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# **Title:** Desarrollo de un simulador para el robot SCARA utilizando SolidWorks y LabView

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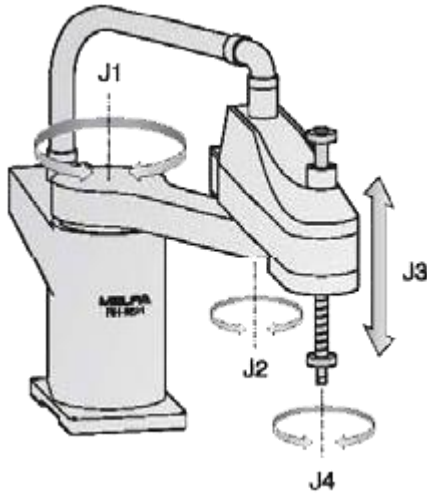
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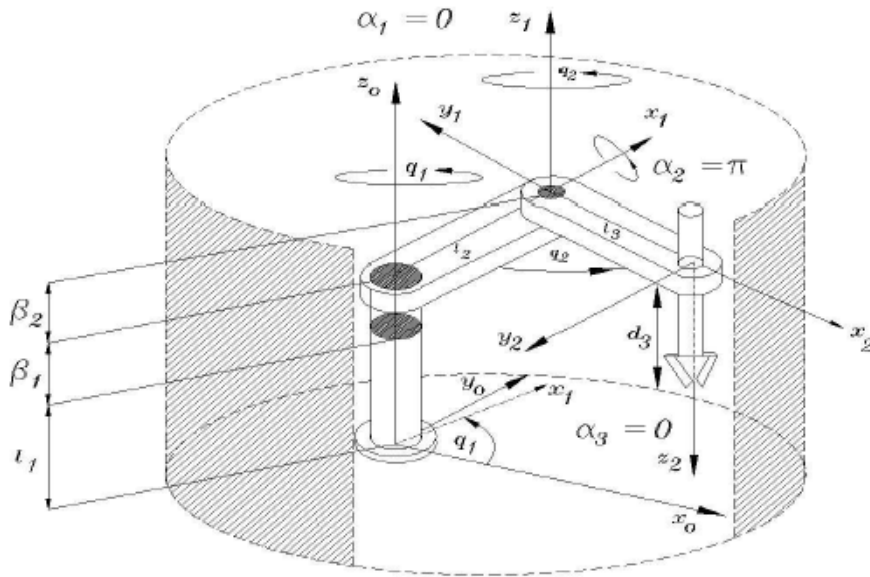


# Robot Scara





# Cinemática Directa



Eslabón	$l_i$	$\alpha_i$	$d_i$	$\theta_i$
1	0	0	$l_1 + \beta_1$	$q_1$
2	$l_2$	$\pi$	$\beta_2$	$q_2$
3	$l_3$	0	$d_3$	0



# Cinemática Directa

$$H_0^1 = H_{Rz_0}(q_1) H_{Tz_0}(l_1 + \beta_1) H_{Tx}(l_2) H_{Rx}(0)$$

$$= \begin{bmatrix} \cos(q_1) & -\text{sen}(q_1) & 0 & l_2 \cos(q_1) \\ \text{sen}(q_1) & \cos(q_1) & 0 & l_2 \text{sen}(q_1) \\ 0 & 0 & 1 & l_1 + \beta_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$H_1^2 = H_{Rz_1}(q_2) H_{Tz_1}(\beta_2) H_{Tx_1}(l_3) H_{Rx_1}(\pi)$$

$$= \begin{bmatrix} \cos(q_2) & \text{sen}(q_2) & 0 & l_3 \cos(q_2) \\ \text{sen}(q_2) & -\cos(q_2) & 0 & l_3 \text{sen}(q_2) \\ 0 & 0 & -1 & \beta_2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$H_2^3 = H_{Rz_2}(0) H_{Tz_2}(d_3) H_{Tx_2}(0) H_{Rx_2}(0)$$

