
# Evaluación (Localización de un robot diferencial)

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Implementación de Robótica Inteligente TE3002B.101

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## Examen Localización de un robot diferencial

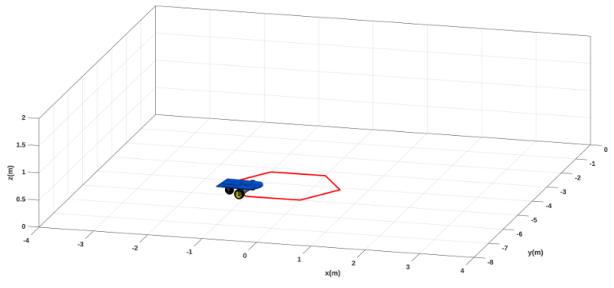
Alumno:

**1.-** Un robot diferencial se encuentra en la posición inicial (-1, -5, 0º), posteriormente genera el siguiente historial de pasos:

| Paso | v(m/s) | ω (rad/s) | Δt (s) |
|---|---|---|---|
| 1 | 1.0 | 0.0 | 1.0 |
| 2 | 0.0 | π/3 | 1.0 |
| 3 | 1.0 | 0.0 | 1.0 |
| 4 | 0.0 | π/3 | 1.0 |
| 5 | 1.0 | 0.0 | 1.0 |
| 6 | 0.0 | π/3 | 1.0 |
| 7 | 1.0 | 0.0 | 1.0 |
| 8 | 0.0 | π/3 | 1.0 |
| 9 | 1.0 | 0.0 | 1.0 |
| 10 | 0.0 | π/3 | 1.0 |
| 11 | 1.0 | 0.0 | 1.0 |
| 12 | 0.0 | π/3 | 1.0 |

a) Obtén la pose del robot en cada paso, integrando numéricamente siguiendo la suposición de Markov. Muestra tus resultados en una tabla.

b) Calcula la pose final (x, y, θ) del robot tras completar los 12 pasos.



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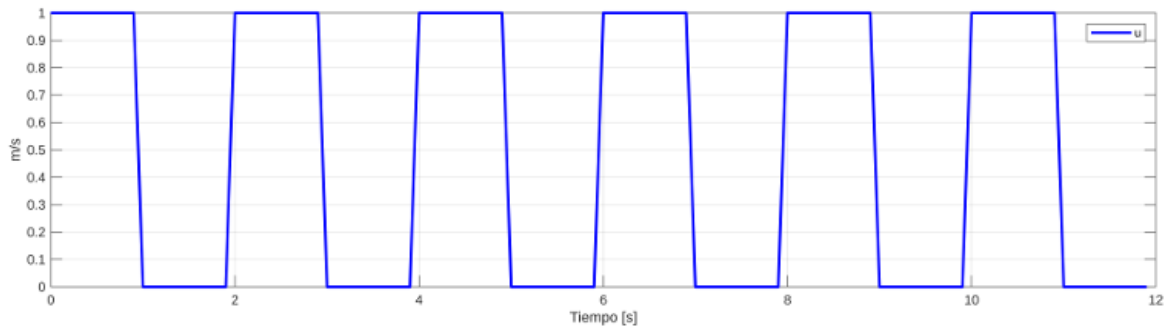


