Taller: Control Robusto y Estocástico

Tema: Control $\mathscr{H}_\infty$ de información completa

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Ejercicio 01. $\mathscr{H}_2$

```
clc, clear all, close all
```

Set random seed for reproducibility

```
rng(5, 'twister');
```

Generate a random state-space system and transpose it. This command creates a 4-output, 5-input stable model and then takes its Hermitian conjugate. This operation yields a 5-output, 4-input unstable model

```
P = rss(3, 4, 5)';  % 3 states, 5 inputs, 4 outputs → transposed: 4 inputs, 5
outputs
pole(P)             % Confirm that P is unstable. All the poles are in the right
half-plane.
```

Display state-space matrices

```
A = P.A
B = P.B
C = P.C
D = P.D

disp('Matrix A:'); disp(A);
disp('Matrix B:'); disp(B);
disp('Matrix C:'); disp(C);
disp('Matrix D:'); disp(D);
```

Controllability and observability analysis

```
ctrbRank = rank(ctrb(A, B))
obsvRank = rank(obsv(A, C))
```

Step Response

```
step(P)
title('Step Response of P');
grid on
```

Impulse response

```
impulse(P)
title('Impulse Response of P');
grid on
```

Frequency response (Bode plot)

```
bode(P)
title('Bode Plot of P');
grid on
```

Pole-zero map

```
pzmap(P)
title('Pole-Zero Map of P');
grid on
```

Controller synthesis

```
[K,CL,GAM] = h2syn(P,2,1);
disp('Controller K:'); disp(K); K
disp('Closed-Loop CL:'); disp(CL);
disp('Gamma:'); disp(GAM);
```