

OzoBlockly Editor
ORA: Investigating Sensor Fusion
Student Guide

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Introduction

Welcome to the exciting world of advanced robotics and artificial intelligence, where you will explore how machines perceive and interpret the complex world around them. In this challenge, you will work with ORA to solve a logic-based problem centered on the critical concept of *sensor fusion*. Sensor fusion is the process of combining data from multiple sources to achieve more accurate and reliable results than any single sensor could provide on its own. This technology is a cornerstone of modern innovation, utilized in everything from self-driving cars that balance radar and camera data to aerospace systems that ensure pilot safety. Today, you will simulate this high-level processing by using computer vision and an LLM to analyze specifically designed color cards.

Each card in this lesson presents two distinct data points for the cobot to interpret: the printed name of a color and the actual background color of the card itself. Your task is to leverage an LLM-powered camera system to perform optical character recognition (OCR) for the text while simultaneously analyzing the visual hue of the background. By treating these as two separate sensory inputs, you will implement a system where the robot must decide if these data points agree or conflict. If the sensors provide matching data—for example, the word "Blue" printed on a blue background—then ORA will move the card to a designated “agree” zone. However, if the text says "Red" but the card is green, the robot must recognize this discrepancy and sort the card into a “disagree” zone. Through this exercise, you will gain hands-on experience in robotic programming and the logic required to help machines navigate conflicting information in real-time environments.

Lab Setup

Figure 1 shows a snapshot just after ORA has finished. The camera is in the bottom center of the figure. Several cards have been placed in the “agree” zone and several have been placed in the “disagree” zone. After seeing the card with the word “Stop”, ORA has just moved to the ZERO position, and the OzoBlockly Editor program has terminated.

You should now view the 18-second time-lapse video showing ORA in action as it executes this challenge. It will give you a better understanding of what is expected when completing this challenge.

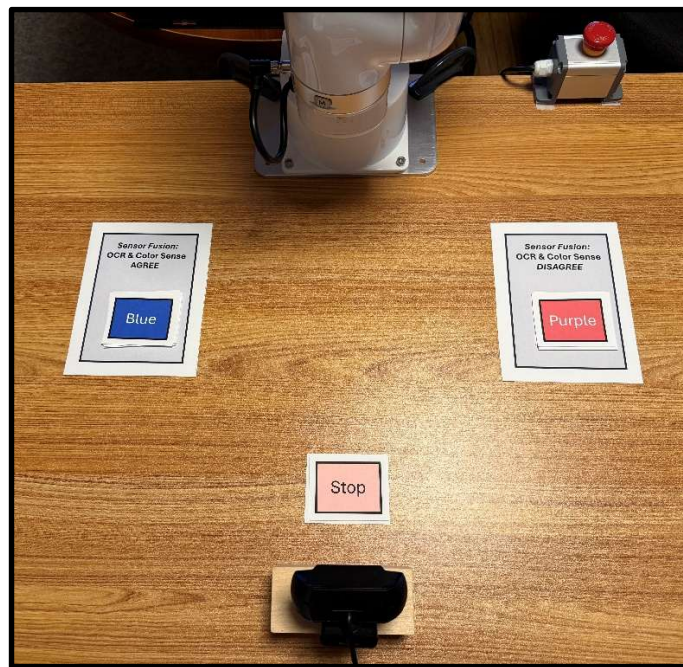


Figure 1

Two **VERY IMPORTANT** 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.

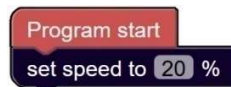


Figure 2

2. Make sure that the **Emergency Stop Button**, shown in the upper right corner 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.

Dive into this exciting challenge with ORA and explore sensor fusion, a key technology in modern robotics! This hands-on experience will enhance your problem-solving skills and showcase how machines interpret conflicting data. Gather your materials, collaborate with your peers, and let your creativity shine as you tackle this task!
