Tecnológico de Monterrey

Evaluación (Localización de un robot diferencial)

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Implementación de robótica inteligente

(Gpo 501)

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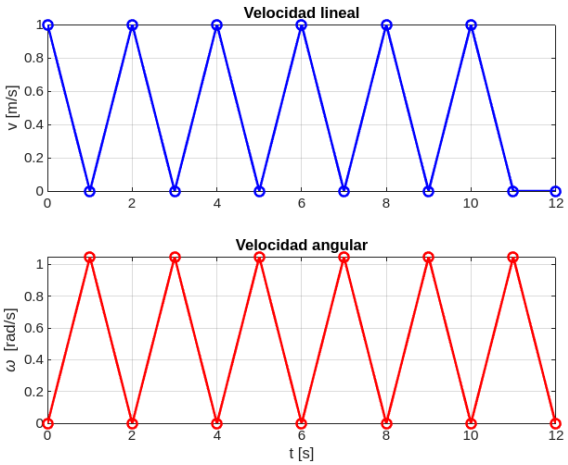
1.- Un robot diferencial se encuentra en la posición inicial (-1, -5, 0º), posteriormente genera el siguiente historial de pasos:

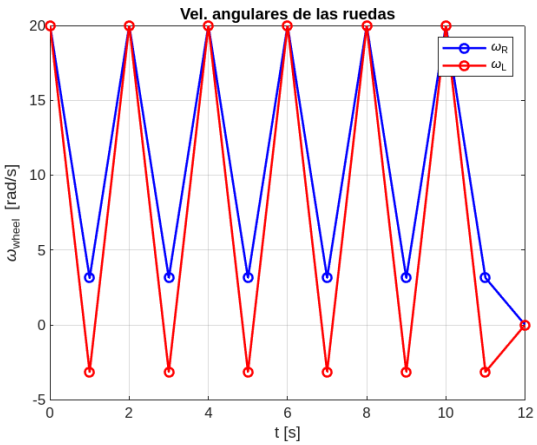
Paso	v(m/s)	ω (rad/s)	Δt (s)
1	1.0	0.0	1.0
2	0.0	π/3	1.0
3	1.0	0.0	1.0
4	0.0	π/3	1.0
5	1.0	0.0	1.0
6	0.0	π/3	1.0
7	1.0	0.0	1.0
8	0.0	π/3	1.0
9	1.0	0.0	1.0
10	0.0	π/3	1.0
11	1.0	0.0	1.0
12	0.0	π/3	1.0

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.

Resultados:

t_s	v_m_s	omega_rad_s	omega_R	omega_L	x_m	y_m	theta_deg
0	1	0	20	20	-1	-5	0
1	0	1.0472	3.1416	-3.1416	0	-5	0
2	1	0	20	20	0	-5	60
3	0	1.0472	3.1416	-3.1416	0.5	-4.134	60
4	1	0	20	20	0.5	-4.134	120
5	0	1.0472	3.1416	-3.1416	3.3307e-16	-3.2679	120
6	1	0	20	20	3.3307e-16	-3.2679	180
7	0	1.0472	3.1416	-3.1416	-1	-3.2679	180
8	1	0	20	20	-1	-3.2679	240
9	0	1.0472	3.1416	-3.1416	-1.5	-4.134	240
10	1	0	20	20	-1.5	-4.134	300
11	0	1.0472	3.1416	-3.1416	-1	-5	300
12	0	0	0	0	-1	-5	360





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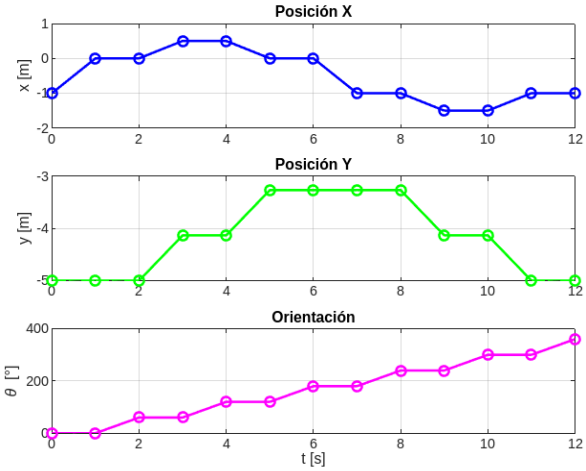

