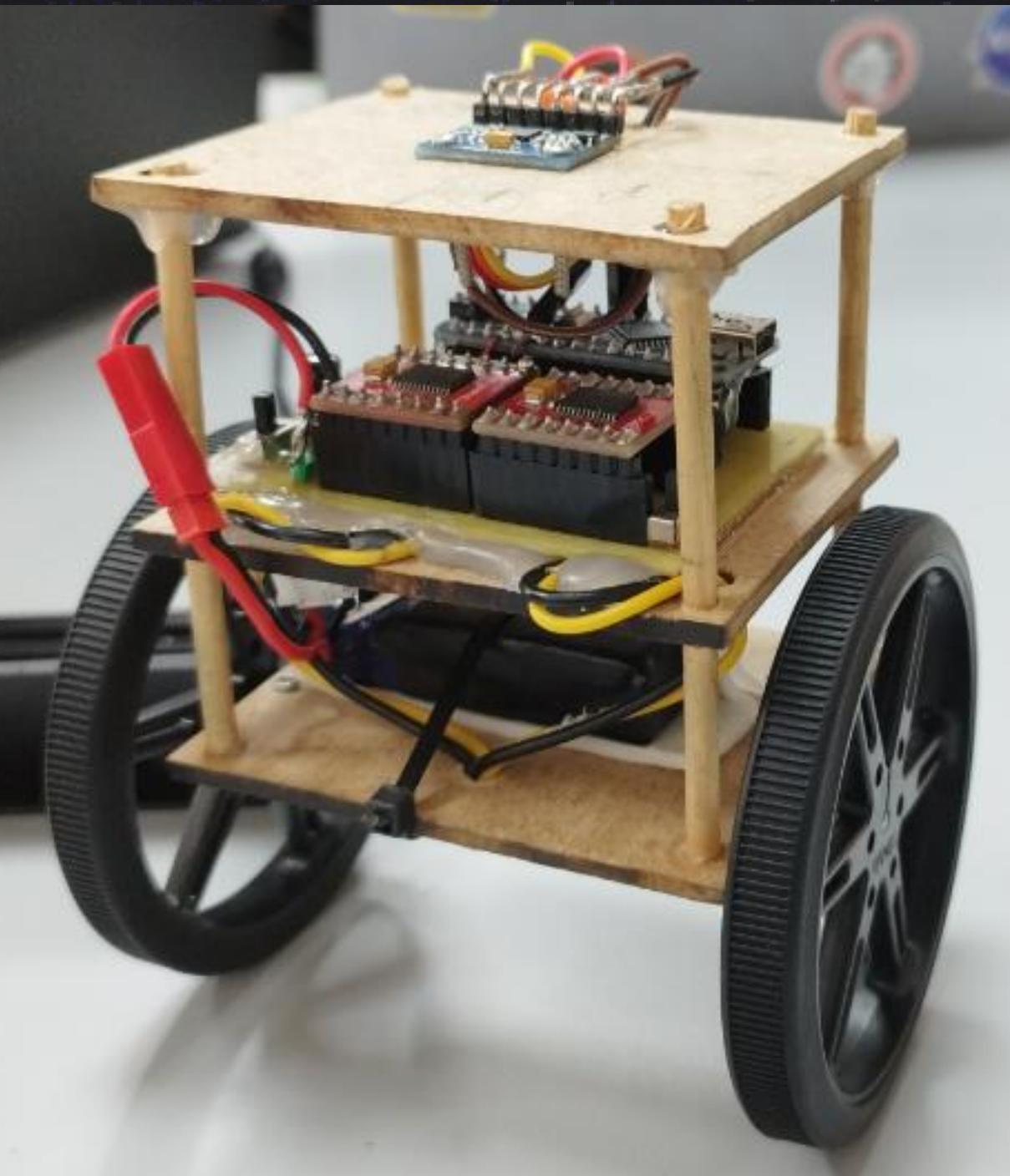


Robobot: Diseño e implementación de control LQR para un Robot tipo balancín



ESPAZIO DE ESTADOS

MATRIZ A

0	1	0	0
0	0	-9.415	0
0	0	0	1
0	0	-192.2	0

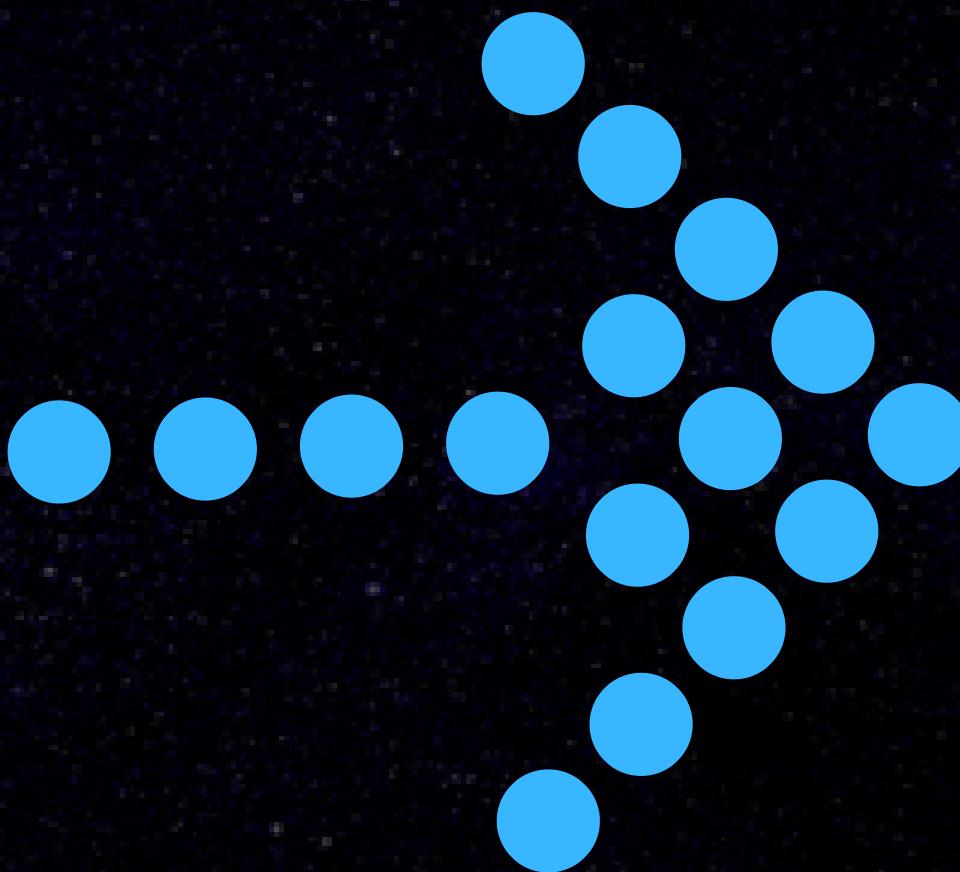
MATRIZ B

0
141.1
0

MATRIZ C

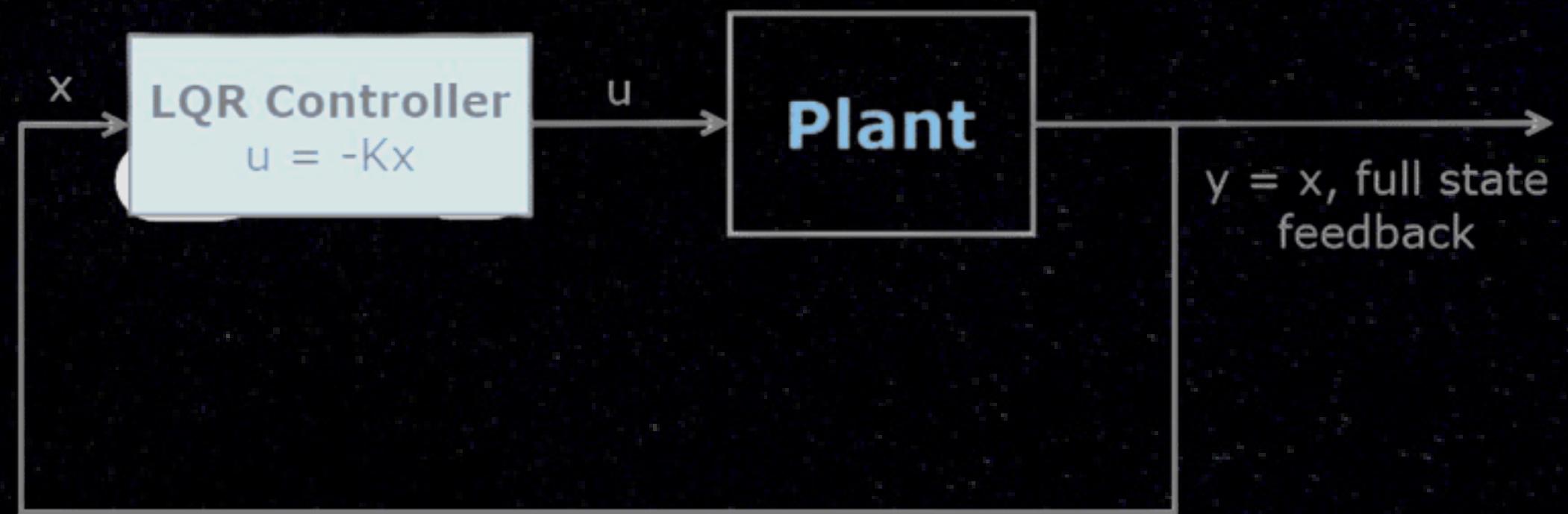
1	0	0	0
---	---	---	---

$f(x)$



CONTROL LQR

DISEÑO



VALORES INICIALES PARA LAS FUNCIONES DE COSTO

MATRIZ Q

1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1

