OzoBlockly Editor Challenge

ORA Sorting Shapes Challenge

Student Guide

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Introduction

Welcome to the "*ORA Sorting Shapes*" challenge! In this lab, you will step into the shoes of an automation engineer to solve a real-world manufacturing challenge: sorting diverse objects using robotics and Artificial Intelligence.

Your mission is to program ORA to identify and sort circles, squares, and rectangles printed on cardstock. To move these shapes, you will utilize a vacuum gripper, an essential industrial tool that uses suction to pick up flat or delicate objects. You will need to coordinate ORA to navigate precisely between the pickup zone and the sorting bins.

What makes this challenge truly cutting-edge is the integration of a camera and a Large Language Model (LLM). Instead of writing complex code to define what a "square" looks like, you will use the power of AI vision. The camera will capture an image of the shape, and the LLM will analyze that visual data to determine which category it falls into. This mimics how modern factories use AI to handle variable tasks without needing a human to reprogram them for every minor change.

Using the OzoBlockly editor, you will bridge the gap between physical hardware and digital intelligence. You will drag and drop blocks to control the vacuum suction, define the robot's path, and trigger the AI's decision-making process. By the end of this lab, you will have created a fully autonomous sorting system, gaining hands-on experience in how robotics, computer vision, and AI work together to shape the future of technology.

You can see these technologies in action throughout modern industry. Recycling facilities use AI-driven arms to rapidly sort materials, while e-commerce giants like Amazon employ similar systems to organize packages for delivery. Additionally, food processing plants use vacuum grippers to handle delicate items like eggs or electronics without causing damage. By mastering these skills, you are learning the same principles that power today's most advanced global supply chains and smart factories. Let's get started!

Lab Setup

Figure 1 is a snapshot taken after ORA has dropped a triangle onto its "bin" and is about to drop a rectangle onto the rectangle bin. Meanwhile, a circle is being placed at the shape pickup location.

The camera that works with the LLM is located at the bottom center of the photo. It will take a snapshot of the shape, in this case a circle. The LLM with camera will then use AI to determine that the shape is indeed a circle. Finally, ORA will move the circle to the circle bin at the far left side of the bins.

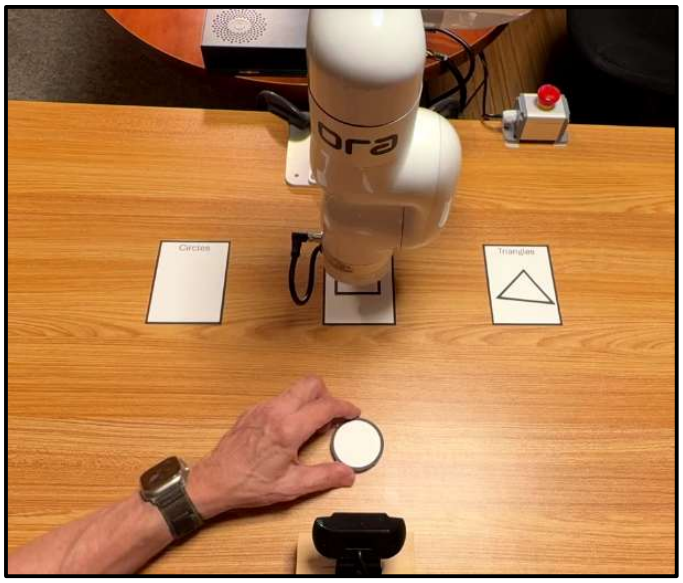

Figure 1

Figure 2 shows the bins at the top with some shapes already placed by ORA. A square 3D-printed riser with a hole in the center is taped to the tabletop with double-stick tape at the pick-up location. The cardstock shapes are placed centered on the riser. The purpose of the riser is to prevent the vacuum from going through the cardstock shape and making a vacuum connection to the tabletop.

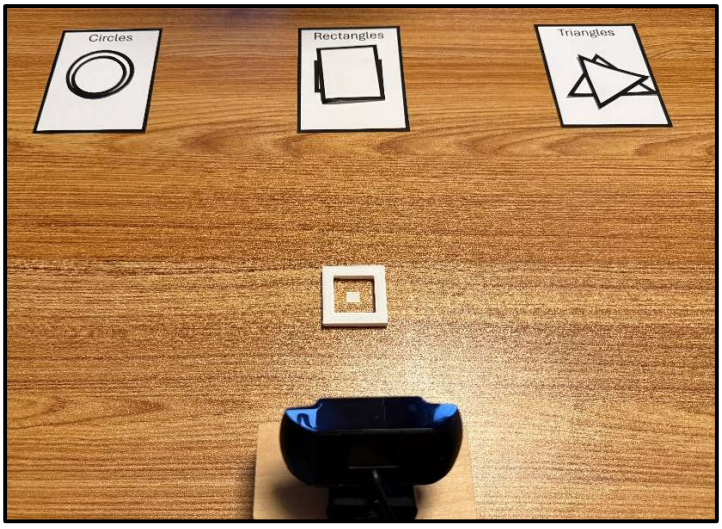

Figure 2

To get a better understanding of how the challenge works, you should view the accompanying 11-second time-lapse video.

Two <u>VERY IMPORTANT</u> Notes Regarding Safety

1. You should include the Ozobot Editor block shown in Figure 3 at the beginning of your program, perhaps right after the *Program start* block or in a function where you initialize a number of things required by your solution to the challenge. Why? When ORA is moving at a slower speed, say 20% or less, you have more time to prevent an impending collision. Of course, this also allows a person more time to move out of the way of ORA's moving arm! This is particularly important throughout the development process while creating your program, when you are more apt to make errors in coordinate values in *move to coordinates* blocks.

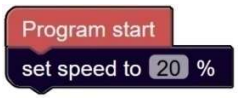

Figure 3

2. Make sure that the **Emergency Stop Button**, also shown in the upper-right side of Figure 1, is within easy reach. It might even be a good idea to have one student with his or her hand above the button when the program is started, in the event that it becomes necessary to instantly terminate all motion of ORA's arm and cancel any commands.

Step into the future as an automation engineer with the ORA Sorting Shapes Challenge. You'll use OzoBlockly to integrate a vacuum gripper and AI-powered vision to sort shapes. As you build this system, remember to prioritize safety by keeping ORA's speed low and staying near the Emergency Stop Button. Master the technology powering today's smart factories while learning to handle industrial hardware responsibly and effectively. Let's get started!