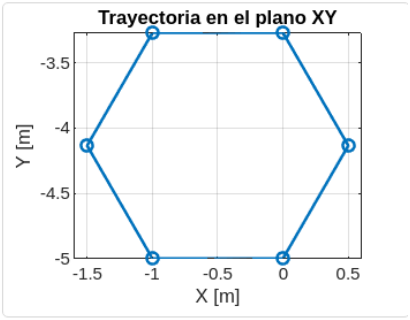

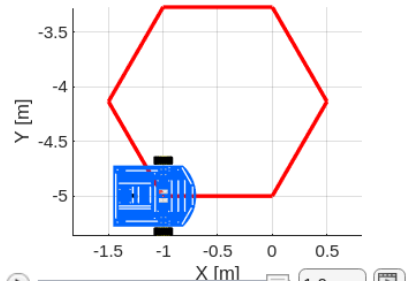

2.- Un robot diferencial con los siguientes parámetros:

Radio de las ruedas: 0.1m.
Distancia entre ruedas (eje): L= 0.4m
Pose inicial $(x_o, y_o, \theta_o) = (0, 0, 0^o)$

Recibe las siguientes señales de entrada:

t (s)	v (m/s)	ω (rad/s)	ω_R (rad/s)	ω_L (rad/s)	x (m)	y (m)	Θ (grados)
0			4.582	1.701			
1			4.773	2.353			
2			5.291	3.676			
3			5.960	4.856			
4			6.490	5.618			
5			-1.168	13.735			
6			-1.364	13.472			
7			5.960	4.856			
8			5.291	3.676			
9			4.773	2.353			
10			4.582	1.701			
11			4.773	2.353			
12			5.291	3.676			
13			5.960	4.856			
14			6.490	5.618			
15			6.686	5.881			
16			6.490	5.618			
17			5.960	4.856			
18			5.291	3.676			
19			4.773	2.353			
20			4.582	1.701			

Completa la tabla y genera la simulación de la trayectoria del robot en Matlab

Resultado:

t_s	v_m_s	omega_rad_s	omega_R	omega_L	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	0.31415	0	41.267
2	0.44835	0.40375	5.291	3.676	0.58196	0.23501	75.931
3	0.5408	0.276	5.96	4.856	0.69095	0.66991	99.064
4	0.6054	0.218	6.49	5.618	0.60575	1.204	114.88
5	0.62835	-3.7257	-1.168	13.735	0.35106	1.7532	127.37
6	0.6054	-3.709	-1.364	13.472	-0.030308	2.2526	-86.101
7	0.5408	0.276	5.96	4.856	0.010856	1.6486	-298.61
8	0.44835	0.40375	5.291	3.676	0.26983	2.1233	-282.8
9	0.3563	0.605	4.773	2.353	0.36914	2.5605	-259.66
10	0.31415	0.72025	4.582	1.701	0.30521	2.9111	-225
11	0.3563	0.605	4.773	2.353	0.083079	3.1332	-183.73
12	0.44835	0.40375	5.291	3.676	-0.27246	3.1564	-149.07
13	0.5408	0.276	5.96	4.856	-0.65705	2.9259	-125.94
14	0.6054	0.218	6.49	5.618	-0.97444	2.4881	-110.12
15	0.62835	0.20125	6.686	5.881	-1.1827	1.9196	-97.632
16	0.6054	0.218	6.49	5.618	-1.2662	1.2968	-86.101
17	0.5408	0.276	5.96	4.856	-1.225	0.69284	-73.611
18	0.44835	0.40375	5.291	3.676	-1.0724	0.17401	-57.797
19	0.3563	0.605	4.773	2.353	-0.83348	-0.20537	-34.664
20	0.31415	0.72025	4.582	1.701	-0.54042	-0.40802	-3.1806e-14

