

When handling objects to complete a task, the target pose of the object is subject to a series of spatial constraints. You are adept at determining the spatial constraints that the target pose of an object must meet based on task instructions and environmental observations. For each task, we will provide you with a language instruction and a picture of the current environment. To help you specify the spatial constraints, we will mark out certain faces of objects in the picture, the center point of these faces, and the corresponding normal vector to that center point (indicated by the same number). Slender objects are modeled using vectors, with their head marked numerically (The vector and the point corresponding to its head can be referred to by this number). The format for spatial constraints is as follows:

1. Vector A and Vector B are on the same line, with the opposite direction.
2. The target position of Point A is x cm along Vector B from Point C's current position.
3. Vector A is parallel to the table surface.
4. Vector A is perpendicular to the table surface.
5. Point A is x cm above the table surface.

Here, A, B, C need to be replaced with the numbers marked in the picture. You also need to replace x with a numerical value based on your estimate of the size of the object. Your response must strictly adhere to the specified format, without adding any brackets or annotations.

Additionally, in some tasks, further manipulation of the target object may be required after achieving the Target Pose. Here we provide several simple subsequent actions. For each task, you can choose several subsequent actions (or not choose):

1. Move vertically down x cm.
2. Move forward x cm.
3. Open the gripper.
4. End-effector rotates 180 degrees.

Briefly describing the objects in the picture related to the task can help in your thinking.

To better assist your understanding, here are three examples:

Example 1:

Instruction: Sweep the paper ball into the dustpan with a brush.



<Start Description>

Surface 1 is the surface of the brush, and Vector 1 is parallel to the tabletop, indicating the direction in which the brush should sweep the paper ball into the dustpan.

<End Description>

<Start Constraint>

1. The target position of Point 1 is 10 cm along Vector 1 from Point 1's current position.

<End Constraint>

<Start Subsequent Actions>

No Subsequent Actions.

<End Subsequent Actions>

Example 2:

Instruction: Put the book into the white shelf.



<Start Description>

Surface 1 is the white bookshelf's side surface, with Point 1 located at its center. Vector 1 is perpendicular to the side surface of the bookshelf and parallel to the tabletop.

Surface 2 is the bottom surface of the bookshelf, and Vector 2 is perpendicular to the tabletop.

Surface 3 is the surface of the book, with Point 3 being a point near the center of the book. Vector 3 is perpendicular to the surface of the book.

<End Description>

<Start Constraint>

1. The target position of Point 3 is 2 cm along Vector 1 from Point 1's current position.

2. Vector 1 and Vector 3 are on the same line, with the opposite direction.

3. Vector 3 is parallel to the table surface.

4. Point 3 is 8 cm above the table surface.

<End Constraint>

<Start Subsequent Actions>

1. Move forward 2 cm.

2. Open the gripper.

<End Subsequent Actions>

Example 3:

Instruction: Pound garlic in wooden jar with stick.



<Start Description>

The stick is a slender object and has been modeled as a vector. Vector 1 represents the stick, with its base held by the end effector of the robotic arm. Point 1 denotes a point on the stick's striking surface, and the direction of Vector 1 is defined from its base towards the striking surface.

Surface 2 is the mouth of the jar, with Vector 2 pointing upwards, perpendicular to the tabletop.

When the wooden stick reaches its target pose, Vector 1 needs to be collinear and opposite in direction to Vector 2, and Point 1 should be 3 cm above Point 2.

After that, to pound the garlic in the wooden jar, the stick needs to be moved down about 10 cm.

<End Description>

<Start Constraint>

1. Vector 1 and Vector 2 are on the same line, with the opposite direction.

2. The target position of Point 1 is 3 cm along Vector 2 from Point 2's current position.

<End Constraint>

<Start Subsequent Actions>

1. Move vertically down 10 cm.

<End Subsequent Actions>

This is the new task.

Instruction: [Task Instruction]