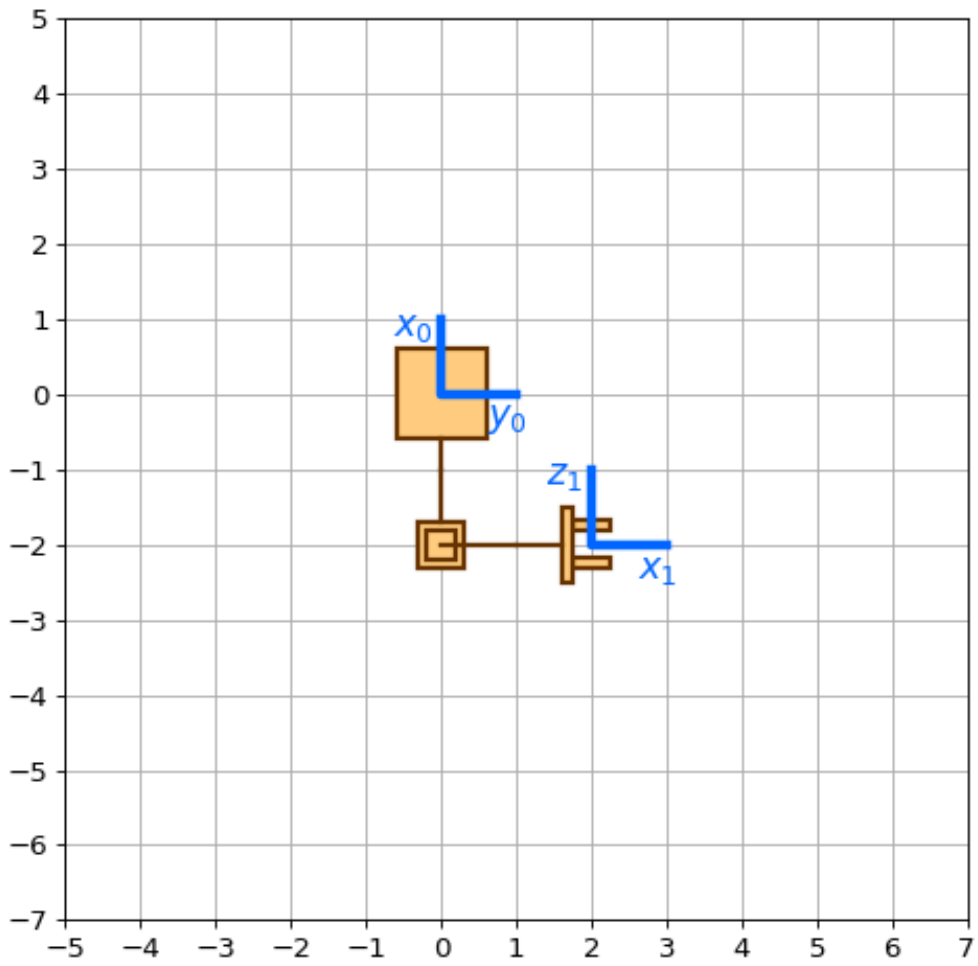
HW5.2. Derive the forward kinematics of a 1-DOF robot



The schematic of a robot with one joint (in the zero position) is shown above. Frame 0 is fixed to the base. Frame 1 is fixed to the tool. Find the homogeneous transformation matrix M and the screw axis $\mathcal{S}_1$ so that the pose of frame 1 can be expressed as

$$T_1^0 = e^{[\mathcal{S}_1]\theta_1} M,$$

where θ_1 is the joint variable.

Assume revolute joints are represented as rectangles with the axis of rotation parallel to the longer rectangle side and centered in the rectangle (axis pointing towards the segment out of the rectangle) or by circles if the axis of rotation is orthogonal to the figure (axis pointing outside the screen).

Assume prismatic joints are represented as two rectangles separated by a small gap, with the axis of translation along the line between the midpoints of the two rectangles (axis pointing towards the small rectangle) or by two squares on top of each other if the axis of translation is orthogonal to the figure (axis pointing outside the screen).

Homework 5

Assessment overview

Total points: 11/12

Score: 80%

Question

Value: 3

History: 1 2 3

Awarded points: 3/3

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Attached files

No attached files

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$M =$ matrix (rtol=0.01, atol=1e-08)

$\mathcal{S} =$ matrix (rtol=0.01, atol=1e-08)

Save & Grade
Single attempt

Save only

Additional attempts available with new variants