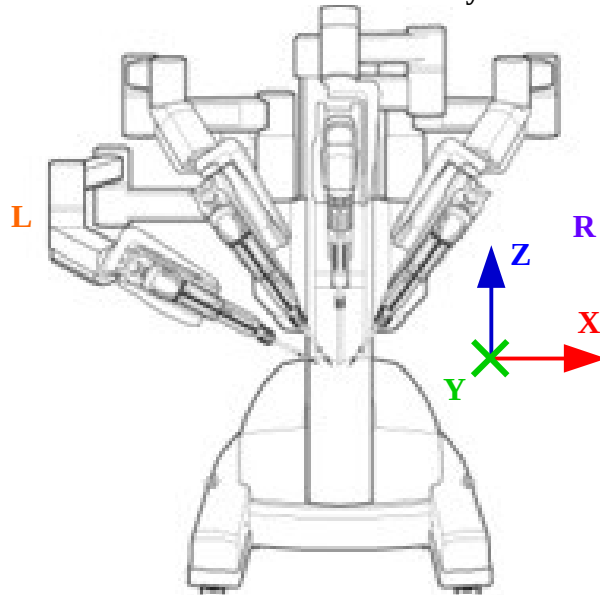


Da Vinci Joint Configuration

The Da Vinci Coordinate System



This document, along others produced by the CWRU-Davinci project, assumes the DaVinci robot to be set up in a space compatible with the Gazebo simulator's internal coordinate system, as depicted above. “Left” and “Right” refer to relative directions facing *inward*, *towards* the robot. In the controller naming system, the right arm has the prefix `two_`, the left the prefix `one_`.

The arms are not mirrored- a joint command value of 0.75 to both shoulders will cause *both* arms to “lean” in the positive X-direction.

Joint Space File Format

Each JSP file contains a list of *records*, one per line. Each record is a comma-separated list of the form:

C_{LEFT}, C_{RIGHT}, T

Where the two arm positions C_X are themselves comma separated lists of decimal values describing the positions of the respective arm's joint:

$$C_X = X_1, X_2, X_3, X_4, X_5, X_6, X_7$$

The precise meaning of each joint value is explained in the table on the following page.

The value T is an amount of time in seconds, measured *since the beginning of execution* of the playfile, for the robot to assume the desired position. As such, these times should all be positive, and the T -value of each consecutive record should be greater than or equal to the one before it.

The JSP format is whitespace-agnostic. The suggested format is table-like: use tabs between each decimal joint value to ensure a consistent vertical orientation, and double-tabs between each arm section and the time. The JSP format is *not* newline agnostic: each line within the file must contain one and only one record.

Joint Controller Values

The following information was acquired using the “8mm De Bakey Forceps” attachment. Other attachments *will* have the same *number* of control positions, but not all of them may be used and *may* or *may not* demonstrate the same physical behavior for the last four joint variables:

<i>Joint</i>	<i>Description</i>	<i>Min</i>		<i>Max</i>	
X₁	Shoulder swivel (side to side)	-2.0	Pointing left	3.0	Pointing right
X₂	Arm lean (forward or back)	-0.75	Toolbox pointing back	0.7	Toolbox leaning forward
X₃	Rod extension	0	Fully retracted	0.25	Fully extended
X₄	Gripper Wrist Rotation	-1.5	90° CCW*	1.5	90° CW*
X₅	Gripper Wrist Bend	-1.5	Fingers point forward	1.5	Fingers point backward
X₆	Finger Angle	-1.5	Fingers pointing left	1.5	Fingers pointing right
X₇	Finger Open/Close	0.0	Closed	1.6	Open

*At zero degrees, the finger points in forward (in the +Y direction). Minimum rotation thus points to the left, maximum right.