$$= \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & d_3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$H_0^3 = H_0^1 H_1^2 H_2^3$$

$$= \begin{bmatrix} \cos(q_1 + q_2) & \text{sen}(q_1 + q_2) & 0 & l_2 \cos(q_1) + l_3 \cos(q_1 + q_2) \\ \text{sen}(q_1 + q_2) & -\cos(q_1 + q_2) & 0 & l_2 \text{sen}(q_1) + l_3 \text{sen}(q_1 + q_2) \\ 0 & 0 & -1 & l_1 + \beta_1 + \beta_2 - d_3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} x_0 \\ y_0 \\ z_0 \end{bmatrix} = f_R(q) = \begin{bmatrix} l_2 \cos(q_1) + l_3 \cos(q_1 + q_2) \\ l_2 \text{sen}(q_1) + l_3 \text{sen}(q_1 + q_2) \\ l_1 + \beta_1 + \beta_2 - d_3 \end{bmatrix}$$





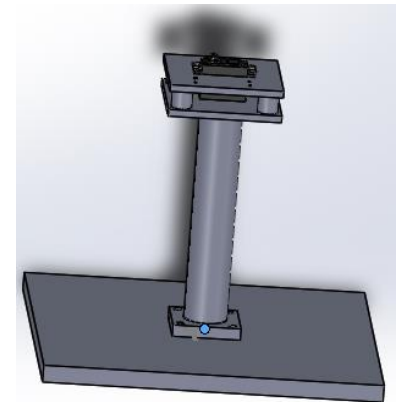
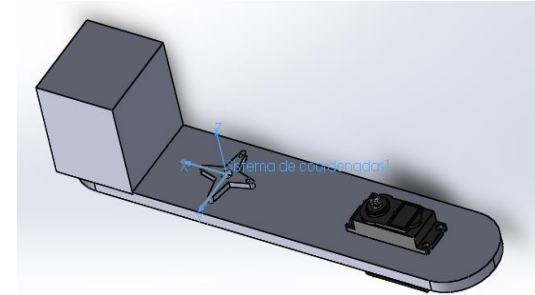
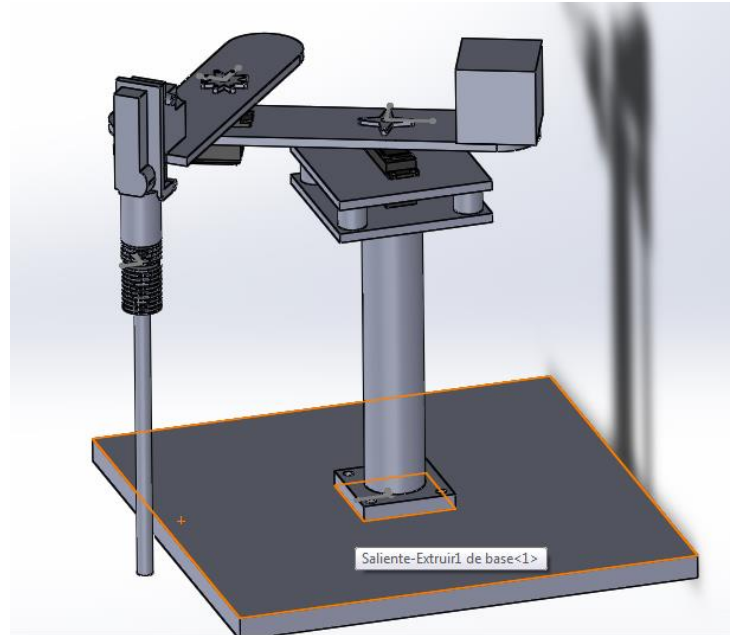
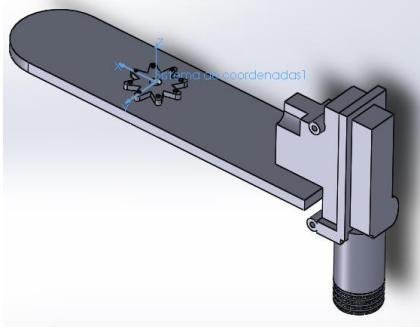
# Cinemática Inversa

