ROBOTYKA (1)

[Ć] 31. 10. 2019 r.

KOLOKWIUM po 7 LIŚCIE 28. 11. 2019 r. !
(zad. 7 z listy 5 będzie)

LISTA 5

2) 1) $V_b = \begin{bmatrix} R^T \dot{T} \\ \omega_b \end{bmatrix} = \begin{bmatrix} v_b \\ \omega_b \end{bmatrix}$

$V_s = \begin{bmatrix} -[T]\omega_s + \dot{T} \\ \omega_s \end{bmatrix} = \begin{bmatrix} v_s \\ \omega_s \end{bmatrix}$ [redacted]

1° $\begin{bmatrix} R(t) & T(t) \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} rot(y, \beta(t)) & 0^T \\ 0 & 1 \end{bmatrix}$

gdzie $\beta(t) = 2t$

$[\omega_b] = R^T \dot{R}$ $\quad [\omega_s] = \dot{R} R^T$

$$[\omega_b] = 2\begin{bmatrix} C_{2t} & 0 & -S_{2t} \\ 0 & 1 & 0 \\ S_{2t} & 0 & C_{2t} \end{bmatrix}\begin{bmatrix} -S_{2t} & 0 & C_{2t} \\ 0 & 0 & 0 \\ -C_{2t} & 0 & -S_{2t} \end{bmatrix} =$$

$$= 2\begin{bmatrix} -C_{2t}S_{2t}+S_{2t}C_{2t} & 0 & C_{2t}^2+S_{2t}^2 \\ 0 & 0 & 0 \\ -C_{2t}^2-S_{2t}^2 & 0 & C_{2t}S_{2t}-C_{2t}S_{2t} \end{bmatrix}$$

$$[\omega_s] = 2\begin{bmatrix} -S_{2t} & 0 & C_{2t} \\ 0 & 0 & 0 \\ -C_{2t} & 0 & -S_{2t} \end{bmatrix}\begin{bmatrix} C_{2t} & 0 & -S_{2t} \\ 0 & 1 & 0 \\ S_{2t} & 0 & C_{2t} \end{bmatrix} =$$

$$= 2\begin{bmatrix} -S_{2t}C_{2t}+S_{2t}C_{2t} & 0 & S_{2t}^2+C_{2t}^2 \\ 0 & 0 & 0 \\ -C_{2t}^2-S_{2t}^2 & 0 & S_{2t}C_{2t}-C_{2t}S_{2t} \end{bmatrix}$$

$$\begin{bmatrix} 0 & -\omega_3 & \omega_2 \\ \omega_3 & 0 & -\omega_1 \\ -\omega_2 & \omega_1 & 0 \end{bmatrix}$$

Macierz skośnosymetryczna

$$[\omega_b] = [\omega_s] = \begin{bmatrix} 0 & 0 & 2 \\ 0 & 0 & 0 \\ -2 & 0 & 0 \end{bmatrix}$$

$\omega_b = \omega_s = [0, 2, 0]^T$

$$R^T \dot{T} = \begin{bmatrix} C_{2t} & 0 & -S_{2t} \\ 0 & 1 & 0 \\ S_{2t} & 0 & C_{2t} \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$[T]\, \omega_s + \dot{T} = \begin{bmatrix} 0 \\ 3 \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 0 \end{bmatrix}$$

$$V_s = V_b = \begin{bmatrix} (0,0,0)^T \\ (0,2,0)^T \end{bmatrix}$$

2) $$\begin{bmatrix} I_3 & (1,2,3)^T t \\ 0 & 1 \end{bmatrix}$$

$$R = I_3 \qquad \dot{R} = 0$$

$$[\omega_b] = [\omega_s] = 0$$

$$\omega_b = \omega_s = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$R^T \cdot \dot{T} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$$[T]\, \omega_s + \dot{T} = \begin{bmatrix} 0 & -3t & 2t \\ 3t & 0 & -t \\ -2t & t & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$$V_b = V_s = \begin{pmatrix} (1,2,3)^T \\ (0,0,0)^T \end{pmatrix}$$

3) $\omega_b = \omega_s = [0,2,0]^T$

$$R^T \dot{v} = \begin{bmatrix} C_{2t} & 0 & -S_{2t} \\ 0 & 1 & 0 \\ S_{2t} & 0 & C_{2t} \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} \cos 2t - 3\sin 2t \\ 2 \\ \sin 2t + 3\cos 2t \end{bmatrix}$$