VALOR DE R

1

MATRIZ CONTROLADA

MATRIZ A

0	1	0	0
-141.1	-203.2	-702.9	-122.4
0	0	0	1
-1441	-2075	-7274	-1250

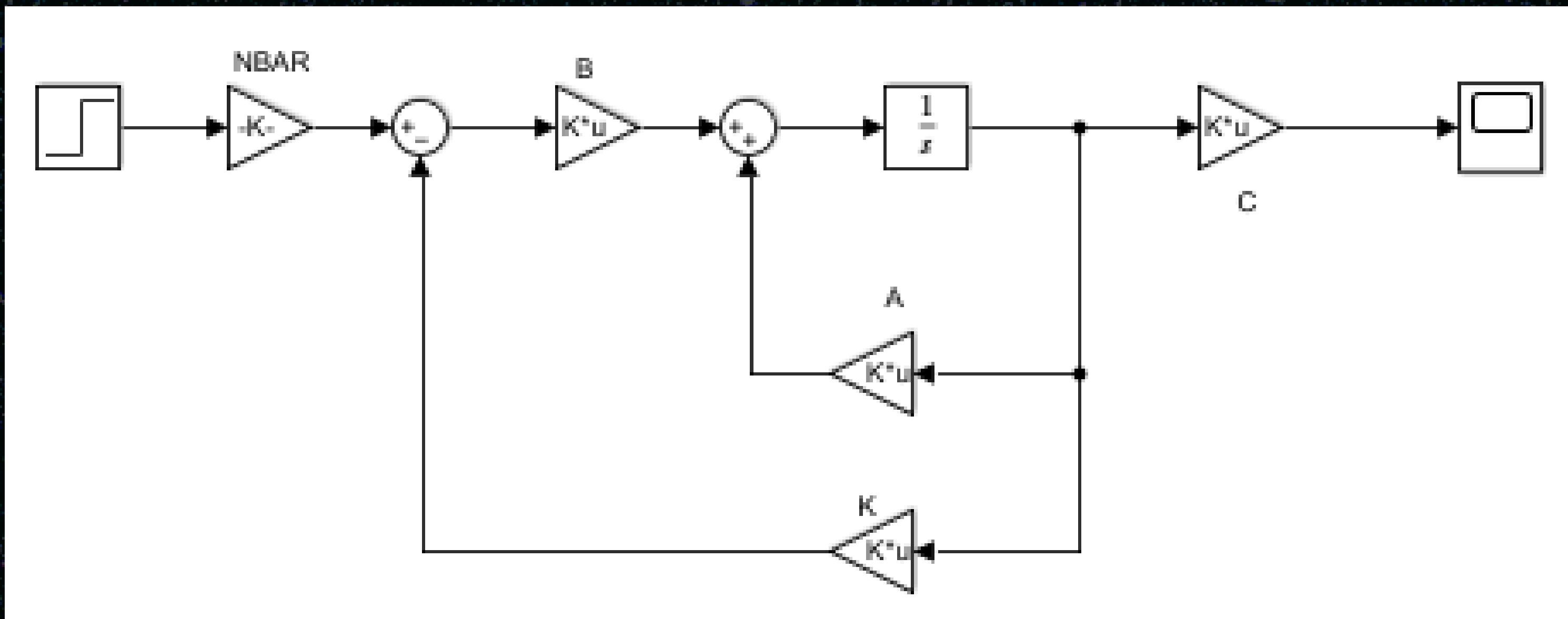
MATRIZ B

0
141.1
0
1441

MATRIZ C

1	0	0	0
0	0	0	0

SIMULACIÓN EN SIMULINK



K:

1.0000

1.4400

4.9147

0.8672

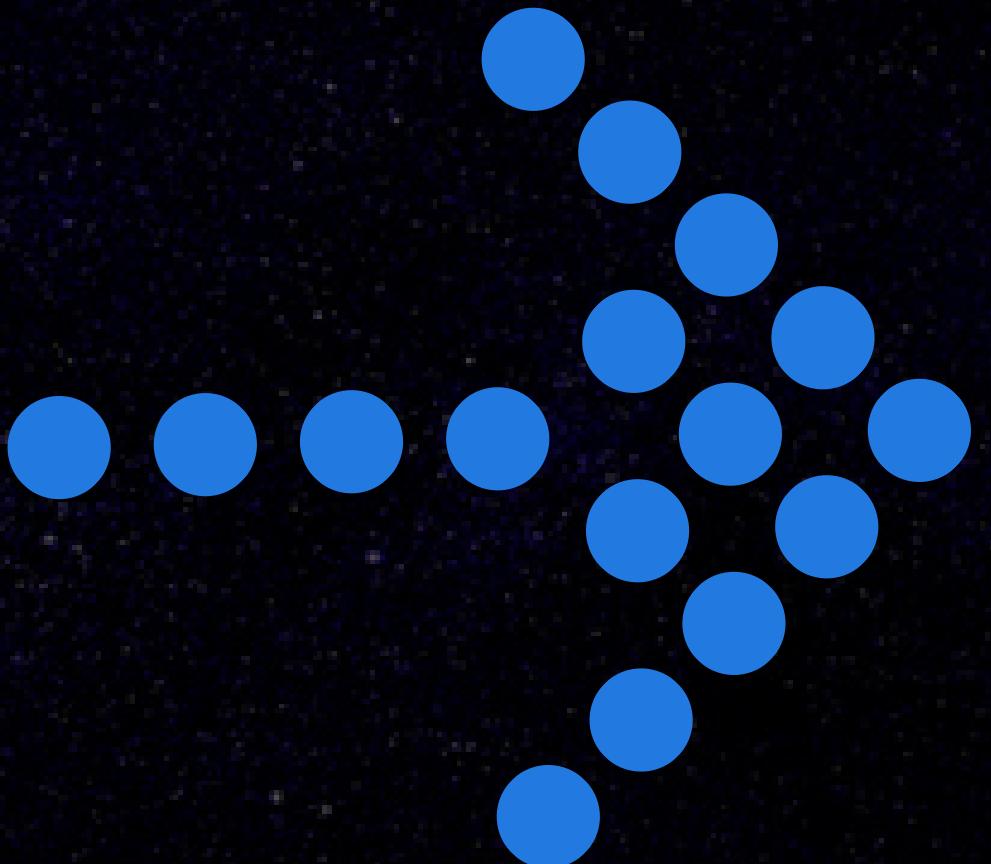
MATRIZ DE RICCATI Y GANANCIAS K

MATRIZ DE RICATTI

1.4400	0.5367	0.8672	-0.0519
0.5367	0.6807	1.3007	-0.0657
0.8672	1.3007	4.9953	-0.1239
-0.0519	-0.0657	-0.1239	0.0070

