Cinemática Directa, Cinemática Inversa - Brazo - Robot 7 Grados de Libertad

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Cinemática Directa, Cinemática Inversa

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Condiciones Cinemática Directa

Art	a	d	α	θ
1	0.0603	0	$\frac{\pi}{2}$	0
2	0	0	$\frac{\pi}{2}$	$\frac{\pi}{2}$
3	0	0.285	$-\frac{\pi}{2}$	$-\frac{\pi}{2}$
4	0	0	$\frac{\pi}{2}$	0
5	0	0.2126	$-\frac{\pi}{2}$	0
6	0	0	$\frac{\pi}{2}$	0
7	0	0.12	0	0

Cinemática Inversa

$r = \sqrt{x^2 + y^2 + (z - D_1)^2}$

$\alpha = Atan2((z - D_1), \sqrt{x^2 + y^2})$

$\gamma = \arccos \frac{-D_2^2 - D_3^2 + r^2}{-2 * D_2 * D_3}$

$\beta = \frac{\arcsin D_3 * \sin \gamma}{r}$

$tunningRadiusElbow = D_2 * \sin \beta$

$Pelbow[0, 0] = Pw[0, 0] = 0$

$Pelbow[1, 0] = Pw[1, 0] = -tunningRadiusElbow * \cos elbowAngle = D_2 * \sin \beta * \cos elbowAngle$

$Pelbow[2, 0] = Pw[2, 0] = -tunningRadiusElbow * \sin elbowAngle = D_2 * \sin \beta * \sin elbowAngle$

$Pelbow[3, 0] = Pw[3, 0] = 1$

WristPosition[0, 0] = WP[0,0] = x;
WristPosition[1, 0] = WP[1,0] = y;
WristPosition[2, 0] = WP[2,0] = z;
WristPosition[3, 0] = WP[3,0] = 1;

$result[0] = Atan2(Pw[1,0] + DHa[0] * \sin result[0], Pw[0,0] + DHa[0] * \cos result[0])$

$result[1] = Atan2(Pw2, 0] - D_1, \sqrt{Pelbow[0,0] * Pelbow[0,0] + Pw[1,0] * Pw[1,0]})$

$result[2] = Atan2(WP[1,0], WP[0,0])$

$result[3] = \frac{\pi}{2} - Atan2(WP[2,0], \sqrt{WP[0,0] * WP[0,0] + WP[1,0] * WP[1,0]})$

Condiciones

if R47[0,0]= =0
result[4]=0
result[5]=0
result[6]=Atan2(R47[1,1],R47[1,2])

else
result[5]=Atan2($\sqrt{1 - (R47[2,0])^2}$, R47[2,0])
result[4]=Atan2(R47[1,0],R47[0,0])
result[6]=Atan2(R47[2,2],-R47[2,1])

if result[4] > 2.4
result[4]+=π
result[5]*=-1
if result[6] > 0
result[6]-=π
else result[6]+=π

if result[4] < -2.4
result[4]+=π
result[5]*=-1
if result[6] > 0
result[6]-=π
else result[6]+=π

