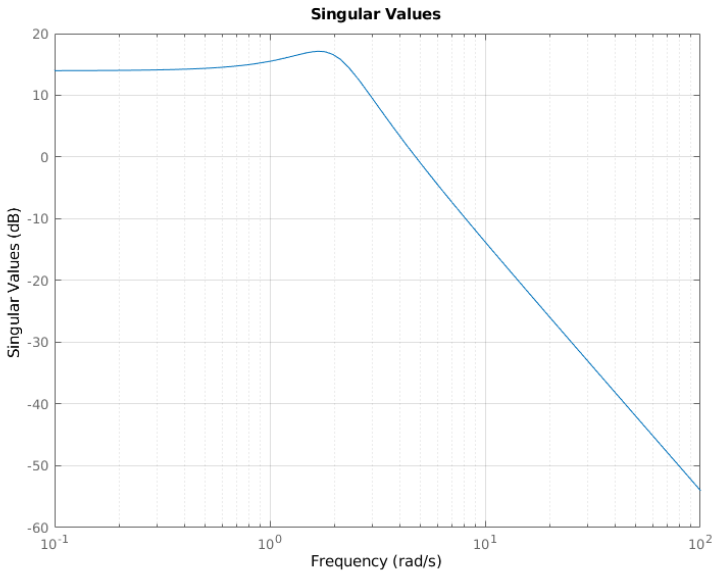
Ejemplo Glover Mc-Farlane Loop Shaping (SISO)

Presentación en vídeo: http://personales.upv.es/asala/YT/V/gmfml.html

Tabla de Contenidos

Estructura de 1 grado de libertad

```
s=tf('s');
G=5*4/(s^2+1.5*s+4); %planta escalada
sigma(G), grid on
```

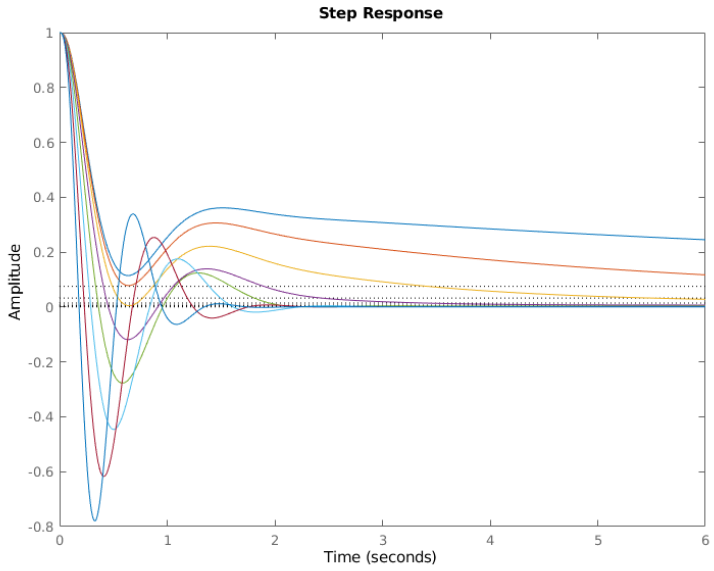



```
kf=0;
clear CLdyy CLdyU CLduy OL
for bw=logspace(log10(0.1),log10(40),8)
    kf=kf+1;
    bw
    Wy=(s+bw)/(s+0.02);
    Wu=1/(s/25+1); %por ancho de banda de actuador y más incert. a alta frec....
    [K,CLLL,GAM,~]=ncfsyn(G,Wu,Wy);
    GAM
    margenestabilidadplantaponderada=1/GAM
    OL{kf}=Wy*G*Wu;
    CLdyy{kf}=feedback(1,minreal(-G*K));%output disturbances to y
    CLduy{kf}=feedback(minreal(G),-K);%response of y to input disturbances
    CLdyU{kf}=feedback(minreal(-K),G); %output disturbance to control action
```