- $q_2 = \cos^{-1} \left( \frac{x_0^2 + y_0^2 - l_2^2 - l_3^2}{2l_2l_3} \right)$
- $q_1 = \tan^{-1} \left( \frac{y_0}{x_0} \right) - \tan^{-1} \left( \frac{l_3 \sin q_2}{l_2 + l_3 \cos q_2} \right)$
- $d_3 = l_1 + \beta_1 + \beta_2 - z_0$





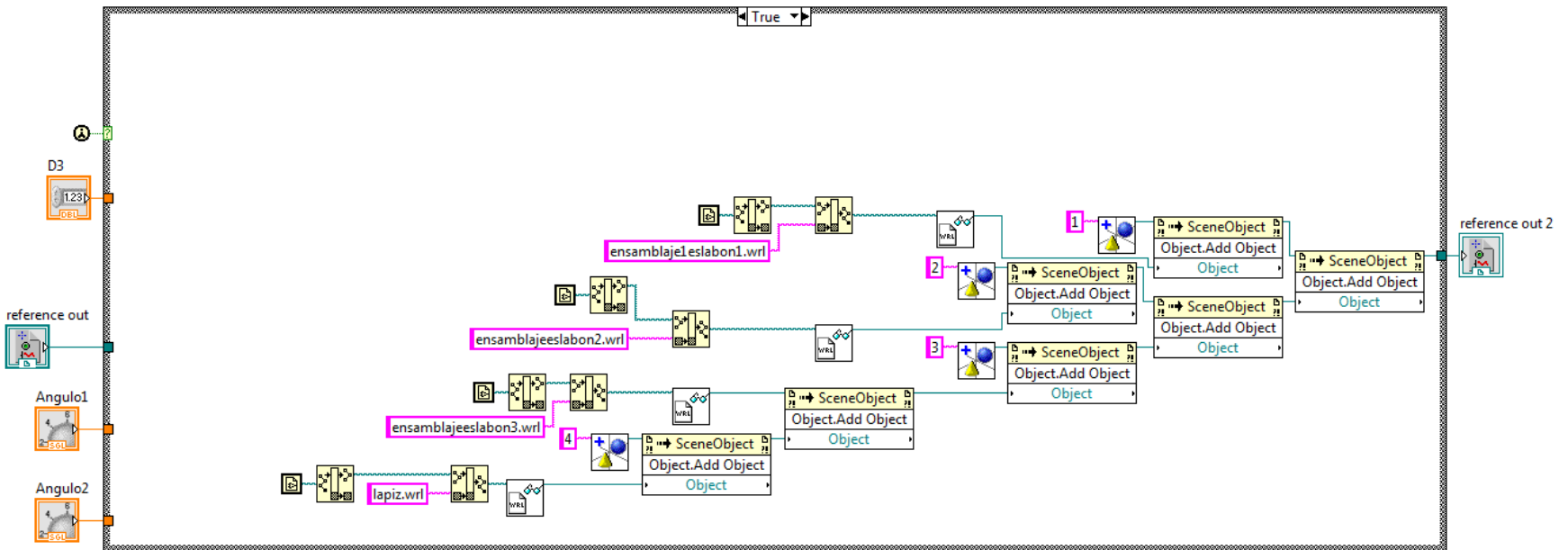
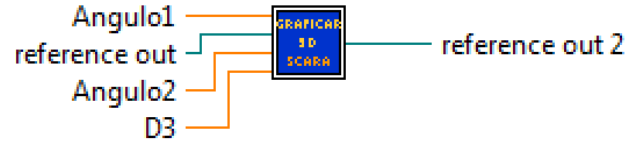
# Piezas en SolidWorks