La cinemática directa y la inversa son las mismas para cada brazo, el único cambio es el sentido de giro de algunas articulaciones. La configuración de los brazos es la misma, un brazo está desplazado respecto del otro.
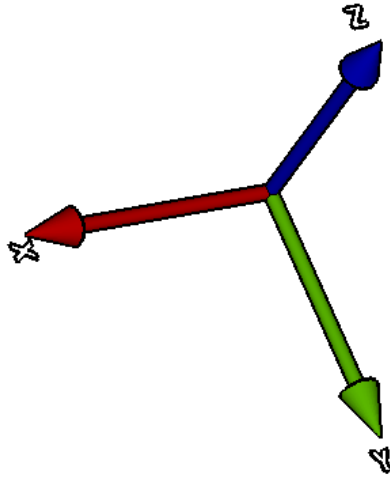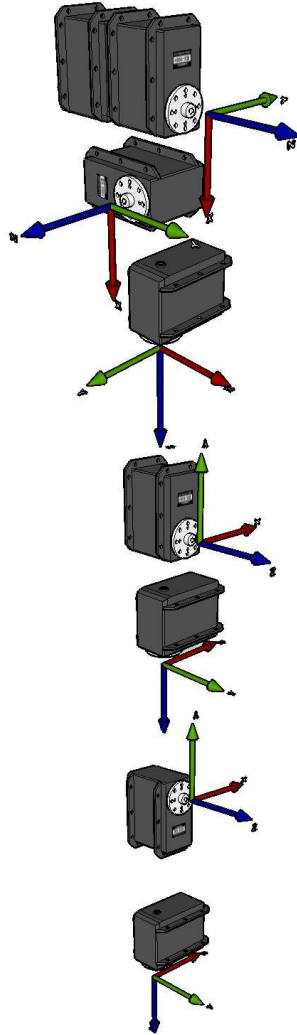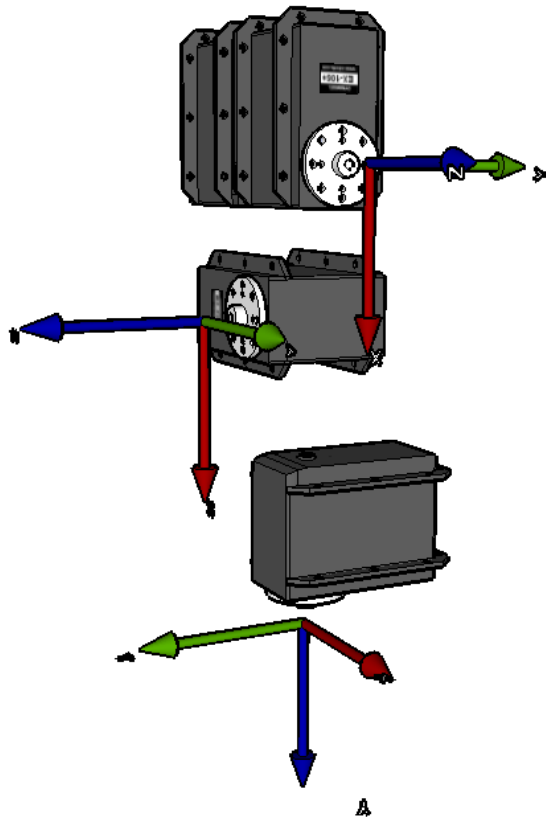