MATRIZ DE GANANCIAS K

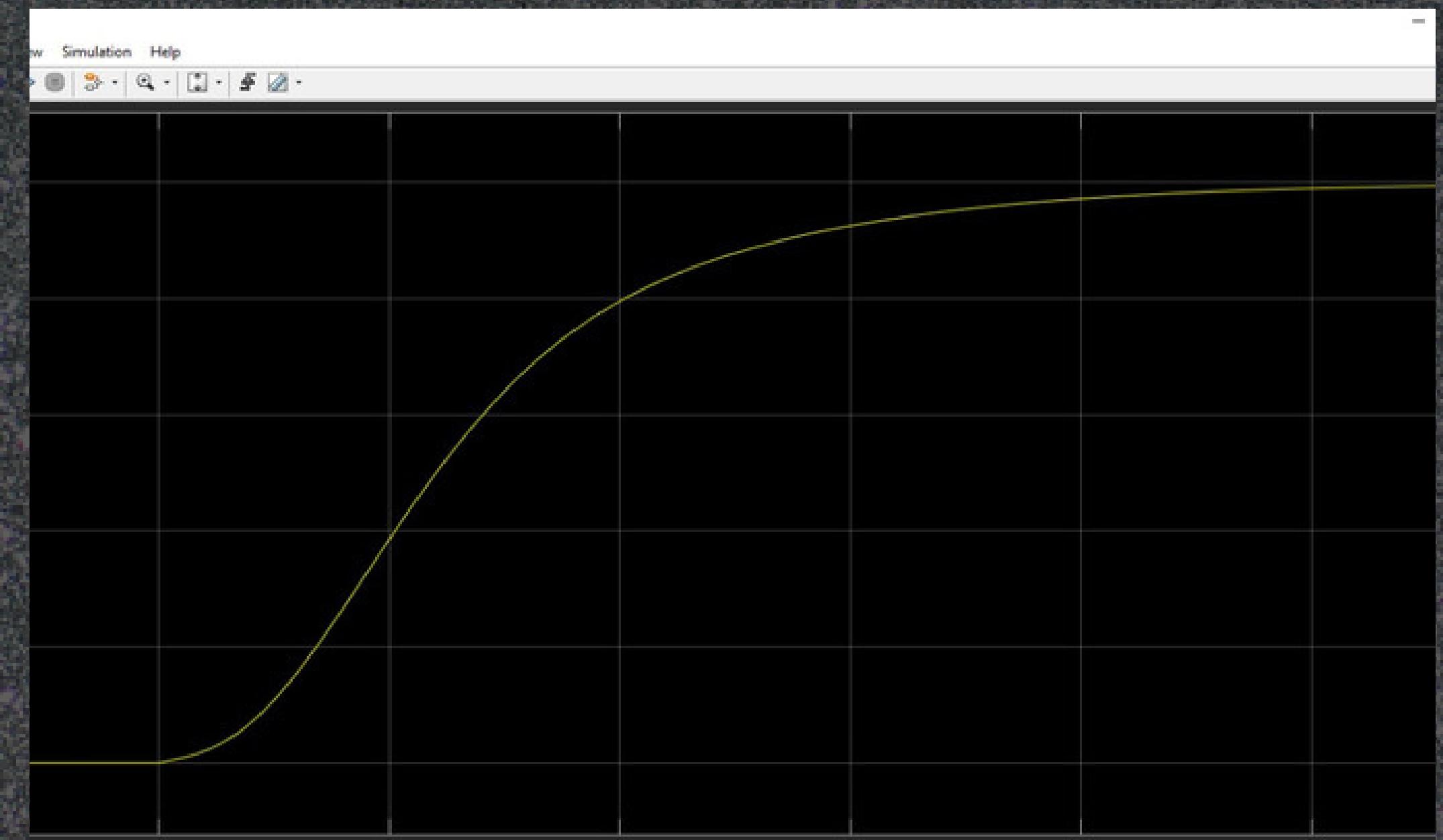
1.0000	1.4400	4.9147	0.8672
--------	--------	--------	--------



