

$$ww := \begin{bmatrix} 0 & w_3 & -w_2 \\ -w_3 & 0 & w_1 \\ w_2 & -w_1 & 0 \end{bmatrix}$$

$$ww := \begin{bmatrix} 0 & w_3 & -w_2 \\ -w_3 & 0 & w_1 \\ w_2 & -w_1 & 0 \end{bmatrix} \tag{1}$$

$$wwI := \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix}$$

$$wwI := \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix} \tag{2}$$

$$jj := \begin{bmatrix} J_1 & 0 & 0 \\ 0 & J_2 & 0 \\ 0 & 0 & J_3 \end{bmatrix}$$

$$jj := \begin{bmatrix} J_1 & 0 & 0 \\ 0 & J_2 & 0 \\ 0 & 0 & J_3 \end{bmatrix} \tag{3}$$

$$rr := \begin{bmatrix} 0 & r_3 & -r_2 \\ -r_3 & 0 & r_1 \\ r_2 & -r_1 & 0 \end{bmatrix}$$

$$rr := \begin{bmatrix} 0 & r_3 & -r_2 \\ -r_3 & 0 & r_1 \\ r_2 & -r_1 & 0 \end{bmatrix} \tag{4}$$

$$tt := \begin{bmatrix} T_1 \\ T_2 \\ T_3 \end{bmatrix}$$

$$tt := \begin{bmatrix} T_1 \\ T_2 \\ T_3 \end{bmatrix} \quad (5)$$

with (LinearAlgebra) :
 $dd := \text{MatrixInverse}(jj)$

$$dd := \begin{bmatrix} \frac{1}{J_1} & 0 & 0 \\ 0 & \frac{1}{J_2} & 0 \\ 0 & 0 & \frac{1}{J_3} \end{bmatrix} \quad (6)$$

with (VectorCalculus) :

$dw := dd.(rr.tt - ww.(jj \bullet wwI))$

$$dw := \left(\frac{-w_3 J_2 w_2 + w_2 J_3 w_3 + r_3 T_2 - r_2 T_3}{J_1} \right) e_x \quad (7)$$

$$+ \left(\frac{w_3 J_1 w_1 - J_3 w_1 w_3 - r_3 T_1 + r_1 T_3}{J_2} \right) e_y$$

$$+ \left(\frac{-w_1 w_2 J_1 + w_1 w_2 J_2 + r_2 T_1 - r_1 T_2}{J_3} \right) e_z$$

$$\frac{\partial}{\partial T_1} dw$$

$$(0)e_x + \left(-\frac{r_3}{J_2} \right) e_y + \left(\frac{r_2}{J_3} \right) e_z \quad (8)$$

$$\frac{\partial}{\partial T_2} dw$$

$$\left(\frac{r_3}{J_1} \right) e_x + (0)e_y + \left(-\frac{r_1}{J_3} \right) e_z \quad (9)$$

$$\frac{\partial}{\partial T_3} dw$$

$$\left(-\frac{r_2}{J_1} \right) e_x + \left(\frac{r_1}{J_2} \right) e_y + (0)e_z \quad (10)$$

$$\frac{\partial}{\partial w_1} dw$$

$$(0)e_x + \left(\frac{J_1 w_3 - J_3 w_3}{J_2} \right) e_y + \left(\frac{-J_1 w_2 + J_2 w_2}{J_3} \right) e_z \quad (11)$$

$$\frac{\partial}{\partial w_2} dw$$

$$\left(\frac{-J_2 w_3 + J_3 w_3}{J_1} \right) e_x + (0)e_y + \left(\frac{-J_1 w_1 + J_2 w_1}{J_3} \right) e_z \quad (12)$$

$$\frac{\partial}{\partial w_3} dw$$

$$\left(\frac{-J_2 w_2 + J_3 w_2}{J_1} \right) e_x + \left(\frac{J_1 w_1 - J_3 w_1}{J_2} \right) e_y + (0)e_z \quad (13)$$