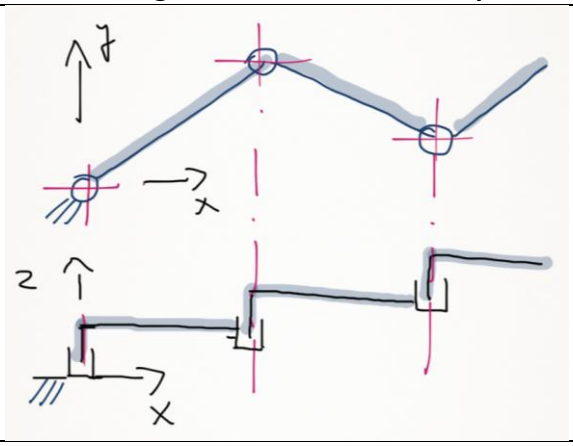
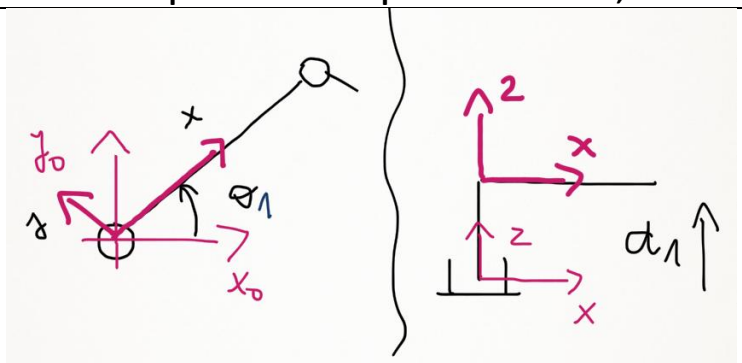
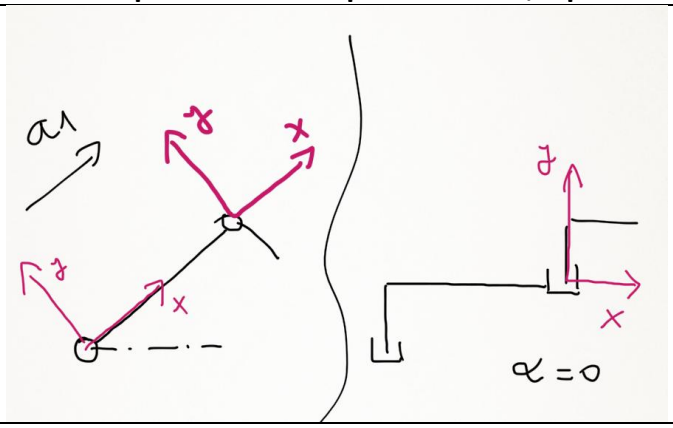
Laborator 10: Cinematica Robotilor

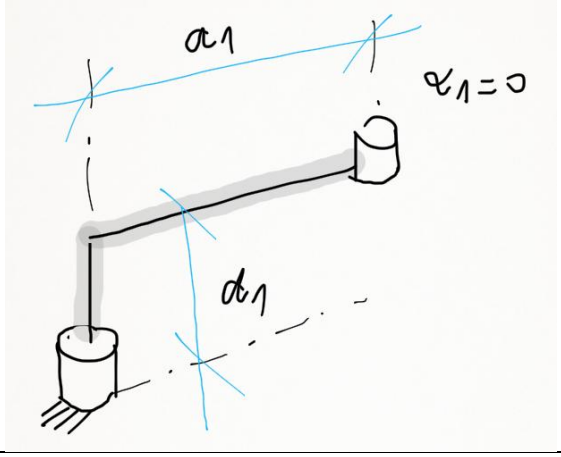
Obiective:

Utilizarea cunostintelor dobandite in cursurile si laboratoarele anterioare pentru realizarea unui model cinematic. Utilizarea toolboxului PC in construirea unei structuri personalizate.

Elemente teoretice: Studii de caz: determinarea parametrilor DH, parcurgerea lantului cinematic