DESEMPEÑO

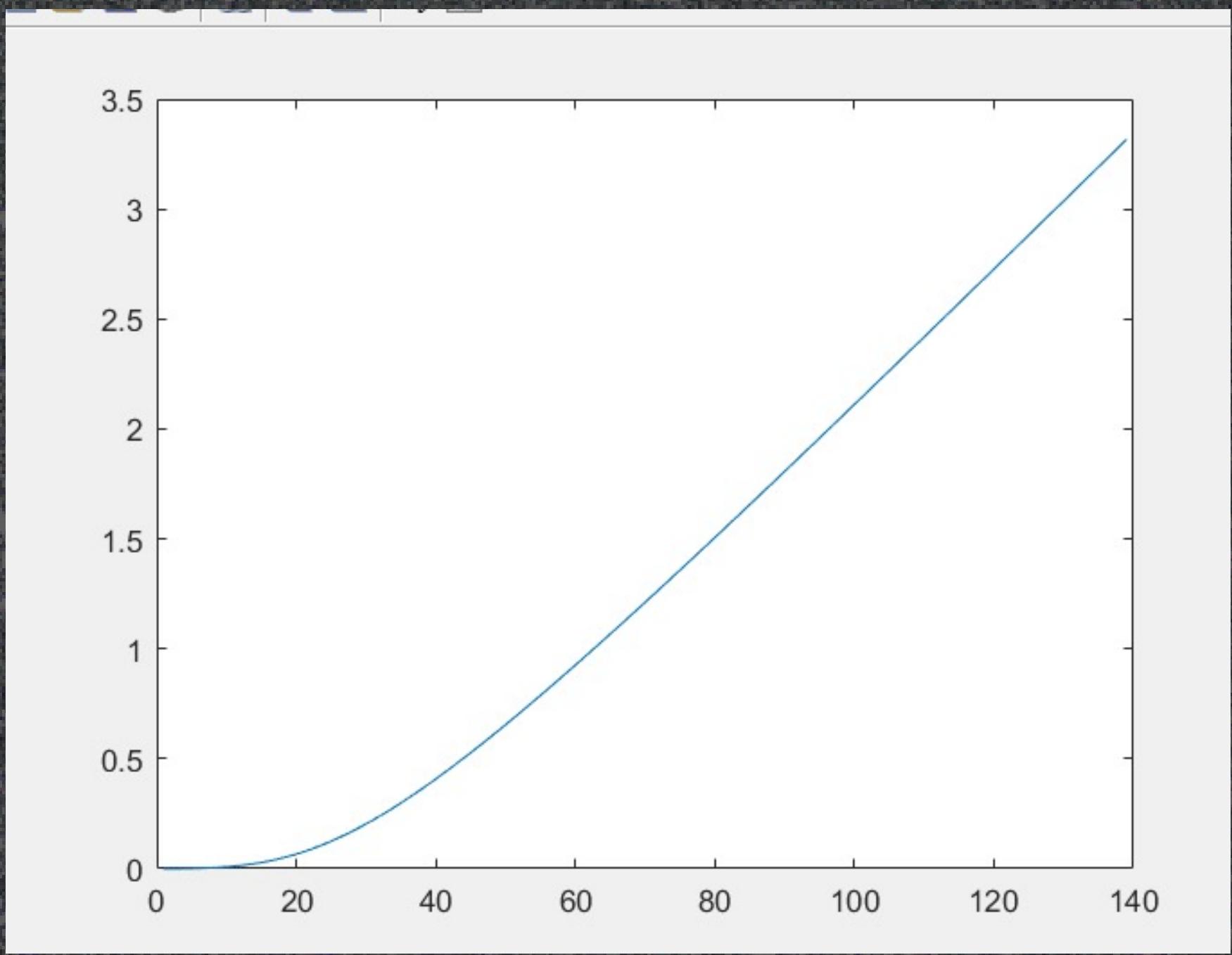


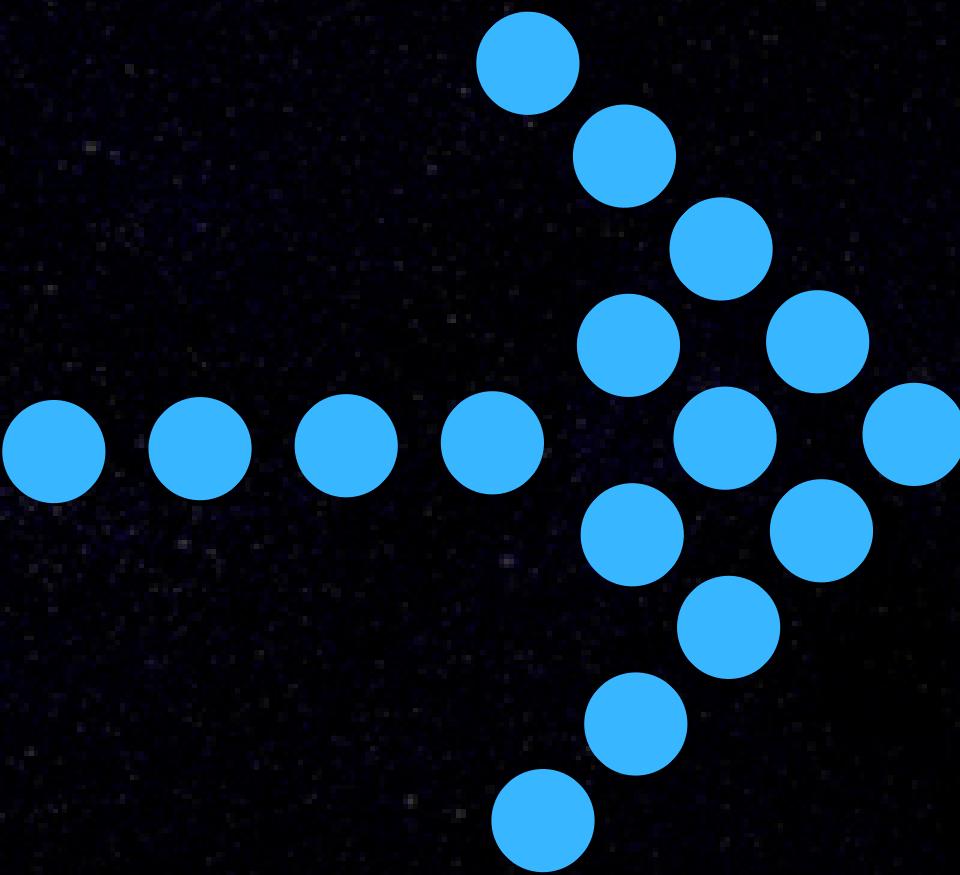
DESEMPEÑO DEL CONTROL LQR



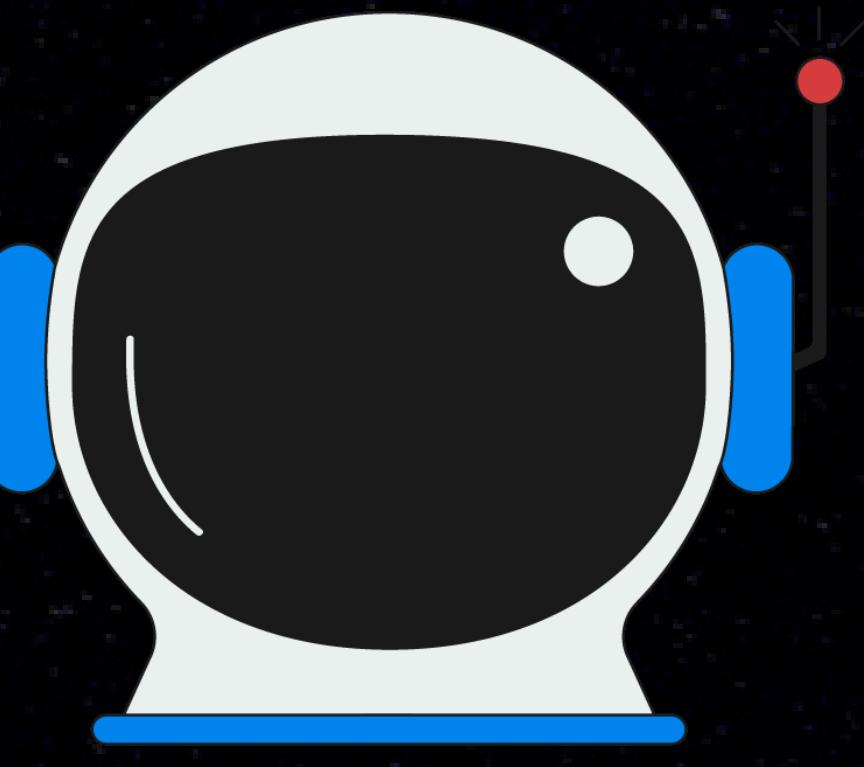
- RiseTime: 2.2166
- SettlingTime: 4.3300
- SettlingMin: 0.9034
- SettlingMax: 0.9992
- Overshoot: 0
- Undershoot: 0
- Peak: 0.9992
- PeakTime: 7.5698

CONSUMO DEL CONTROL LQR





SIMULACIONES EN MATLAB



1. VALORES INICIALES PARA LAS FUNCIONES DE COSTO

MATRIZ Q

15	0	0	0
0	15	0	0
0	0	15	0
0	0	0	15

VALOR DE R

0.0254

MATRIZ DE RICCATI Y GANANCIAS K

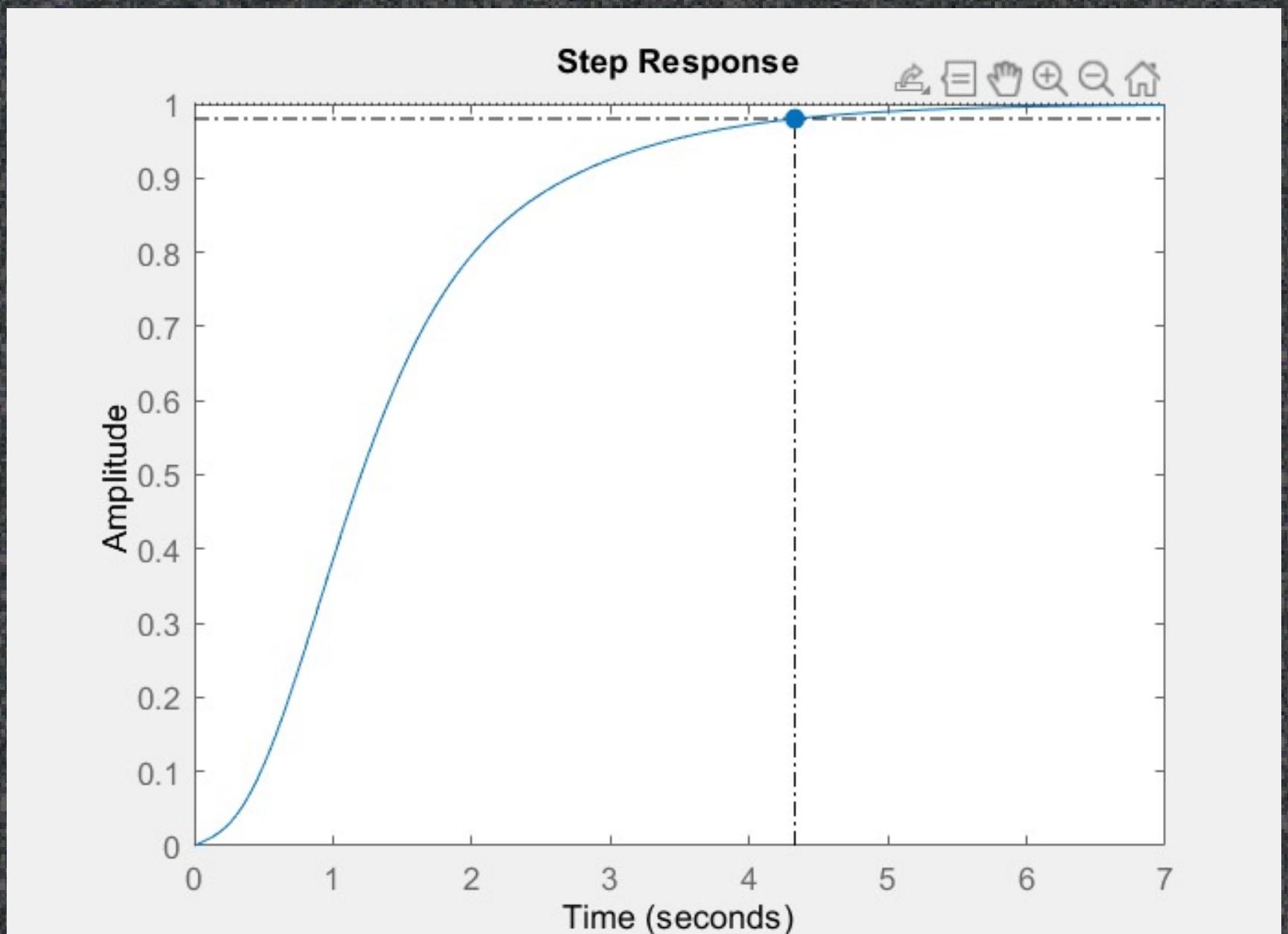
MATRIZ DE RICCATI

21.5876	8.0342	12.9601	-0.7863
8.0342	10.1846	19.4381	-0.9966
12.9601	19.4381	74.6581	-1.9012
-0.7863	-0.9966	-1.9012	0.0980

