

OzoBlockly Editor Challenge

Intelligent Package Sorting – ORA Reads Shipping Labels

Student Guide

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Introduction

Welcome to today's robotics challenge! Have you ever wondered how modern factories can sort thousands of packages per hour with incredible accuracy? Today, you'll explore the fascinating world of Vision-Language Models (VLMs) – AI systems that can literally "see" and "think" about what they're looking at.

Imagine an AI system that combines the power of a camera with the intelligence of an LLM. This technology doesn't just take pictures; it reads shipping labels, recognizes hazard symbols, analyzes package sizes, and makes smart decisions about where each item should go on a factory floor. It's like having a super-smart warehouse worker who never gets tired and can process visual information faster than any human.

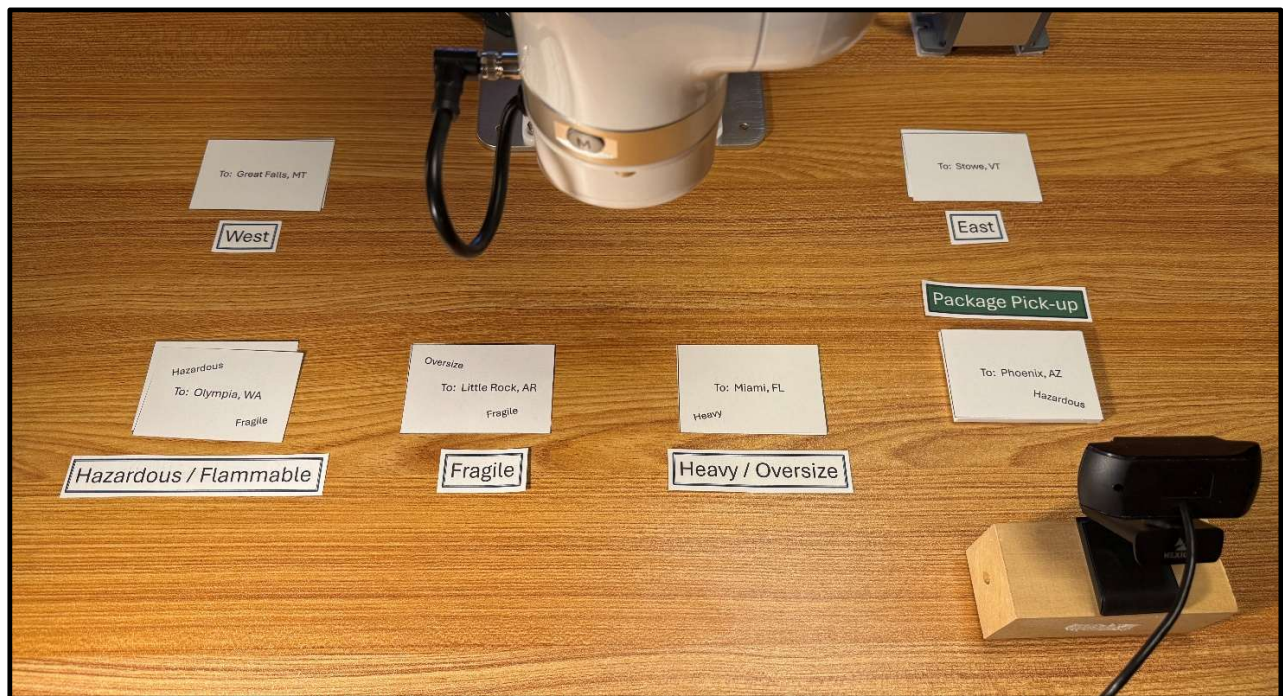
Your challenge today is to understand how these multimodal AI systems work by breaking down their "vision" (camera input), "brain" (language processing), and "decision-making" (logical reasoning) components. You'll discover how cutting-edge robotics combines computer vision with artificial intelligence to revolutionize package sorting on the factory floor.

Challenge Details

The figure below shows the setup as a snapshot in time. The packages are represented by small cards with shipping information including destinations with city and state. We will omit detailed address information without loss of the power of this package sorting process. The cards may also contain words describing the package contents such as *hazardous*, *flammable*, *fragile*, *heavy*, and *oversize*, as appropriate.

The packages are first scanned by the camera at the bottom right corner of the figure. The VLM then determines what words, if any, describe the contents of the package. The VLM also determines if the destination city is east or west of the Mississippi river. ORA then moves the package to one of the five factory floor locations **Hazardous/Flammable, Fragile, Heavy/Oversize, East, or West**.

To get a better feeling for how the process proceeds, view the 20-second time-lapse video that accompanies this challenge.



The Factory's Internal Rulebook

This rulebook provides the logical reasoning that must be applied to determine where ORA is to place each package. This factory's rulebook provides four levels of priority, 1 through 4, with level 1 having the highest priority.

Priority 1: Hazardous/Flammable. Any package labeled as either hazardous or flammable must go to the *Hazardous/Flammable location*, regardless of any other information on the package label.

Priority 2: Fragile. If the package is not hazardous or flammable but is indicated as fragile, then the package must go to the *Fragile location*, regardless of any other information on the package label.

Priority 3: Heavy/Oversize. If the package is not hazardous, flammable, or fragile, but is indicated as either heavy or oversize, then the package must go to the *Heavy/Oversize location*, regardless of any other information on the package label.

Priority 4: Destination. If the label contains only the city and state, then packages destined for locations east of the Mississippi river must go to the East location. Those destined for locations west of the Mississippi River must go to the *West location* in the factory.

Welcome to the future of logistics! Today, you're not just coding a robot; you're engineering an intelligent system capable of "seeing" and "thinking" like a human. In this challenge, you will guide ORA, a robot powered by Vision-Language Models (VLMs), to tackle a critical real-world problem: high-speed package sorting. Your mission is to program ORA to scan shipping labels, interpret vital data like "Fragile" or "Flammable," and make split-second decisions based on a strict factory rulebook. From prioritizing safety hazards to determining geographic destinations, you will bridge the gap between computer vision and physical action. Get ready to revolutionize the warehouse floor—it's time to teach ORA how to think!
