Jacobiano → Derivada da posição

Questão 2 - Lista 9

s → seno c → cosseno

$$F_w = \begin{bmatrix} c\alpha & s\alpha & 0 & rc\alpha \\ s\alpha & c\alpha & 0 & rs\alpha \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$dr = 0{,}1$ $\alpha = 30°$

$d\alpha = 0{,}05$ $L = 10$

$r = 15$ $dL = 0{,}2$

$$dp_x = c\alpha\, dr - r s\alpha\, d\alpha$$
$$dp_y = s\alpha\, dr + r c\alpha\, d\alpha$$
$$dp_z = dL$$

$$\Rightarrow \begin{bmatrix} dp_x \\ dp_y \\ dp_z \end{bmatrix} = \begin{bmatrix} c\alpha & -rs\alpha & 0 \\ s\alpha & rc\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} dr \\ d\alpha \\ dL \end{bmatrix}$$

Agora é só substituir os valores e teremos o espaço de estados final.

Questão 3

$$J_{ef} = \begin{bmatrix} rs\beta c\gamma \\ rs\beta s\gamma \\ rc\beta \\ 1 \end{bmatrix}$$

$$dp_x = s\beta\gamma\, dr + rc\beta c\gamma\, d\beta - rs\beta s\gamma\, d\gamma$$
$$dp_y = s\beta s\gamma\, dr + rc\beta s\gamma\, d\beta + rs\beta\gamma\, d\gamma$$
$$dp_z = c\beta\, dr - rs\beta\, d\beta + 0$$

$r = 20$ $dr = 2$

$\beta = 60°$ $d\beta = 0{,}05$

$\gamma = 30$ $d\gamma = 0{,}1$

$$\Rightarrow \begin{bmatrix} dp_x \\ dp_y \\ dp_z \end{bmatrix} = \begin{bmatrix} s\beta c\gamma & rc\beta c\gamma & -rs\beta s\gamma \\ s\beta s\gamma & rc\beta s\gamma & rs\beta s\gamma \\ c\beta & -rs\beta & 0 \end{bmatrix} \begin{bmatrix} dr \\ d\beta \\ d\gamma \end{bmatrix}$$

Questão 5

$\phi_i = 20$ } 5 seg — 3° grau
$\phi_f = 80$ — $t_i = 0$
$\phi_{f_2} = 25$ } 5 seg — $t_f = 5$ seg

$\phi(t_f) = C_0 + C_1 5 + C_2 5^2 + C_3 5^3$
$80 = 20 + 25C_2 + 125C_3$
$25C_2 + 125C_3 = 60$

$\phi(t) = C_0 + C_1 t + C_2 T^2 + C_3 T^3$; $\dot{\phi}(T_f) = C_1 + 2C_2 T + 3C_3 T^2$

$\phi(T_i) = C_0$
$C_0 = 20$

$0 = 0 + 10C_2 + 75C_3$

$\dot{\phi}(T_i) = C_1 + 2C_2 T + 3C_3 T^2$
$0 = C_1$

$\begin{cases} 25C_2 + 125C_3 = 60 \\ 10C_2 + 75C_3 = 0 \end{cases}$ $C_2 = 7,2$; $C_3 = -0,96$

$$\phi(T) = 20 + 7,2T^2 - 0,96T^3$$
$$\dot{\phi}(T) = 14,4T - 2,88T^2$$
$$\ddot{\phi}(T) = 14,4 - 5,76T$$

Resolvendo a segunda parte T_{f_2}

Ѐ tomando $a = 10$, $a = -10$

$\phi_f = 80$ } 5 seg
$\phi_{f_2} = 25$

$\phi(t) = C_0 + C_1 T_1 + C_2 T^2 + C_3 T^3 + C_4 T^4 + C_5 T^5$
$\phi(T_i) = C_0 - 0$
$80 = C_0$
$\dot{\phi}(T_i) = C_1 + 2C_2 T + 3C_3 T^2 + 4C_4 T^3 + 5C_5 T^4$
$0 = C_1$
$\ddot{\phi}(T_i) = 2C_2$
$10 = 2C_2 \Rightarrow C_2 = 5$

$$\phi(T_f) = 80 + 0 + 5 \cdot 5^2 + C_3 5^3 + C_4 5^4 + C_5 5^5$$

$$25 = 80 + 125 + 125C_3 + 625C_4 + 3125C_5$$

$$125C_3 + 625C_4 + 3125C_5 = -180$$

$$\dot\phi(T_f) = 0 + 0 + 2(5)(5) + 3C_3 5^2 + 4C_4 5^3 + 5C_5 5^4$$

$$0 = 50 + 75C_3 + 500C_4 + 3125C_5$$

$$\ddot\phi(T_f) = 2 \cdot 5 + 6C_3 5 + 12C_4 5^2 + 20C_5 5^3$$

$$-10 = 10 + 30C_3 + 300C_4 + 2500C_5$$

$$\overset{A}{\begin{bmatrix} 125 & 625 & 3125 \\ 75 & 500 & 3125 \\ 30 & 300 & 2500 \end{bmatrix}} \overset{B}{\begin{bmatrix} C_3 \\ C_4 \\ C_5 \end{bmatrix}} = \overset{C}{\begin{bmatrix} -180 \\ -50 \\ -20 \end{bmatrix}} \left.\right\} \begin{aligned} C_3 &= -8,4 \\ C_4 &= 2,32 \\ C_5 &= -0,1856 \end{aligned}$$

inv(A) · C no matlab

$$\phi(t) = 80 + 5t^2 - 8,4t^3 + 2,32t^4 - 0,1856t^5$$

Questão 1

	a	α	d	φ
0-1	88	90	330	ϕ_1^*
1-2	310	0	0	$\phi_2^* + 90$
2-3	40	90	0	ϕ_3^*
3-4	0	-90	305	ϕ_4^*
4-5	0	90	0	ϕ_5^*
5-6	0	0	86,5	ϕ_6^*
~~6-7~~				

Pra fazer [illegible] como calcula.

H_0^1

H_0^2

H_0^3

H_0^4

H_0^5

H_0^6