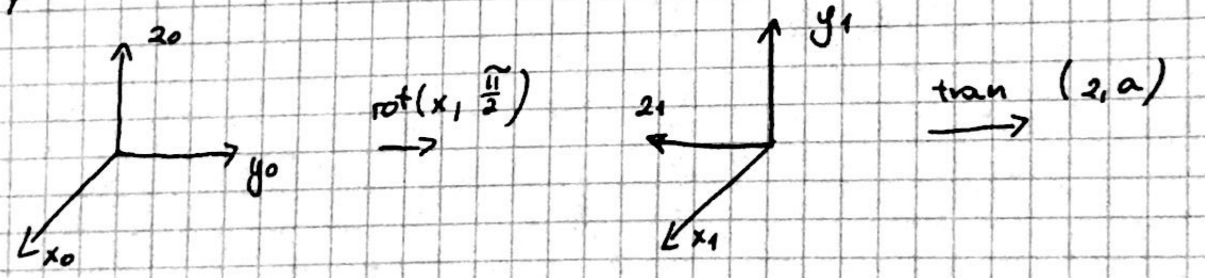
$$V_b = \begin{bmatrix} [\cos 2t + 3\sin 2t \ , \ 2, \ \sin 2t + 3\cos 2t \\ [0,2,0]^T \end{bmatrix}$$

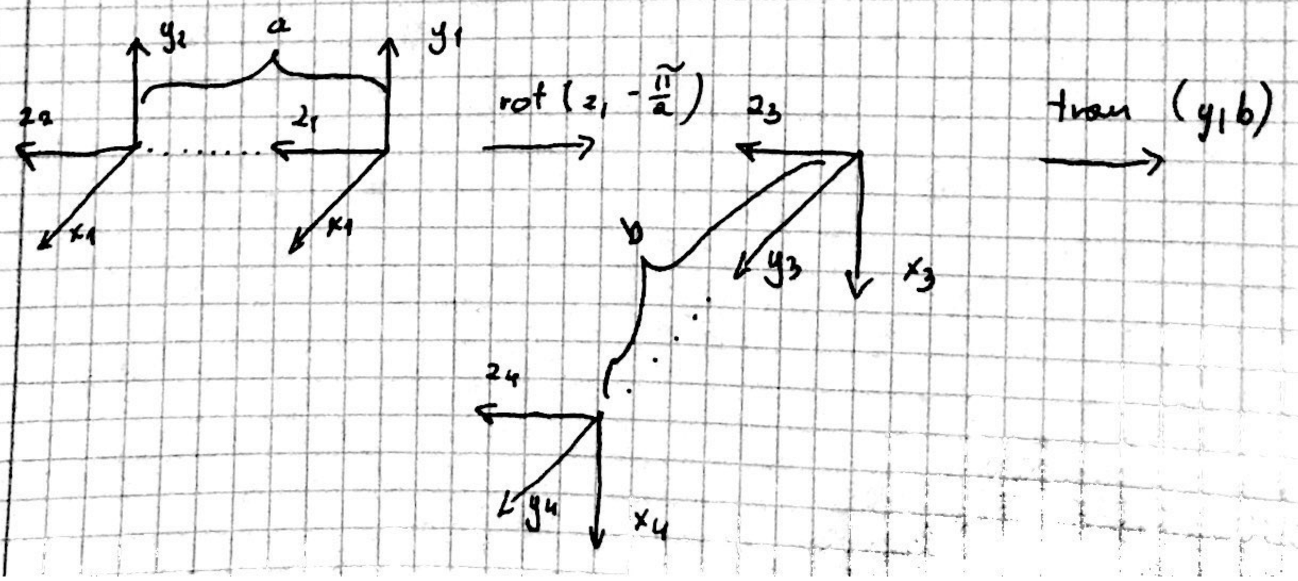
$$[T]\,\omega_b + \dot{T} = \begin{bmatrix} 0 & -3t & 2t \\ 3t & 0 & -t \\ -2t & t & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} =$$

$$= \begin{bmatrix} -6t + 1 \\ 2 \\ 2t + 3 \end{bmatrix}$$

$$V_s = \begin{bmatrix} [-6t+1, \ 2, \ 2t+3]^T \\ [0,2,0]^T \end{bmatrix}$$

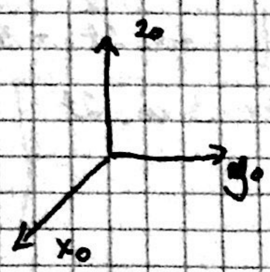
3) $A = rot(x, \frac{\pi}{2}) \ trans(z, a) \ rot(z, -\frac{\pi}{2}) \ trans(y, b)$





4)

$A = rot(y, -\frac{\pi}{4})\, rot(z, \frac{3}{4}\pi)\, trans(x, a)\, rot(x, \frac{5}{4}\pi)$



$rot(y, -\frac{\pi}{4})$
$\rightarrow$

7)

i	θ_i	d_i	a_i	α_i
1	q_i	d_1	0	$\frac{\pi}{2}$
2	$\frac{\pi}{2}$	q_2	a_2	0
3	q_3	d_3	a_3	$-\frac{\pi}{2}$

$A_{i-1}^{i} = rot(z_i, \theta_i)\, tran(z_i, d_i)$
$tran(x_i, a_i)\, rot(x, \alpha_i)$