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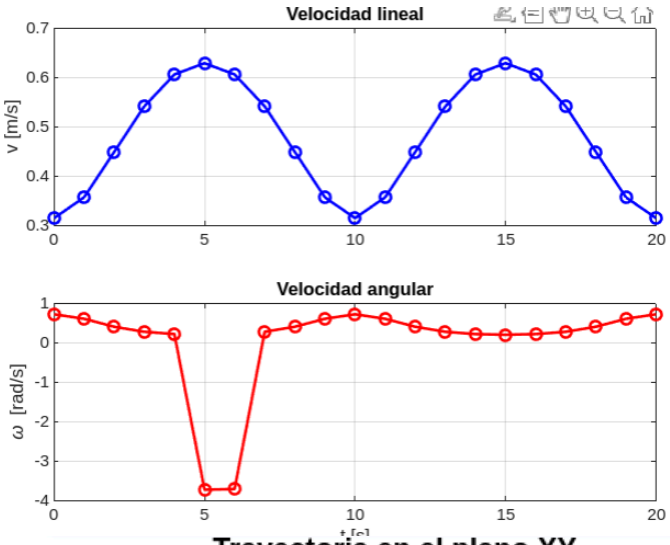

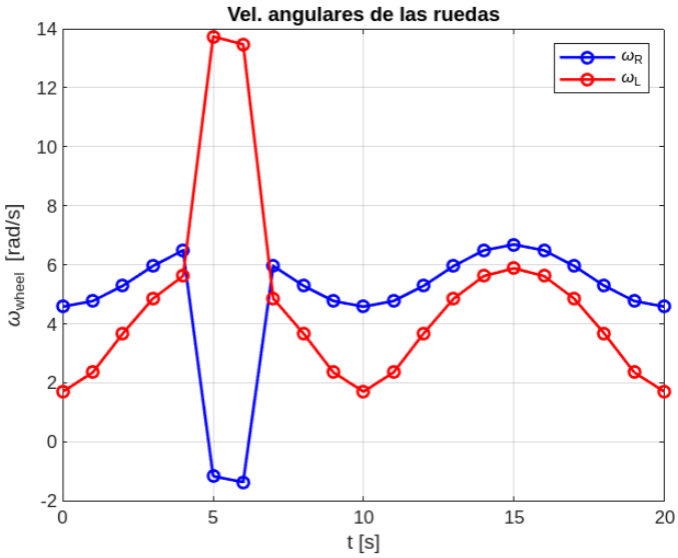

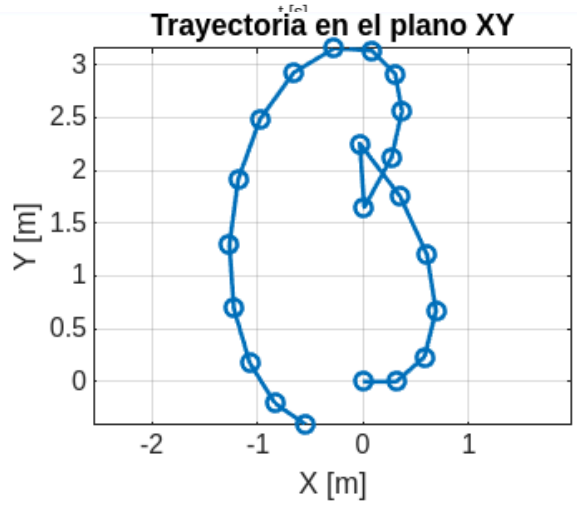

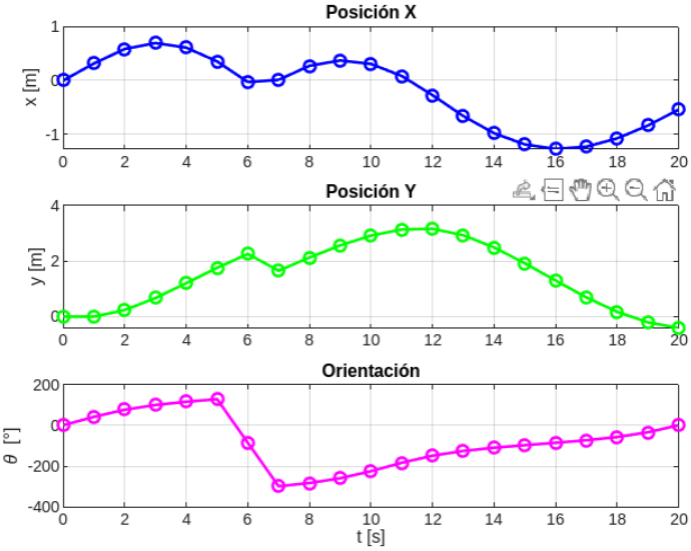

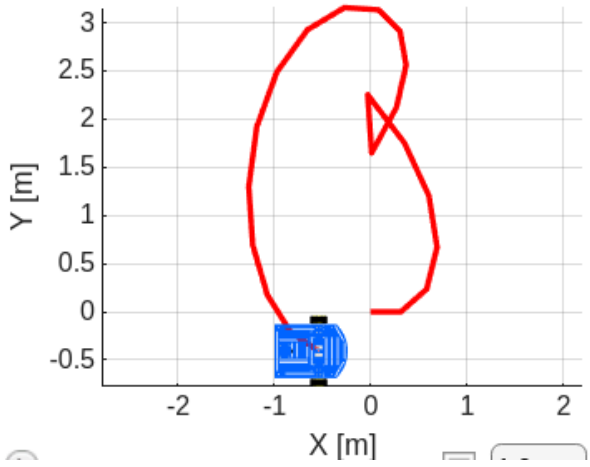

3.- Considerando los parámetros del robot descrito en el reactivo 2. Obtén la tabla de las señales de entrada **ω_R (rad/s)** y **ω_L (rad/s)** requeridas en cada instante de muestreo si se desea obtener una trayectoria circular con un radio de 20m, cuyo centro sea el origen (0, 0). Genera la simulación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

Resultados:

t_s	omega_R	omega_L	x_m	y_m	theta_deg
0	10.1	9.9	20	0	90
1	10.1	9.9	20	1	92.865
2	10.1	9.9	19.95	1.9988	95.73
3	10.1	9.9	19.85	2.9938	98.594
4	10.1	9.9	19.701	3.9825	101.46
5	10.1	9.9	19.502	4.9626	104.32
6	10.1	9.9	19.255	5.9315	107.19
7	10.1	9.9	18.959	6.8868	110.05
