered Image Analysis for Industrial Object Quality Assurance

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Abstract: *The increasing demand for automation in quality assurance across industrial sectors has highlighted the need for intelligent, real-time defect detection systems. This paper proposes an AI-powered image analysis system designed to inspect industrial objects on a conveyor-based platform. Leveraging a Raspberry Pi 4 as the central controller, the system captures live image feeds via a USB camera and processes them using a lightweight convolutional neural network (CNN) model. The classified objects—categorized as either "good" or "defective"—are handled accordingly by actuating a servo motor to eliminate faulty units, while a DC motor drives the conveyor to maintain continuous operation. The integration of IR sensors ensures accurate object detection and synchronization of mechanical actions. The system is implemented in Python and demonstrates efficient performance with high accuracy in defect identification, offering a scalable and cost-effective solution for small to medium-scale industrial environments.*

Keywords: AI-based quality inspection, Raspberry Pi 4, Real-Time Image Analysis, Industrial Automation, Convolutional Neural Network (CNN), Defect Detection