MATRIZ DE GANANCIAS K

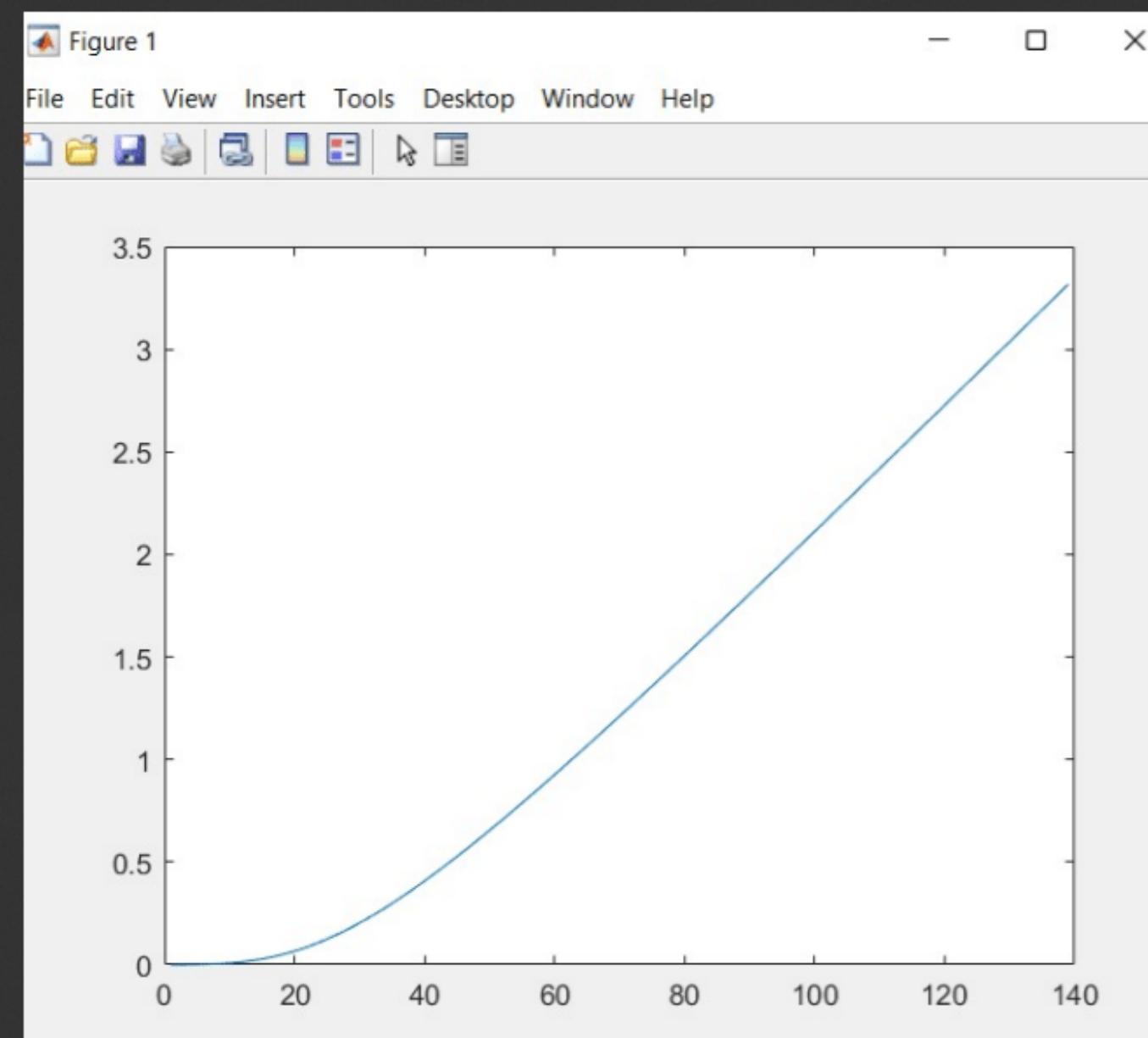
24.3013	34.9738	122.2810	20.9965
---------	---------	----------	---------

DESEMPEÑO DEL CONTROL LQR



- RiseTime: 2.2165
- SettlingTime: 4.3294
- SettlingMin: 0.9036
- SettlingMax: 0.9992
- Overshoot: 0
- Undershoot: 0
- Peak: 0.9992
- PeakTime: 7.5736
- TIEMPO DE ESTABILIZACIÓN=4.33
- ESFUERZO CONSUMO= 106.4534

Ascenso del consumo



- Tiempo de estabilización= 4.33 s
- Esfuerzo=106.4534

2. VALORES INICIALES PARA LAS FUNCIONES DE COSTO

MATRIZ Q

1000	0	0	0
0	100	0	0
0	0	100	0
0	0	0	100

VALOR DE R

1

MATRIZ DE RICCATI Y GANANCIAS K

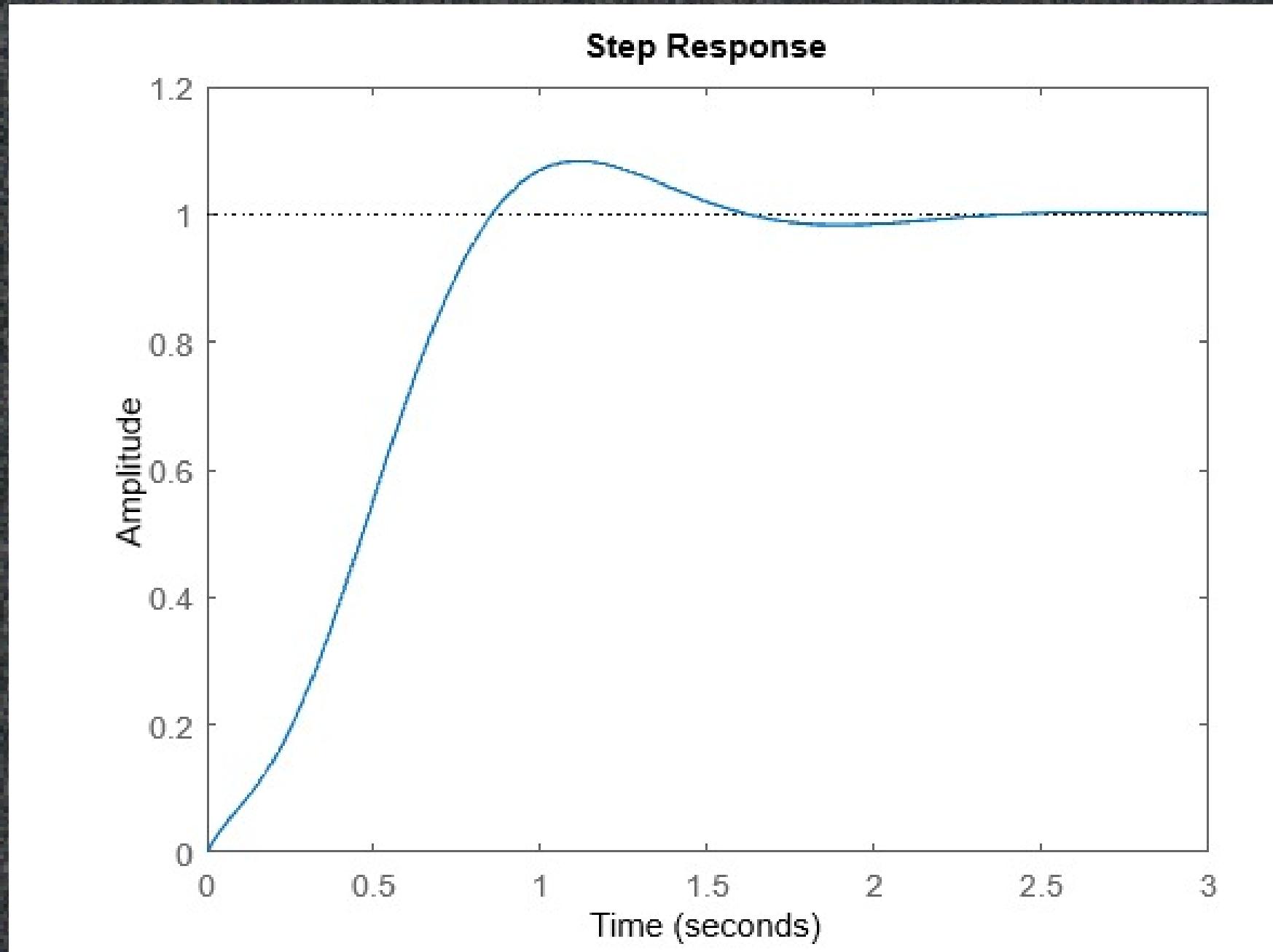
MATRIZ DE RICCATI

14.3922	5.3567	8.6421	-0.5238
5.3567	6.7906	12.9617	-0.6639
8.6421	12.9617	49.7825	-1.2657
-0.5238	-0.6639	-1.2657	0.0656