Figure 1: Eje X,Y,Z

Figure 2: Brazo Izquierdo

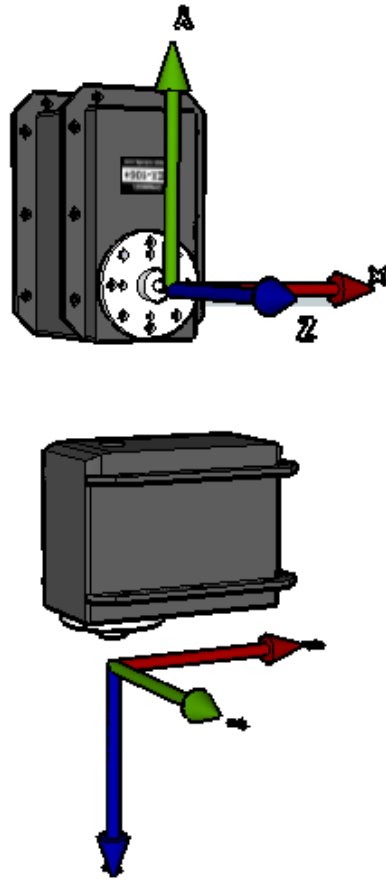4

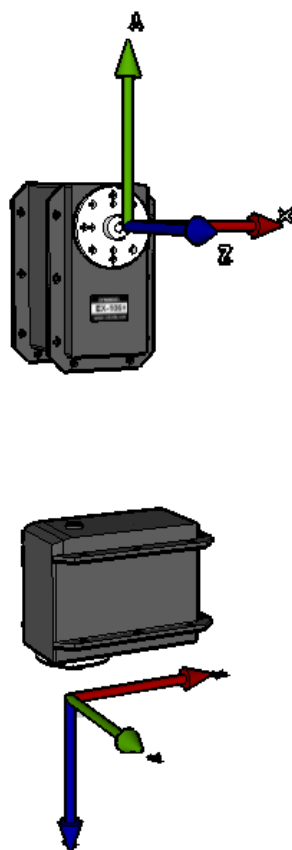Figure 3: Articulaciones 1,2,3

Figure 4: Articulaciones 4,5
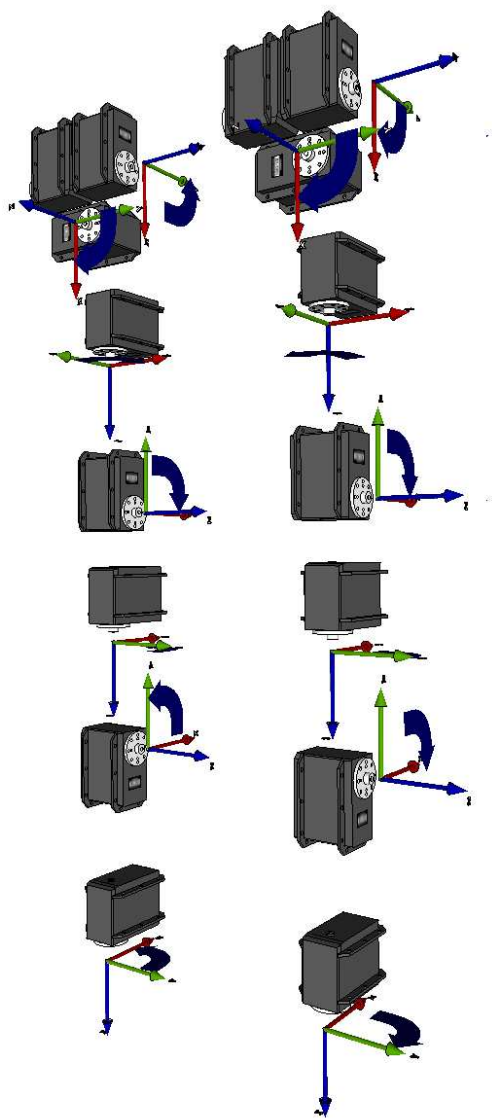
Figure 5: Articulaciones 6,7