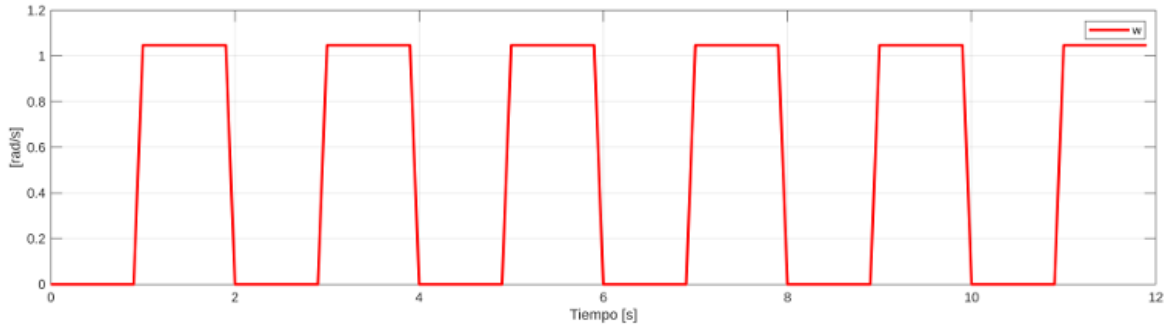


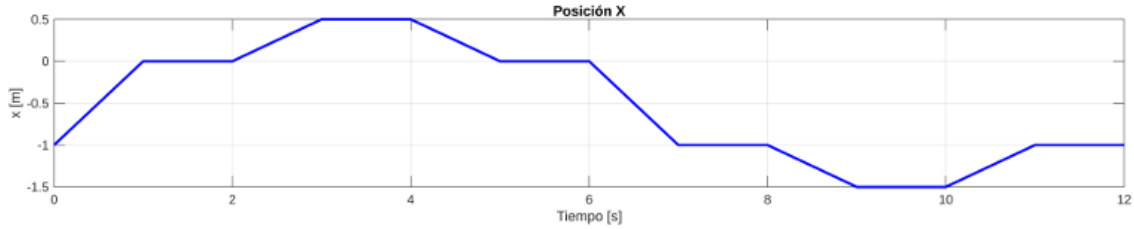


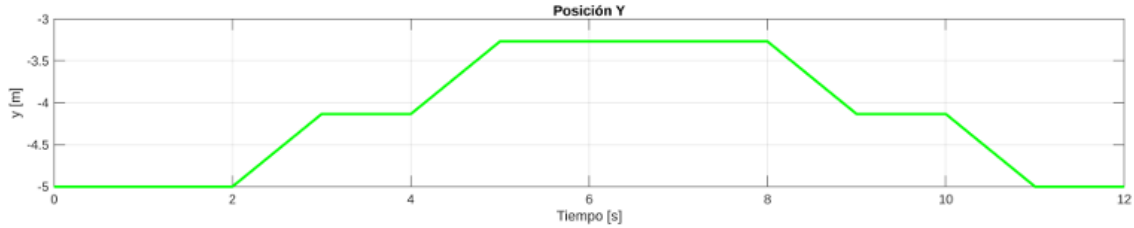


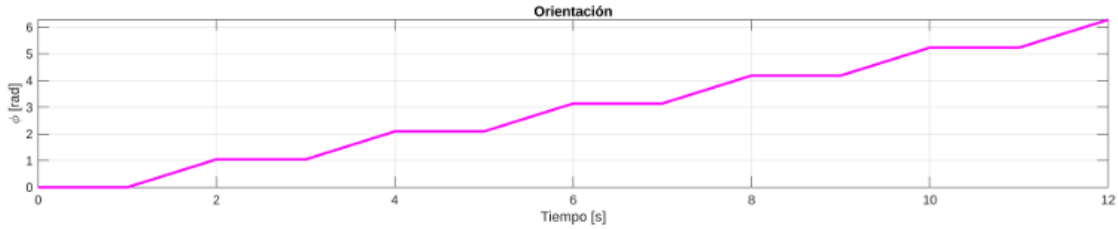

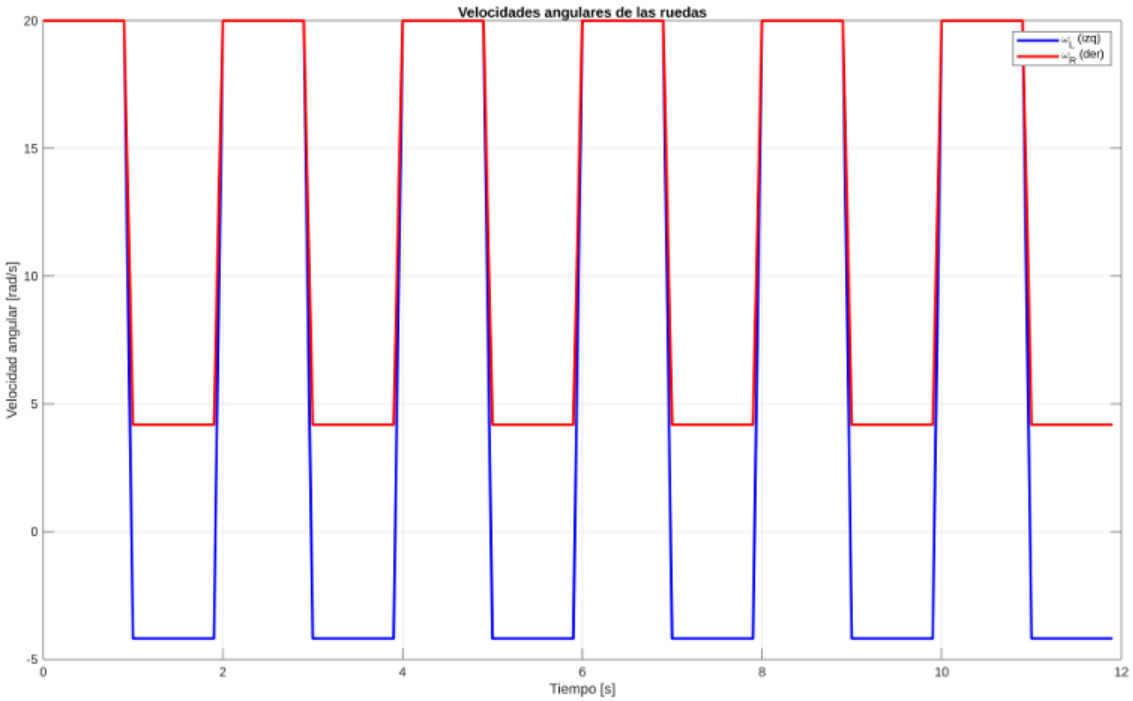


| Tiempo_s | X_m | Y_m | Theta_rad |
|---|---|---|---|
| 0 | -1 | -5 | 0 |
| 1 | -1.3878e-16 | -5 | 0 |
| 2 | -1.3878e-16 | -5 | 1.0472 |
| 3 | 0.5 | -4.134 | 1.0472 |
| 4 | 0.5 | -4.134 | 2.0944 |
| 5 | 4.0246e-16 | -3.2679 | 2.0944 |