# Graficar en Labview el robot en 3D

3Dsimulacionscara.vi







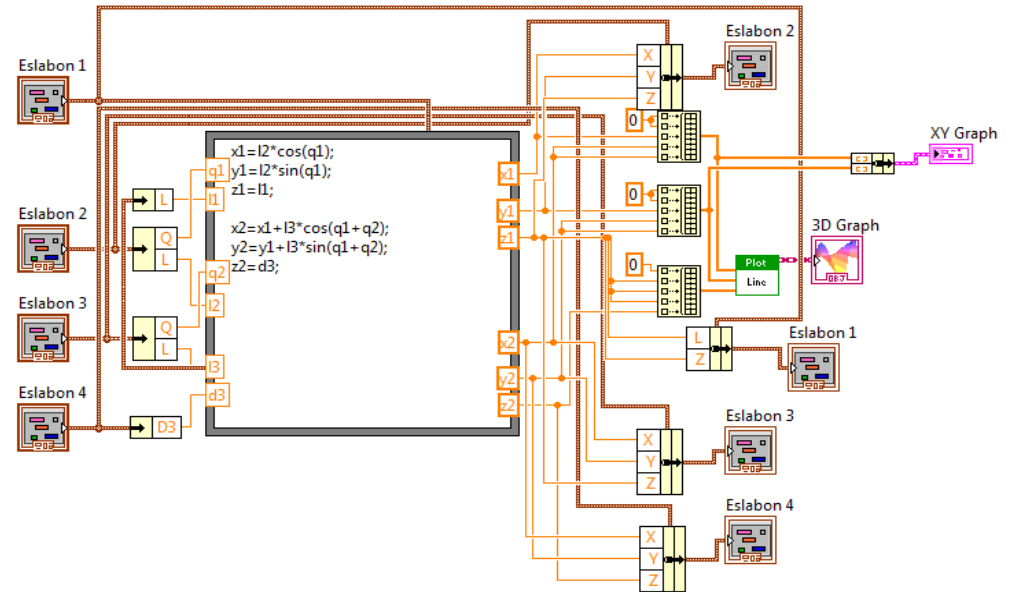
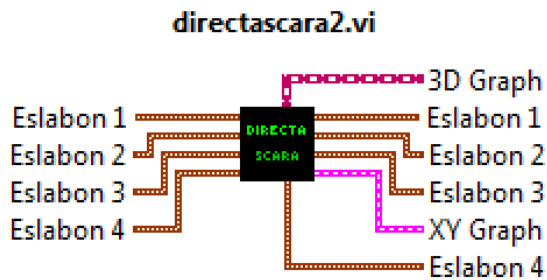
# Graficar en Labview el robot en 3D







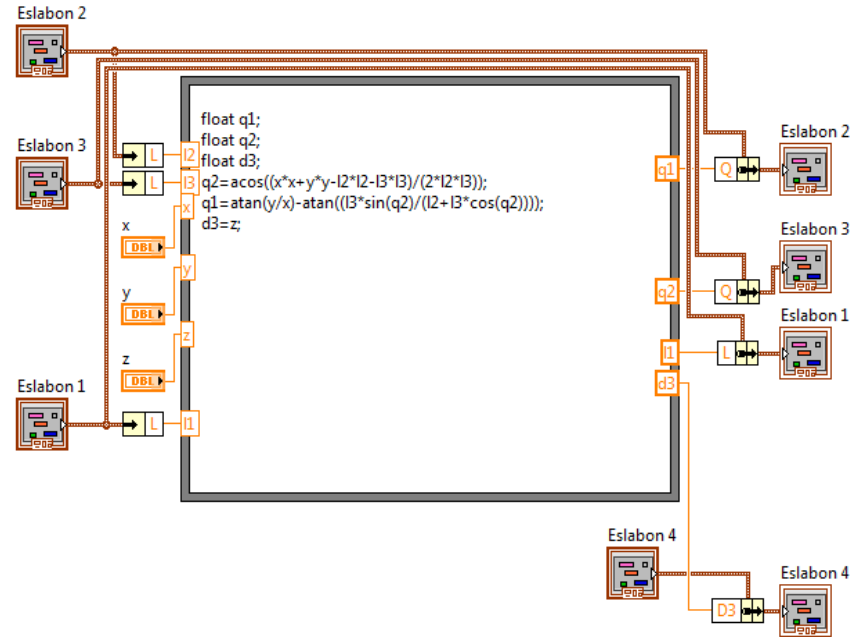
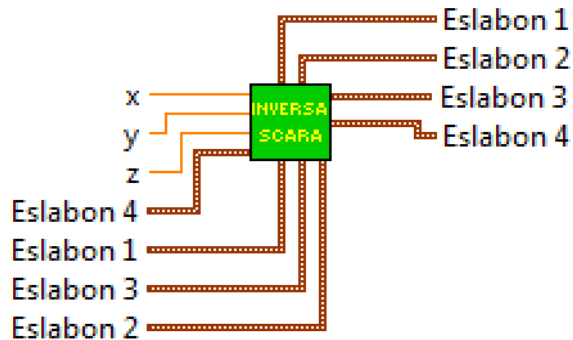
# SubVI Cinemateca Directa