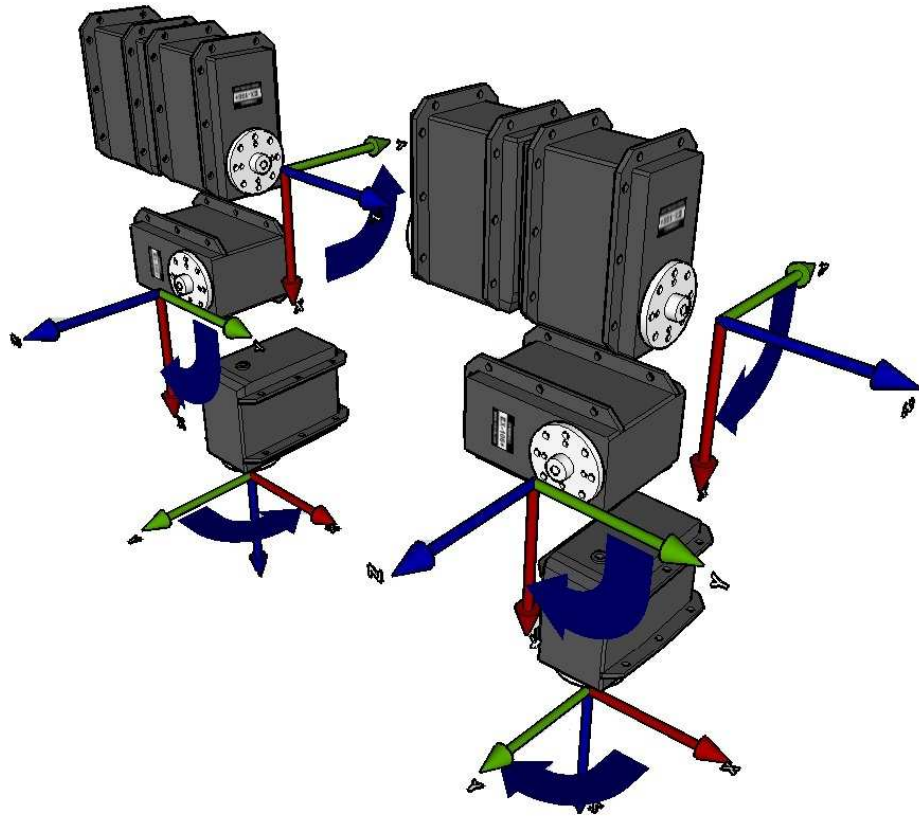Figure 6: Sentido de giro brazo derecho-izquierdo
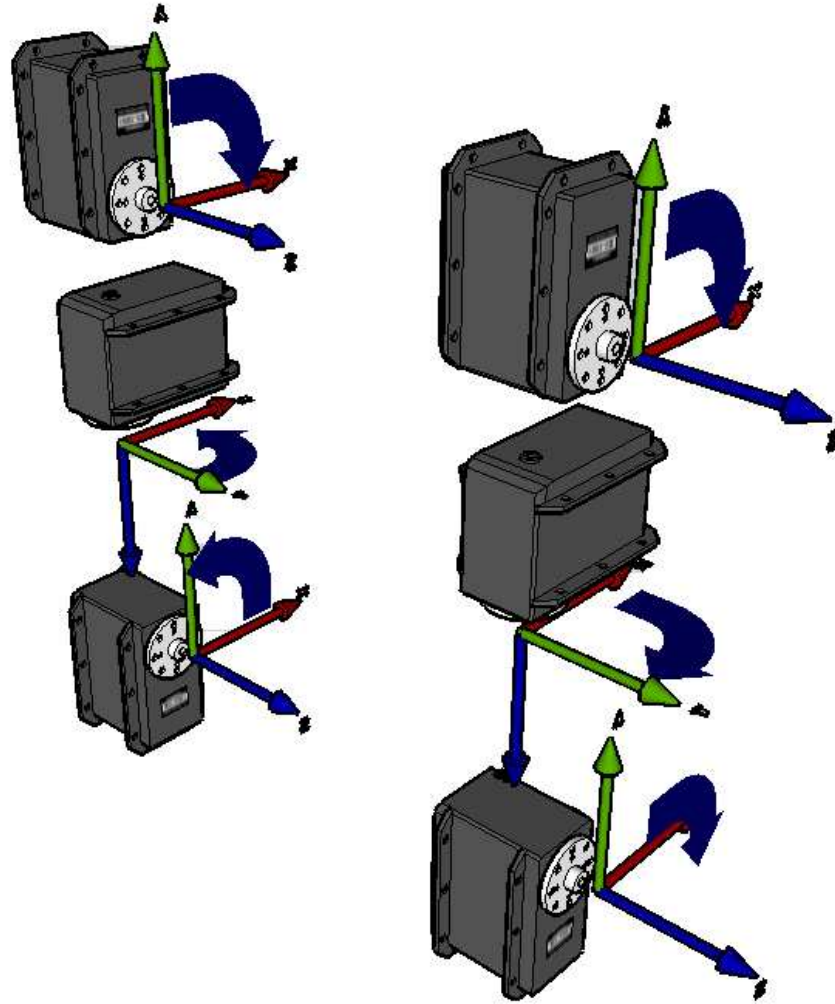
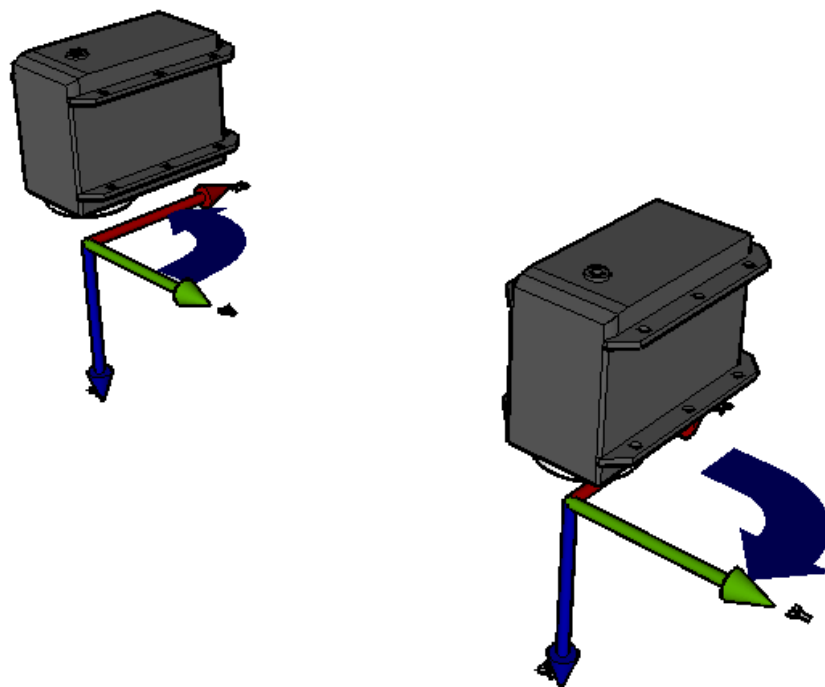Figure 7: Giro de Articulaciones 1,2,3

Figure 8: Giro de Articulaciones 4,5,6

Figure 9: Giro de Articulación 7