OzoBlockly Editor

ORA: The Autonomous Fruit Grocer – From Vision to Cart

Student Guide

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Introduction

In this lesson, you will step into the shoes of a systems engineer to bridge the gap between digital intelligence and physical action. Using the Ozobot ORA and Ari, you will build a miniature version of a modern automated fulfillment center.

Your task is to manage a complex workflow. A camera uses an AI-driven Large Language Model to identify nine different fruits on a 3x3 grid. You will then use Ari's touchscreen as a handheld interface to select your order. Once the data is entered, ORA will execute the pick and place movements necessary to transfer the selected items into a grocery cart.

This challenge mirrors the cutting-edge technologies currently transforming global industries. By using a camera and LLM to identify the fruit grid, you are exploring computer vision, the same logic used by self-driving cars to perceive and categorize their environment. The ORA 6-axis cobot demonstrates the flexibility of six degrees of freedom, allowing it to mimic human movement safely in collaborative spaces. Finally, by using Ari as a handheld interface to trigger ORA's actions, you are mastering integrated systems, making different machines communicate to complete a task. This workflow represents the precision and logic required in the modern automated world.

Lab Setup

Figure 1 shows the setup for this challenge. Images of different fruit have been randomly placed on an 8½" x 11" piece of paper that has been divided into a grid of three rows by three columns. A camera has been suspended from a dowel rod attached to a ring stand. Based upon an image of the grid taken by the camera, a Large Language Model has determined the type of fruit in each location on the grid. ORA has then moved four of the fruit selected by a user to the image of a grocery basket on the left. The fruit have been selected using Ari. With all of the fruit desired by the user moved to the basket, ORA has then moved to the ZERO position. A lamp in the lower left provides good illumination for the grid. You should now view the accompanying 14-second time-lapse video showing ORA in action.

Some additional features that should be included in your solution to this challenge include:

- Any given fruit can be selected only once.

- You do not need to remove selected fruit from the list of fruit displayed on Ari. If the user of Ari selects a fruit that has already been selected, he/she should be informed of this fact and asked to try again with a different fruit.
- After any given fruit has been moved to the cart, the Ari user should be asked if he/she is finished selecting fruit. If so, ORA should move to the ZERO position and the program terminated. If not, the user should specify the desired fruit from Ari's list of all fruits.
- If all nine fruits have been selected, ORA should move to the ZERO position and the program terminated.

Figure 1

To get a better understanding of how the challenge works, you should view the accompanying 14-second time-lapse video that shows four fruits being transferred from the grid to image of a grocery cart.

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

1. You should include the Ozobot Editor block shown in Figure 2 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.

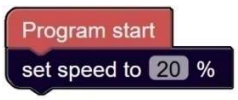

Figure 2

2. Make sure that the **Emergency Stop Button** 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.

Experience the future of grocery shopping by becoming a systems engineer in the Autonomous Fruit Grocer challenge! You'll use AI-driven computer vision to identify a grid of nine fruits and program ORA to fulfill customer orders. By integrating Ari's touchscreen interface with ORA's robotic precision, you'll master the technology powering modern automated warehouses. Build a system that sorts fresh produce into a digital cart with perfect accuracy!