MATRIZ DE GANANCIAS K

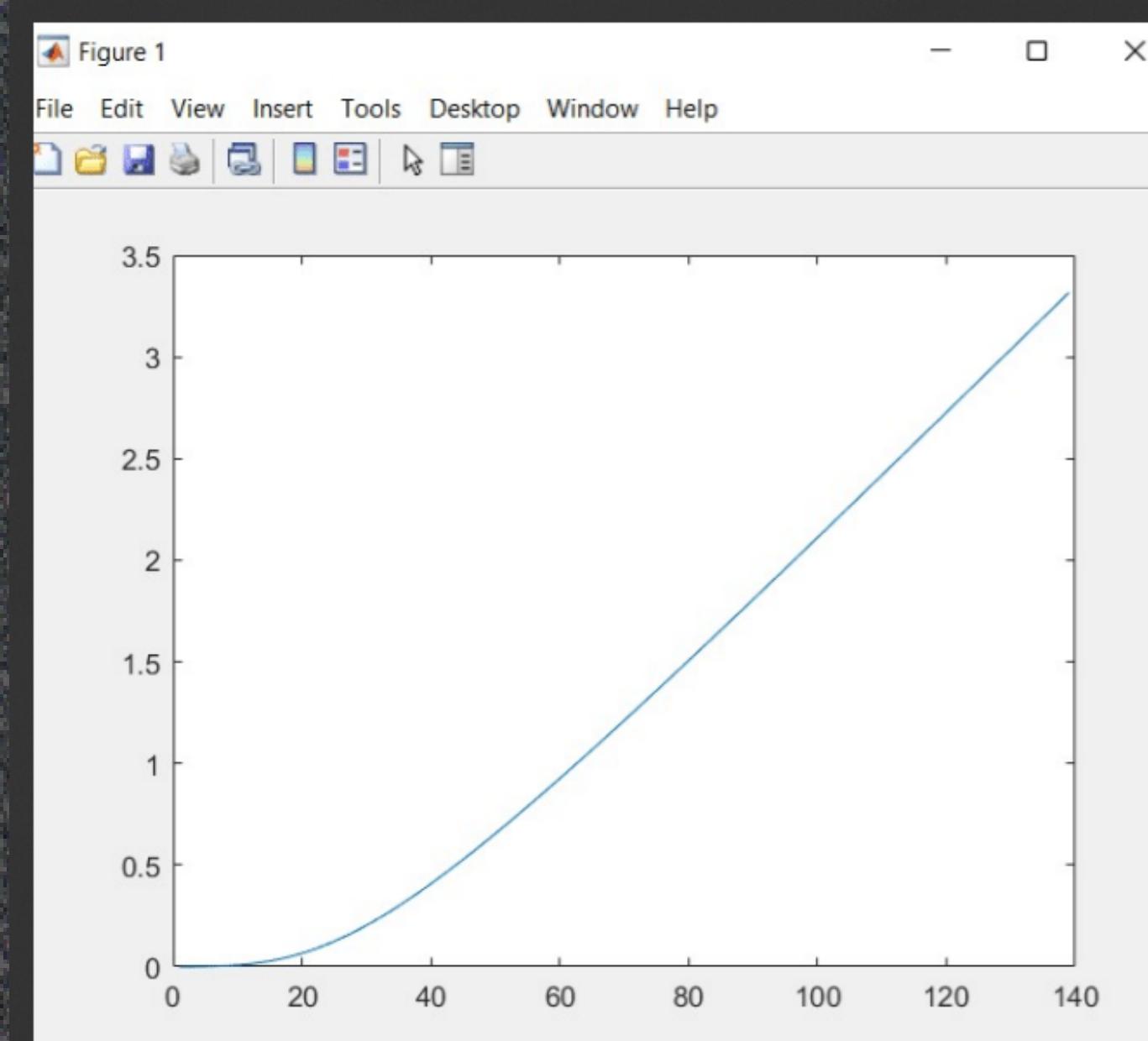
10	14.3922	50.2460	8.6421
----	---------	---------	--------

DESEMPEÑO DEL CONTROL LQR



- RiseTime: 2.2165
- SettlingTime: 4.3295
- SettlingMin: 0.9036
- SettlingMax: 0.9992
- Overshoot: 0
- Undershoot: 0
- Peak: 0.9992
- PeakTime: 7.5736

Ascenso del consumo



- Tiempo de estabilización= 4.33 s
- Esfuerzo=106.4523

3. VALORES INICIALES PARA LAS FUNCIONES DE COSTO

MATRIZ Q

1	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

VALOR DE R

1

MATRIZ DE RICCATI Y GANANCIAS K

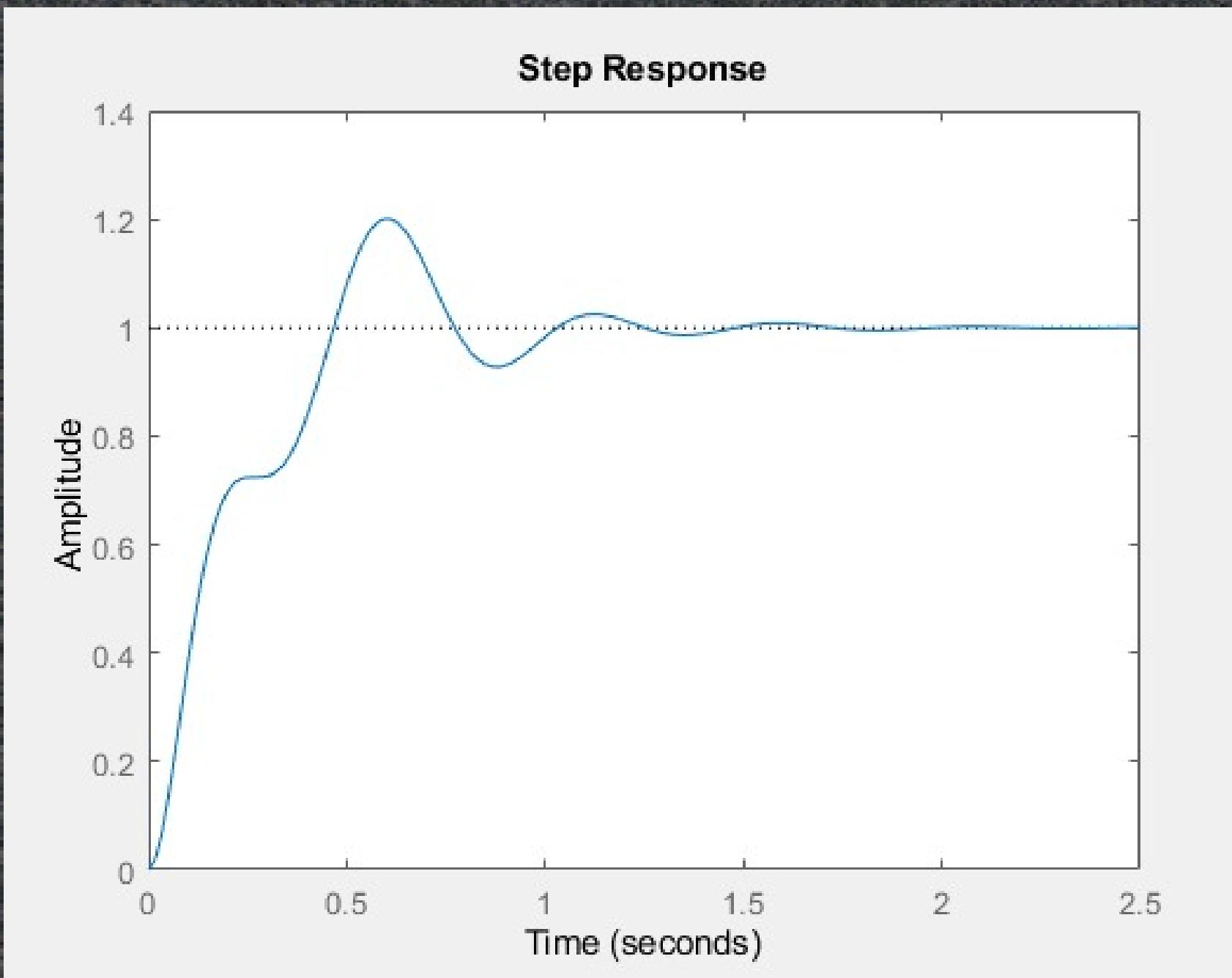
MATRIZ DE RICCATI

0.1556	0.0121	-0.0048	-0.0005
0.0121	0.0024	-0.0003	-0.0001
-0.0048	-0.0003	0.0006	0
-0.0005	-0.0001	0	0