| 6 | 4.0246e-16 | -3.2679 | 3.1416 |
| 7 | -1 | -3.2679 | 3.1416 |



| | | | |
|---|---|---|---|
| 8 | -1 | -3.2679 | 4.1888 |
| 9 | -1.5 | -4.134 | 4.1888 |
| 10 | -1.5 | -4.134 | 5.236 |
| 11 | -1 | -5 | 5.236 |

POSE FINAL
x = -1.0000 m
y = -5.0000 m
phi = 6.2832 rad

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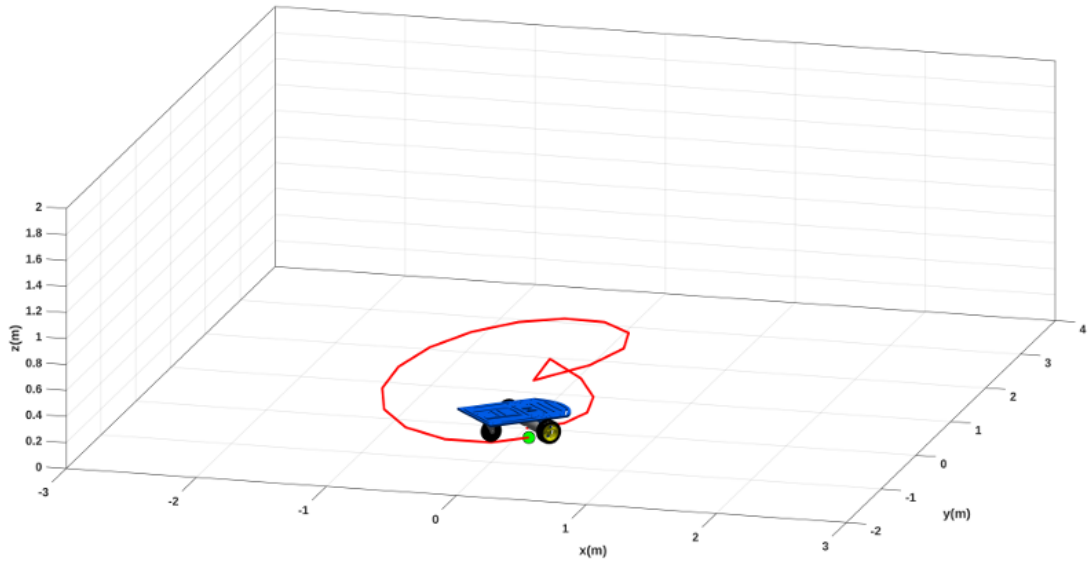
**2.-** Un robot diferencial con los siguientes parámetros:

Radio de las ruedas: 0.1m.
Distancia entre ruedas (eje): L= 0.4m
Pose inicial ($x_0$, $y_0$, $\theta_0$) = (0, 0, 0º)

| t_s | v_m_s | w_rad_s | wR_rad_s | wL_rad_s | x_m | y_m | theta_deg |
|---|---|---|---|---|---|---|---|
| 0 | 0.31415 | 0.72025 | 4.582 | 1.701 | 0 | 0 | 0 |
| 1 | 0.3563 | 0.605 | 4.773 | 2.353 | 0.23613 | 0.2072 | 41.267 |
| 2 | 0.44835 | 0.40375 | 5.291 | 3.676 | 0.32274 | 0.55282 | 75.931 |
| 3 | 0.5408 | 0.276 | 5.96 | 4.856 | 0.2521 | 0.99557 | 99.064 |
| 4 | 0.6054 | 0.218 | 6.49 | 5.618 | 0.024596 | 1.4862 | 114.88 |
| 5 | 0.62835 | -3.7257 | -1.168 | 13.735 | -0.34284 | 1.9673 | 127.37 |
| 6 | 0.6054 | -3.709 | -1.364 | 13.472 | -0.30012 | 1.3404 | -86.101 |
| 7 | 0.5408 | 0.276 | 5.96 | 4.856 | -0.010216 | 1.8719 | -298.61 |
| 8 | 0.44835 | 0.40375 | 5.291 | 3.676 | 0.10958 | 2.3993 | -282.8 |
| 9 | 0.3563 | 0.605 | 4.773 | 2.353 | 0.029136 | 2.8403 | -259.66 |
| 10 | 0.31415 | 0.72025 | 4.582 | 1.701 | -0.2228 | 3.0923 | -225 |
| 11 | 0.3563 | 0.605 | 4.773 | 2.353 | -0.53629 | 3.1127 | -183.73 |
| 12 | 0.44835 | 0.40375 | 5.291 | 3.676 | -0.84192 | 2.9296 | -149.07 |
| 13 | 0.5408 | 0.276 | 5.96 | 4.856 | -1.105 | 2.5666 | -125.94 |
| 14 | 0.6054 | 0.218 | 6.49 | 5.618 | -1.2911 | 2.0588 | -110.12 |
| 15 | 0.62835 | 0.20125 | 6.686 | 5.881 | -1.3715 | 1.4588 | -97.632 |
| 16 | 0.6054 | 0.218 | 6.49 | 5.618 | -1.3288 | 0.83187 | -86.101 |
| 17 | 0.5408 | 0.276 | 5.96 | 4.856 | -1.158 | 0.25107 | -73.611 |
| 18 | 0.44835 | 0.40375 | 5.291 | 3.676 | -0.86975 | -0.20654 | -57.797 |
| 19 | 0.3563 | 0.605 | 4.773 | 2.353 | -0.50098 | -0.46155 | -34.664 |
| 20 | 0.31415 | 0.72025 | 4.582 | 1.701 | -0.14468 | -0.46155 | -6.3611e-15 |
| 21 | NaN | NaN | NaN | NaN | 0.091444 | -0.25434 | 41.267 |