8	10.1	9.9	18.616	7.8262	112.92
9	10.1	9.9	18.227	8.7473	115.78
10	10.1	9.9	17.792	9.6477	118.65
11	10.1	9.9	17.312	10.525	121.51
12	10.1	9.9	16.79	11.378	124.38
13	10.1	9.9	16.225	12.203	127.24
14	10.1	9.9	15.62	12.999	130.11

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109	10.1	9.9	13.082	-14.635	402.26
110	10.1	9.9	13.822	-13.962	405.13
111	10.1	9.9	14.527	-13.254	407.99
112	10.1	9.9	15.197	-12.51	410.86
113	10.1	9.9	15.828	-11.735	413.72
114	10.1	9.9	16.42	-10.929	416.59
115	10.1	9.9	16.97	-10.094	419.45
116	10.1	9.9	17.479	-9.2329	422.32
117	10.1	9.9	17.943	-8.3473	425.18
118	10.1	9.9	18.363	-7.4397	428.05
119	10.1	9.9	18.737	-6.5122	430.91
120	10.1	9.9	19.064	-5.5672	433.77
121	10.1	9.9	19.343	-4.6071	436.64
122	10.1	9.9	19.574	-3.6341	439.5
123	10.1	9.9	19.757	-2.6509	442.37
124	10.1	9.9	19.889	-1.6597	445.23
125	10.1	9.9	19.972	-0.66317	448.1

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