

$$\begin{aligned}
T(\mathbf{v}) &= (1 - \cos \theta) (\mathbf{v} \cdot \hat{\mathbf{r}}) \hat{\mathbf{r}} + \cos \theta \mathbf{v} + \sin \theta (\hat{\mathbf{r}} \times \mathbf{v}) \\
&= (1 - \cos \theta) \begin{bmatrix} u_x^2 & u_x u_y & u_x u_z \\ u_x u_y & u_y^2 & u_y u_z \\ u_x u_z & u_y u_z & u_z^2 \end{bmatrix} \mathbf{v} + \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cos \theta \mathbf{v} + \sin \theta \begin{bmatrix} 0 & -u_z & u_y \\ u_z & 0 & -u_x \\ -u_y & u_x & 0 \end{bmatrix} \mathbf{v} \\
&= \left\{ (1 - \cos \theta) \begin{bmatrix} u_x^2 & u_x u_y & u_x u_z \\ u_x u_y & u_y^2 & u_y u_z \\ u_x u_z & u_y u_z & u_z^2 \end{bmatrix} + \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cos \theta + \sin \theta \begin{bmatrix} 0 & -u_z & u_y \\ u_z & 0 & -u_x \\ -u_y & u_x & 0 \end{bmatrix} \right\} \mathbf{v} \\
&= \begin{bmatrix} tu_x^2 + C & tu_x u_y - Su_z & tu_x u_z + Su_y \\ tu_x u_y + Su_z & tu_y^2 + C & tu_y u_z - Su_x \\ tu_x u_z - Su_y & tu_y u_z + Su_x & tu_z^2 + C \end{bmatrix} \mathbf{v}
\end{aligned}$$

where

$$\begin{aligned}
\hat{\mathbf{r}} &= (u_x, u_y, u_z) \\
C &= \cos \theta \\
S &= \sin \theta \\
t &= 1 - \cos \theta
\end{aligned}$$