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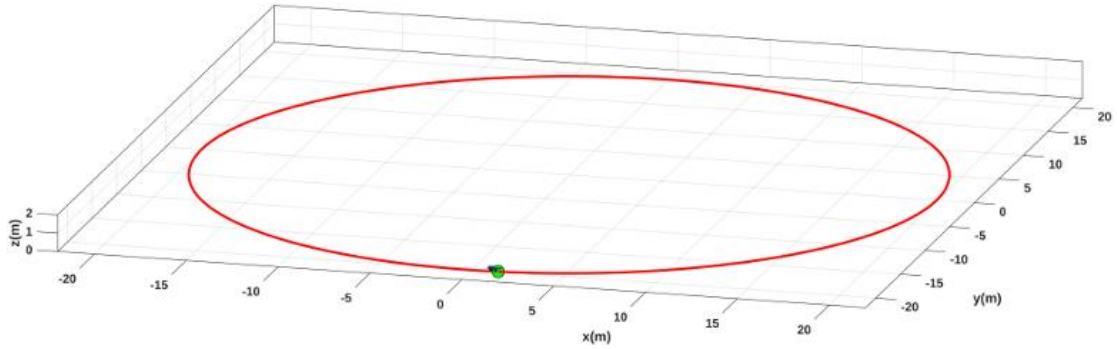
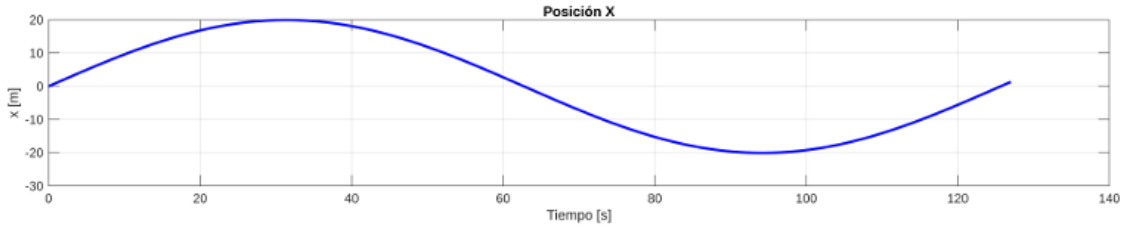
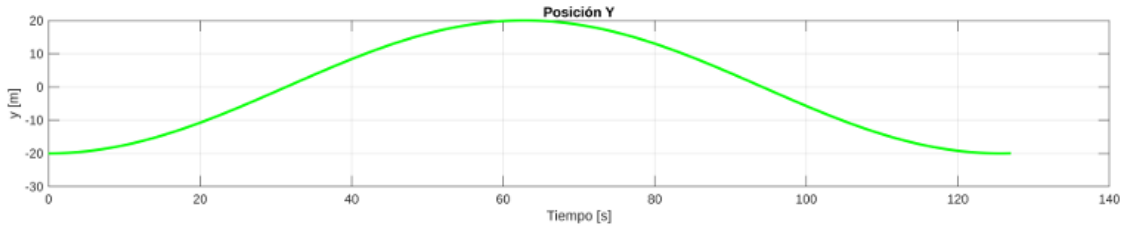
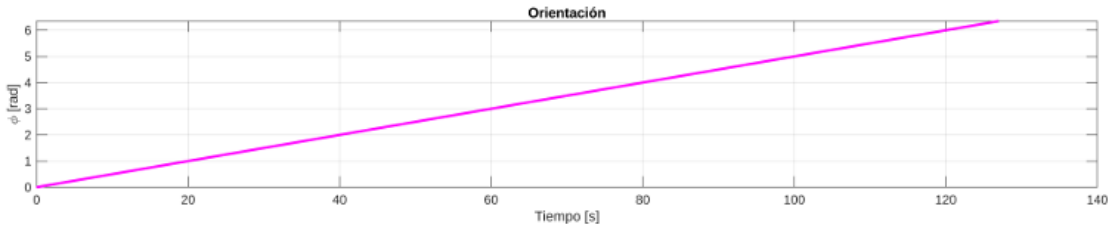
**3.-** Considerando los parámetros del robot descrito en el reactivo 2. Obtén la tabla de las señales de entrada **ω_R (rad/s)** y **ω_L (rad/s)** requeridas en cada instante de muestreo si se desea obtener una trayectoria circular con un radio de 20m, cuyo centro sea el origen (0, 0). Genera la simulación en Matlab.



