Warsaw, 1.11.2021

Modelling and Control of Manipulators

Homework 1

Derive the kinematic model of the ABB IRb-7600 manipulator, i.e. solve the direct and inverse kinematic problem for that manipulator.

Deadline for submission of the homework is the 3rd of January, 2022 at noon (12:00). The homework should be submitted to Mr. Maksym Figat.

Direct kinematics

Text, letter

Description automatically generated

Matrix(4, 4, [[((c1\*c2 - s1\*s2)\*c3\*c4 + (-c1\*s2 - c2\*s1)\*s4)\*c5 - (c1\*c2 - s1\*s2)\*s3\*s5, -((c1\*c2 - s1\*s2)\*c3\*c4 + (-c1\*s2 - c2\*s1)\*s4)\*s5 - (c1\*c2 - s1\*s2)\*s3\*c5, -(c1\*c2 - s1\*s2)\*c3\*s4 + (-c1\*s2 - c2\*s1)\*c4, (c1\*c2 - s1\*s2)\*s3\*d4 + (c1\*c2 - s1\*s2)\*a3 + c1\*a2 + a1], [-c4\*c5\*s3 - c3\*s5, c4\*s3\*s5 - c3\*c5, s3\*s4, c3\*d4 + d1], [((-c1\*s2 - c2\*s1)\*c3\*c4 + (-c1\*c2 + s1\*s2)\*s4)\*c5 - (-c1\*s2 - c2\*s1)\*s3\*s5, -((-c1\*s2 - c2\*s1)\*c3\*c4 + (-c1\*c2 + s1\*s2)\*s4)\*s5 - (-c1\*s2 - c2\*s1)\*s3\*c5, -(-c1\*s2 - c2\*s1)\*c3\*s4 + (-c1\*c2 + s1\*s2)\*c4, (-c1\*s2 - c2\*s1)\*s3\*d4 + (-c1\*s2 - c2\*s1)\*a3 - s1\*a2], [0, 0, 0, 1]])

Invers kinematics

Invers t01 Matrix(4, 4, [[c1/(c1^2 + s1^2), 0, -s1/(c1^2 + s1^2), -a1\*c1/(c1^2 + s1^2)], [-s1/(c1^2 + s1^2), 0, -c1/(c1^2 + s1^2), s1\*a1/(c1^2 + s1^2)], [0, 1, 0, -d1], [0, 0, 0, 1]])