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Assignment in Computer Graphics II – Assignment 13 –

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Assignment 1 [2 Points] Robot arm

Given is a simplified robot arm, consisting of two unit cubes (-0.5...0.5).



- 1. Sketch the transformations depicted in an x-y-coordinate system.
- 2. Calculate: On what world coordinate the point (0.5, 0, 0) of each upper and lower arm is mapped?

Assignment 2 [3 Points] Denavit-Hardenberg

Given the imaged three-dimensional model with the values $a_1 = 4$, $\alpha_1 = -\frac{\pi}{2}$, $d_1 = 1$, $\phi_1 = -\frac{\pi}{3}$.



- 1. Determine a transformation matrix that maps points in the coordinate system $\{P_2, \hat{\mathbf{x}}_2, \hat{\mathbf{y}}_2, \hat{\mathbf{z}}_2\}$ on points relative to the base $\hat{\mathbf{x}}_1 = (1, 0, 0)^T, \hat{\mathbf{y}}_1 = (0, 1, 0)^T, \hat{\mathbf{z}}_1 = (0, 0, 1)^T$. Note: Calculate to do this the following matrices: $R((1, 0, 0)^T, \alpha_1)$: Map $\hat{\mathbf{z}}_1$ to $\hat{\mathbf{z}}_2$ ab $T(a_1, 0, d_1)$: Move \mathbf{P}_1 to \mathbf{P}_2 $R((0, 0, 1)^T, \phi_1)$: Map $\hat{\mathbf{x}}_1$ to $\hat{\mathbf{x}}_2$ ab.
- 2. Determine the unit vectors \hat{x}_2 , \hat{y}_2 , \hat{z}_2 using the previously calculated matrix. Note: Check the result based on the sketch.

Total points after sheet 13: 70 of 70.

Hand in: Until 18.07.2018 12:00 o'clock in mailbox of our chair (next to room 7115).