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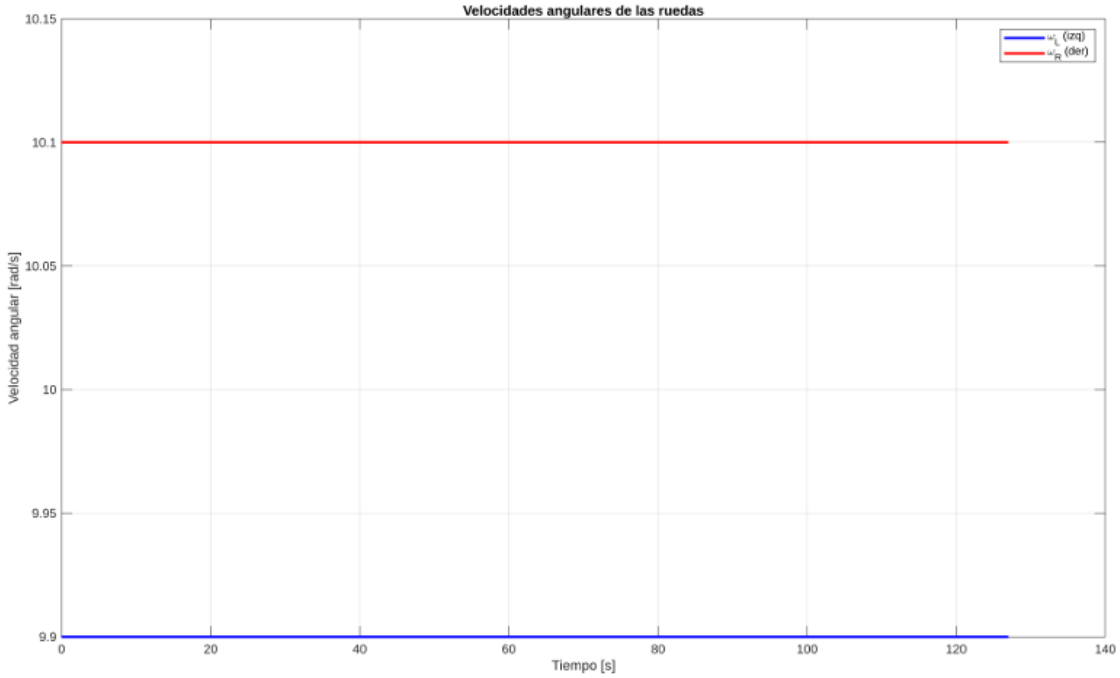

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| Tiempo_s | omega_R_rad_s | omega_L_rad_s |
|---|---|---|
| 0 | 10.1 | 9.9 |
| 5 | 10.1 | 9.9 |
| 10 | 10.1 | 9.9 |
| 15 | 10.1 | 9.9 |
| 20 | 10.1 | 9.9 |
| 25 | 10.1 | 9.9 |
| 30 | 10.1 | 9.9 |
| 35 | 10.1 | 9.9 |
| 40 | 10.1 | 9.9 |
| 45 | 10.1 | 9.9 |
| 50 | 10.1 | 9.9 |
| 55 | 10.1 | 9.9 |
| 60 | 10.1 | 9.9 |
| 65 | 10.1 | 9.9 |
| 70 | 10.1 | 9.9 |
| 75 | 10.1 | 9.9 |
| 80 | 10.1 | 9.9 |
| 85 | 10.1 | 9.9 |
| 90 | 10.1 | 9.9 |
| 95 | 10.1 | 9.9 |
| 100 | 10.1 | 9.9 |
| 105 | 10.1 | 9.9 |
| 110 | 10.1 | 9.9 |
| 115 | 10.1 | 9.9 |
| 120 | 10.1 | 9.9 |
| 125 | 10.1 | 9.9 |