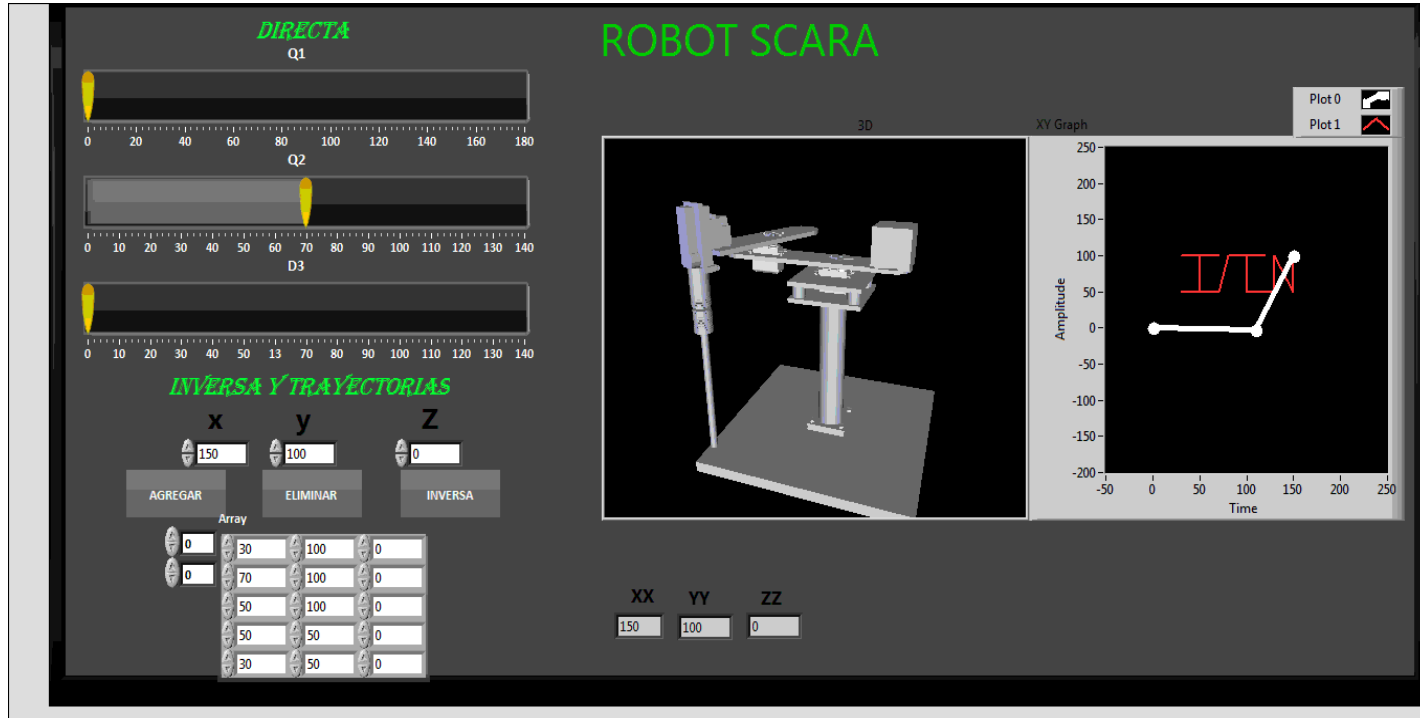
# SubVI Cinemática Inversa

inversascara.vi



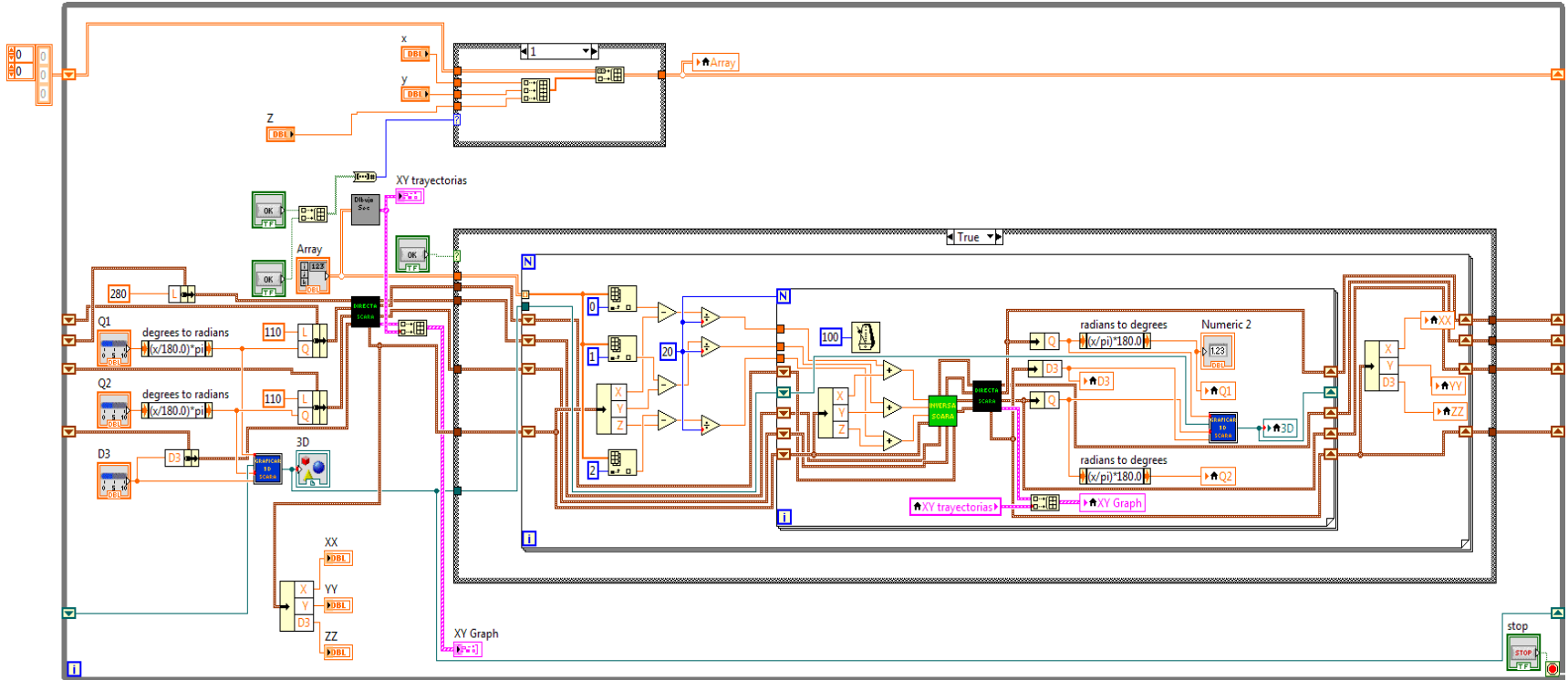


# Resultados





# Resultados



Congreso Interdisciplinario de Energías Renovables,  
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