Exercise 1 - Theory

Abdelaziz, Ibrahim Robroo Berg, Oliver

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1 Properties of Rotation Matrices

1.1 Showing that $U^T = U^{-1}$ holds for *general* rotation matrix $U \in \mathbb{R}^3$

Generally note that $UU^{-1} = I$ subject to $U^{-1} = U^T$, as provided by U being rotation matrix and as such orthogonal, yields $UU^T = I$.

For given column-vectors c_1, c_2, c_3 of U we observe

$$< c_i, c_j >= \delta_{ij}$$

which in combination with

$$U^T = (c_1, c_2, c_3)^T = (c_1^T, c_2^T, c_2^T)$$

results in

$$UU^T = (< c_i, c_j >)_{1 \leq i,j \leq 3} = I$$

Motivated by [1][2][3].

1.2 Geometric interpretation of determinant of 3x3 matrix

Bla

2 Transformation Chain

Blub

References

[1] matrix transpose * itself = identity. [Online]. Available: https://math.stackexchange.com/questions/768098/matrix-transpose-itself-identity

[2] Why is inverse of orthogonal matrix is its transpose. [Online]. Available: https://math.stackexchange.com/questions/1097422/why-is-inverse-of-orthogonal-matrix-is-its-transpose

[3] Orthogonale matrix. [Online]. Available: https://de.wikipedia.org/wiki/Orthogonale_Matrix