MATRIZ DE GANANCIAS K

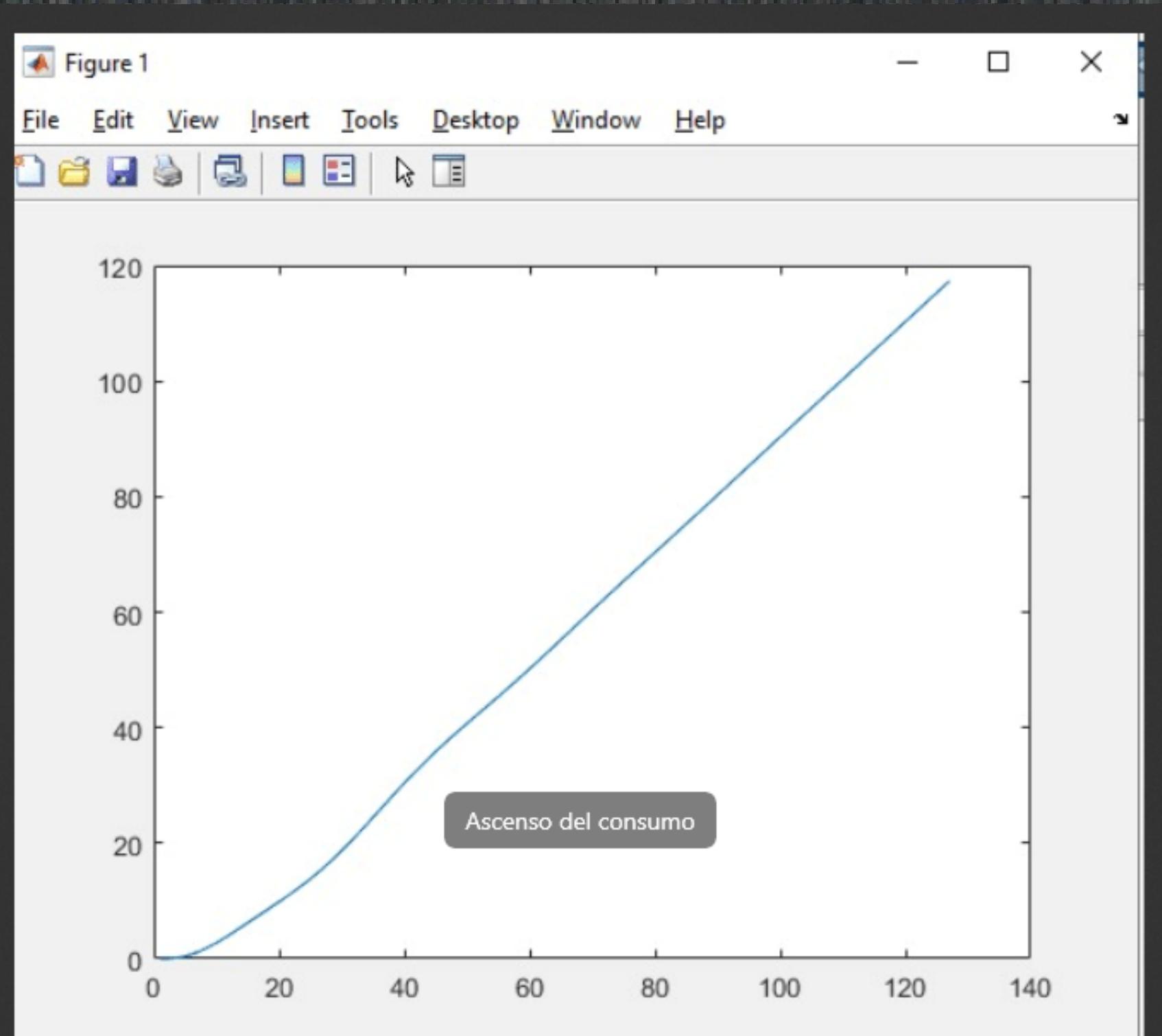
1	0.1556	-0.0195	-0.0048
---	--------	---------	---------

DESEMPEÑO DEL CONTROL LQR



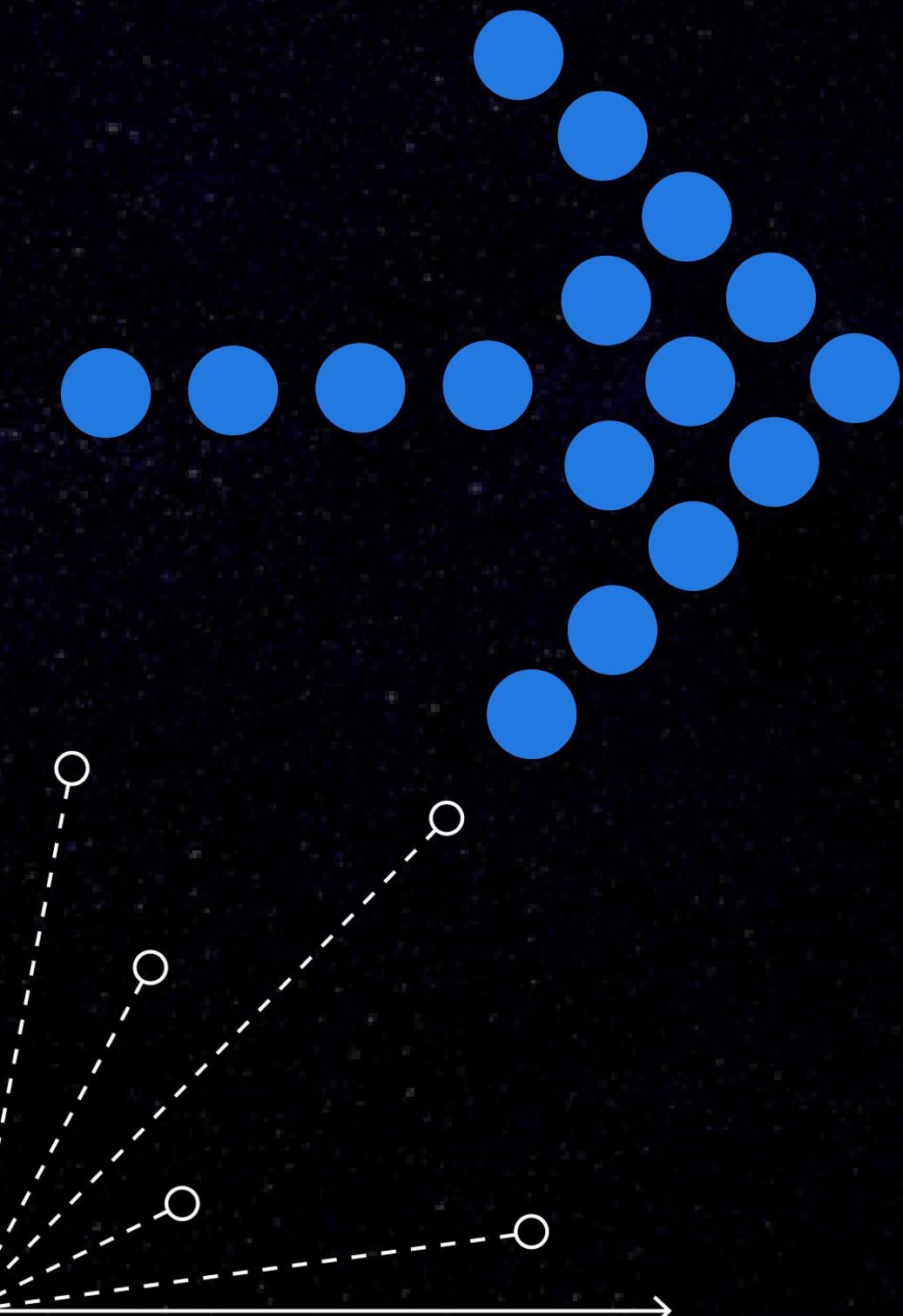
- RiseTime: 0.3856
- SettlingTime: 1.1698
- SettlingMin: 0.9276
- SettlingMax: 1.2008
- Overshoot: 20.0823
- Undershoot: 0
- Peak: 1.2008
- PeakTime: 0.5931

