

ABSTRACT

Object detection systems play a crucial role in various automation applications. However, implementing complex deep learning algorithms on resource-constrained embedded devices is challenging. Therefore, this research focuses on developing an automatic object shape recognition and clustering system using a Raspberry Pi 5 and a 3-DOF robotic arm. The main objectives are to implement object recognition on a Raspberry Pi, analyze the effect of the number of epochs on system accuracy, and integrate the object recognition system with a 3-DOF robotic arm for automatic clustering. This research is limited to using a Raspberry Pi 5 as the main control unit, implementing the YOLOv8 algorithm for object detection, and recognizing three simple geometric shapes (triangle, square, and circle).

This system is expected to demonstrate efficient and accurate object detection performance on an embedded Raspberry Pi device. The success of this research will be measured quantitatively based on the accuracy of object recognition and the robotic arm's ability to cluster objects based on their shape. The results of this research are expected to make significant contributions to various fields, including industrial automation, smart agriculture, security systems, and as an educational platform for the study of computer vision and robotics, by offering an economical, portable, and efficient solution.

Keywords: *Object Recognition, YOLOv8, Raspberry Pi, 3-DOF Robot Arm, Shape Classification.*