

## **ABSTRACT**

In the era of Industry 4.0, automation in the packaging process is becoming increasingly important to enhance efficiency and reduce human error. This study develops a 3 DOF (Degrees of Freedom) robotic arm system equipped with a gripper and a PixyCam sensor to classify and handle objects based on color. The robot is specifically designed for use in the packaging process within a factory, where the objects to be manipulated are cuboid and rectangular boxes.

The robotic arm features a base rotation angle of 180 degrees, allowing for a wide operational range without requiring a full 360-degree rotation. The gripper is chosen as the end effector due to its ability to securely grasp and handle flat-shaped boxes such as those used in packaging, ensuring stable and efficient manipulation. Color detection is used as the classification method due to its simplicity, speed, and alignment with industrial packaging applications, where color is often used to identify and categorize products.

Testing results show that the system is capable of detecting and classifying objects based on color with high accuracy, and can perform precise picking and placing of objects. With its efficient design and stable control, the robot improves the speed and accuracy of the packaging process, making it a viable solution for industrial applications. This research paves the way for further development, including adaptations to handle objects with more complex shapes and characteristics.

**Keywords:** 3 DOF robotic arm, gripper, PixyCam, color detection, packaging, industrial automation