OzoBlockly Editor Challenge

ORA Expansion Gripping: Getting a Grip from Within

Student Guide

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Introduction

In this lab, you will explore a specialized material-handling technique known as **expansion gripping**, also known as internal gripping. While we often think of robotic fingers as pinching an object from the outside, expansion gripping works by applying outward pressure against the internal diameter of a hollow part.

You will program ORA's finger gripper end-effector to enter the center bore of a gear, expand its fingers to secure a firm hold, and transport the component to a vertical mounting wall. This method is particularly useful in industrial manufacturing because it allows the robot to move gears without touching or damaging the delicate external teeth.

This technique requires a high degree of precision. Because you are placing the gear onto a peg on a vertical surface, coordination of ORA's joints is critical. You must ensure the gripper maintains constant outward force during the rotation and approach to prevent the gear from slipping.

As you work through this challenge, pay close attention to the how the internal geometry of the gear dictates your approach angle. By the time you complete this challenge, you will understand how professional automation engineers choose between internal and external gripping to maximize efficiency and protect sensitive hardware.

The Challenge Setup

Figure 1 shows the setup for this challenge. This figure shows a snapshot taken as ORA is about to release a gear onto a peg on the vertical wall. Notice that the finger gripper has expanded to grip the gear from within. Three additional gears are waiting on the left to be transferred one-by-one to the wall. The gears and vertical wall can be 3D-printed from STL files included with this challenge lesson.

In order to gain a better feeling for the result expected from this challenge, please view the 7-second time-lapse video that accompanies this challenge lesson. There is also a 26-second video at normal speed showing ORA pick and place the first gear.

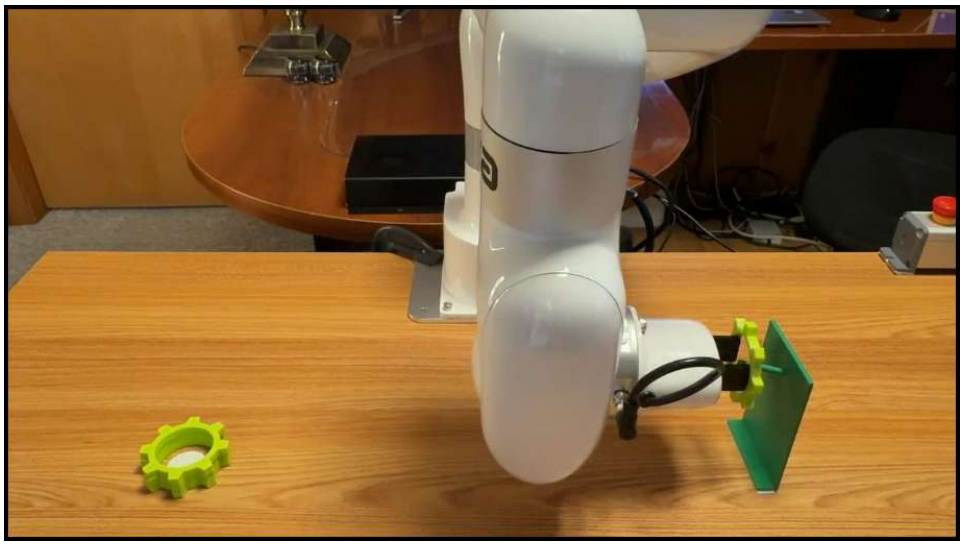

Figure 1

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.

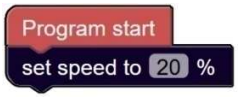

Figure 2

2. Make sure that the **Emergency Stop Button**, also shown in the center-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.

Master the precision of industrial automation by tackling the ORA Expansion Gripping challenge! Instead of standard pinching, you will program a robot to grip gears from the inside out, protecting delicate components just like professional engineers do. This hands-on lab pushes your coding skills to the limit as you coordinate complex joint movements and ensure steady pressure. Dive in, prioritize safety, and discover how internal gripping transforms modern manufacturing!