Ascenso del consumo

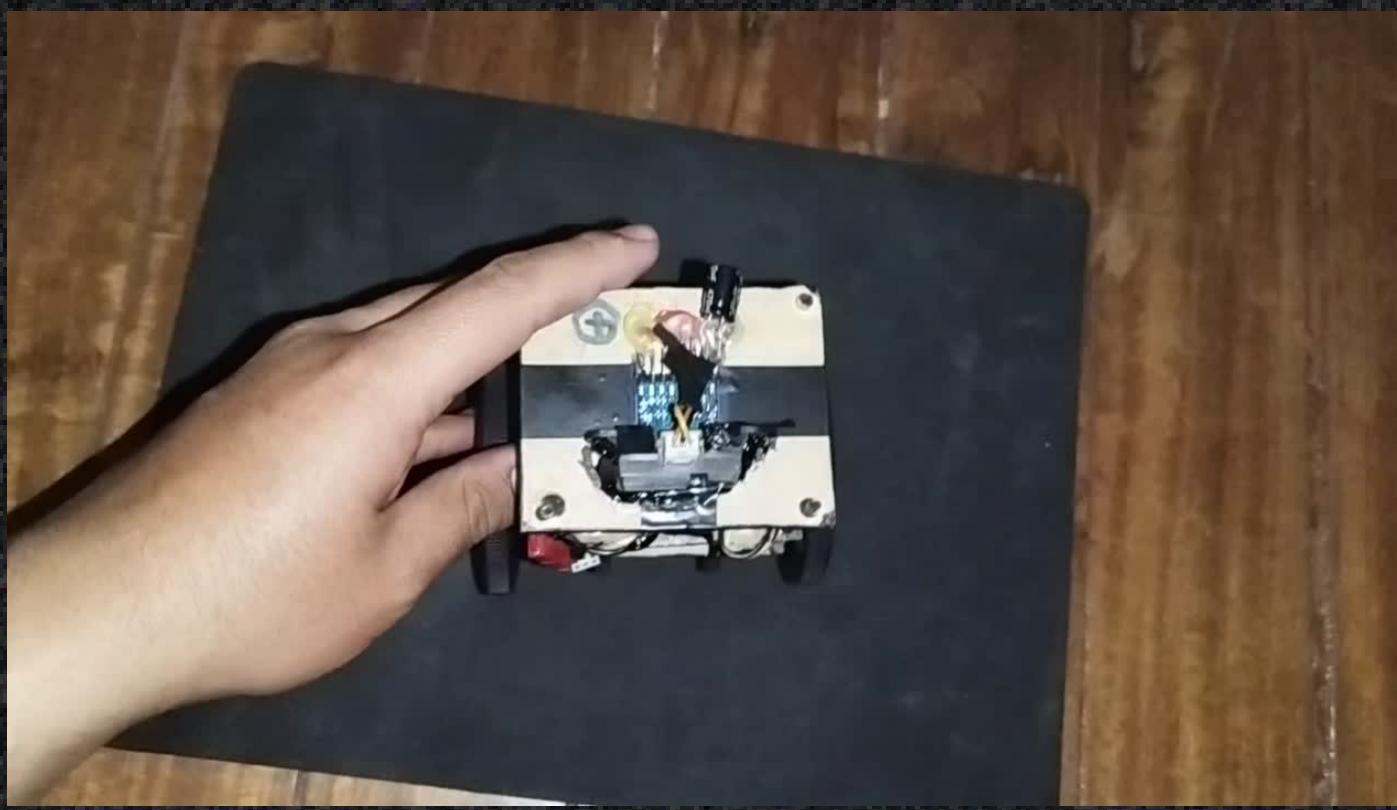
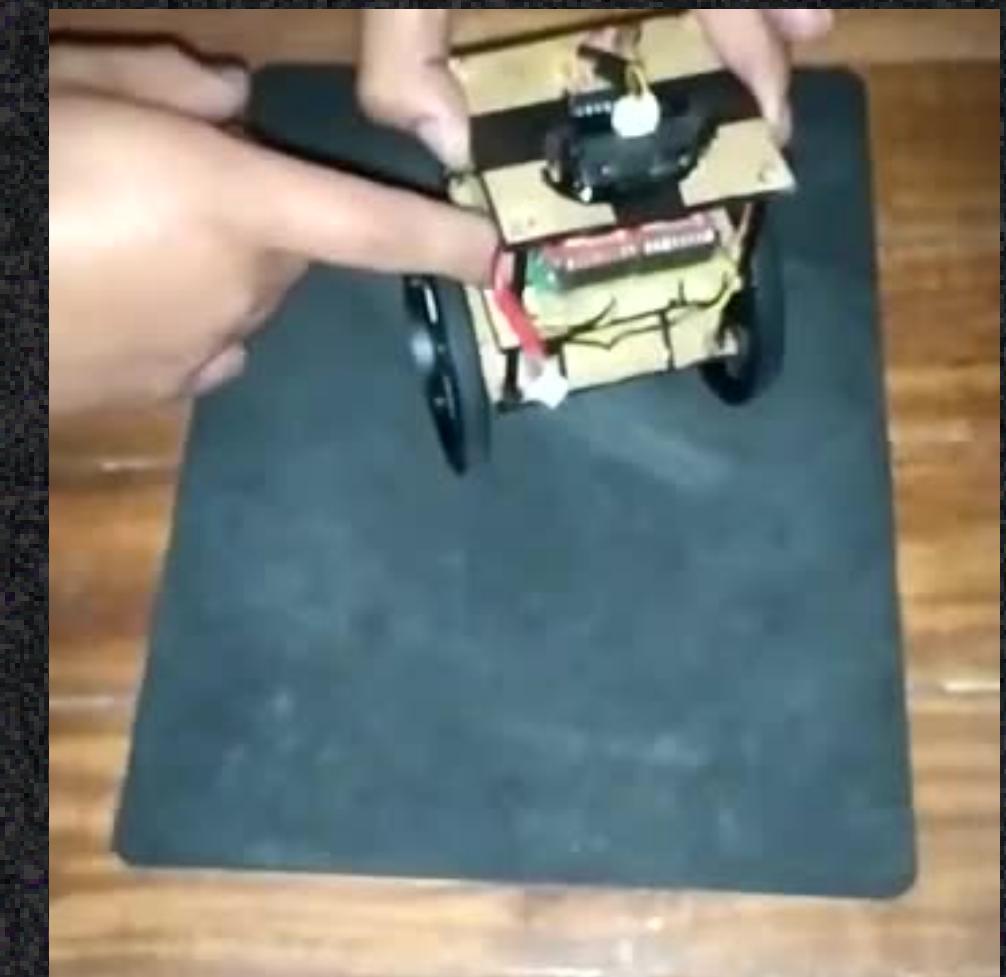


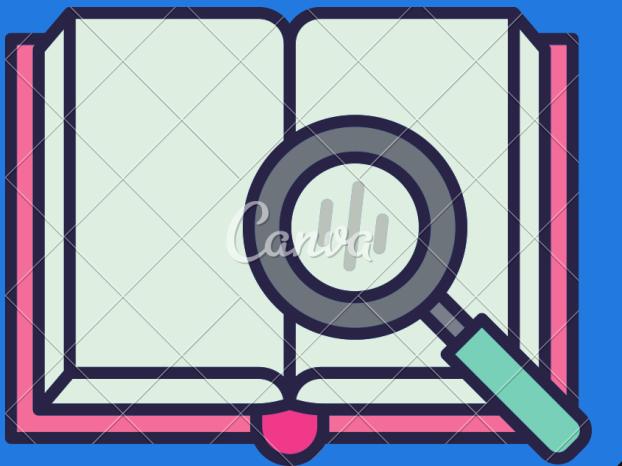
- Tiempo de estabilización= 1.17 s
- Esfuerzo= 117.3176

IMPLEMENTACION



VIDEOS:





BIBLIOGRAFÍA

LQR CONTROL

<https://drive.google.com/file/d/1HBY6u7q3DIyGf8npcriYDcEqIls7Xq-DS/view?usp=sharing>
<https://drive.google.com/file/d/1rWt8OJfALZ3hAgXhkbrf4hXow-xgHp6r/view?usp=sharing>

ESTADO DEL ARTE

<https://drive.google.com/drive/folders/11u83Fj0OH8jXftq8-SaTluw9mk1gILCB?usp=sharing>

THAAN
YOO