Se da structura din figura si se cere definirea parametrilor DH

Pentru primul element parametrii theta1; d1

Pentru primul element parametrii a1; alpha1


Pentru primul element

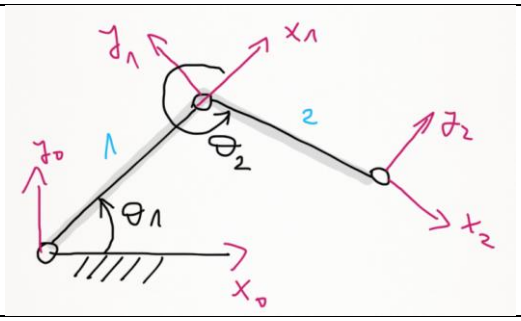


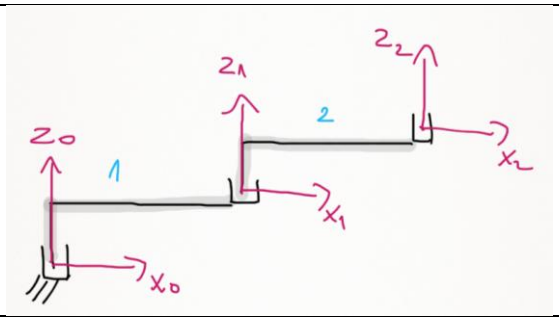
Matricea de transformare

$$ {}^{j-1}A_j = \begin{bmatrix} c\theta_j & -s\theta_j c\alpha_j & s\theta_j s\alpha_j & a_j c\theta_j \\ s\theta_j & c\theta_j c\alpha_j & -c\theta_j s\alpha_j & a_j s\theta_j \\ 0 & s\alpha_j & c\alpha_j & d_j \\ 0 & 0 & 0 & 1 \end{bmatrix} $$

$$ {}^{j-1}A_j = \left[\begin{array}{ccc|c} c\theta_j & -s\theta_j & 0 & a_j c\theta_j \\ s\theta_j & c\theta_j & 0 & a_j s\theta_j \\ 0 & 0 & 1 & d_j \\ \hline 0 & 0 & 0 & 1 \end{array}\right] $$

Cele doua elemente



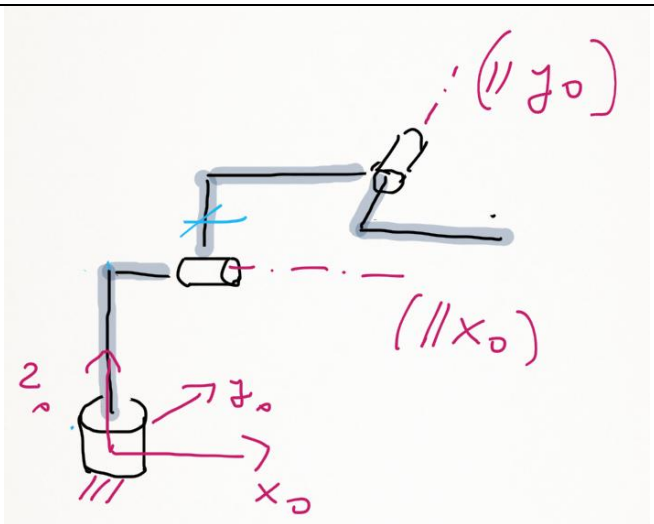


Problema propusa 1.

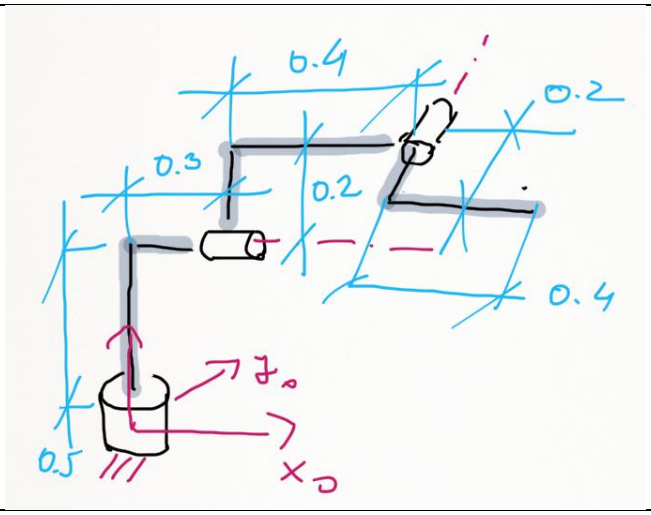
1. Pentru structura din figura se cere:
   a. Definirea parametrilor DH;
   b. Construirea robotului (PC toolbox) si reprezentarea lui;
   c. rezolvarea problemei de cinematica directa: pozitia initiala si finala;
   d. determinarea operatorului Dhpentru cele doua pozitii mentionate;

e. reprezentarea traiectoriei carteziene a robotului (din pozitia initiala in cea finala)

Schema cinematica a robotului



Dimensiunile bratelor



Pozitiile unghiulare initiale si finale

$\theta_1 = 0 \dots \frac{\pi}{3}$

$\theta_2 = 0 \dots \frac{11}{6}$

$\theta_3 = 0 \dots \frac{\pi}{4}$