

$$T_1 = \frac{1}{\sqrt{2}}U\begin{bmatrix}0 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0\end{bmatrix}V^T$$

where

$$U\in\mathbb{R}^{3\times3}$$

$$V\in\mathbb{R}^{3\times3}$$