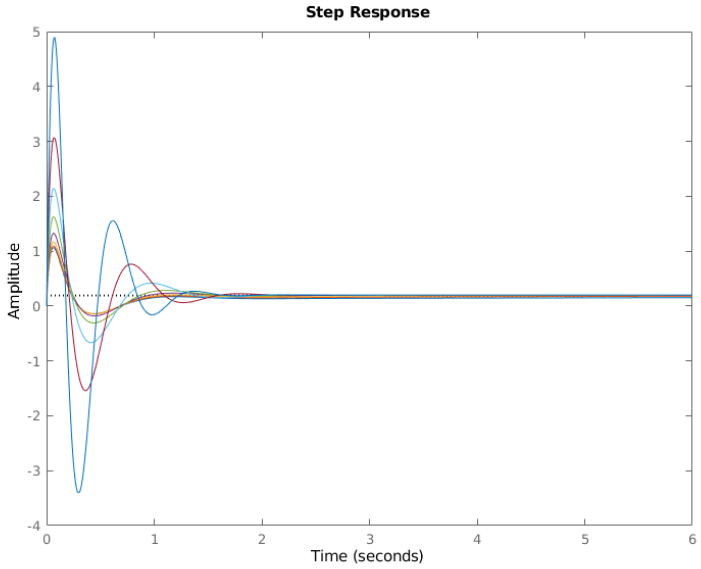
```
    margendeestabilidadsinescalado=ncfmargin(G,-K)
end
```

```
bw = 0.1000
GAM = 2.0969
margenestabilidadplantaponderada = 0.4769
margendeestabilidadsinescalado = 0.4745
bw = 0.2354
GAM = 2.1428
margenestabilidadplantaponderada = 0.4667
margendeestabilidadsinescalado = 0.4647
bw = 0.5539
GAM = 2.2487
margenestabilidadplantaponderada = 0.4447
margendeestabilidadsinescalado = 0.4440
bw = 1.3037
GAM = 2.4824
margenestabilidadplantaponderada = 0.4028
margendeestabilidadsinescalado = 0.4026
bw = 3.0683
GAM = 2.9414
margenestabilidadplantaponderada = 0.3400
margendeestabilidadsinescalado = 0.3315
bw = 7.2213
GAM = 3.6655
margenestabilidadplantaponderada = 0.2728
margendeestabilidadsinescalado = 0.2333
bw = 16.9956
GAM = 4.5533
margenestabilidadplantaponderada = 0.2196
margendeestabilidadsinescalado = 0.1378
bw = 40.0000
GAM = 5.4655
margenestabilidadplantaponderada = 0.1830
margendeestabilidadsinescalado = 0.0734
```

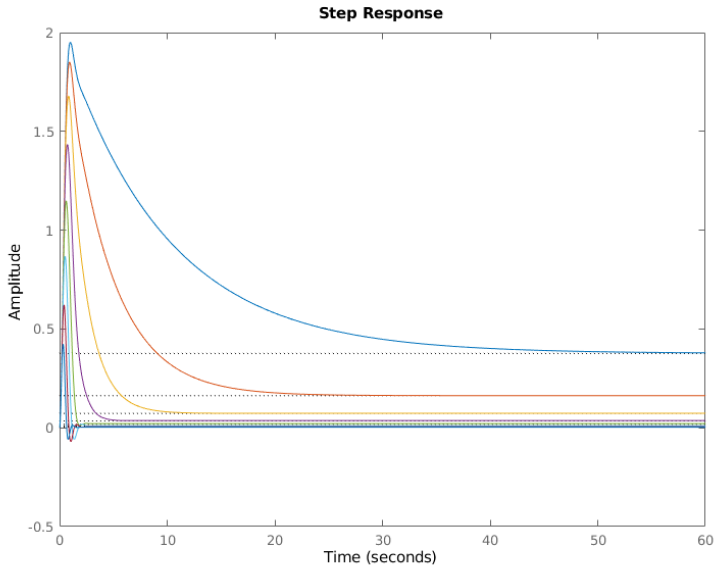
```
figure()
hold on
for i=1:kf
    step(CLdyy{i},6)
end
hold off
```



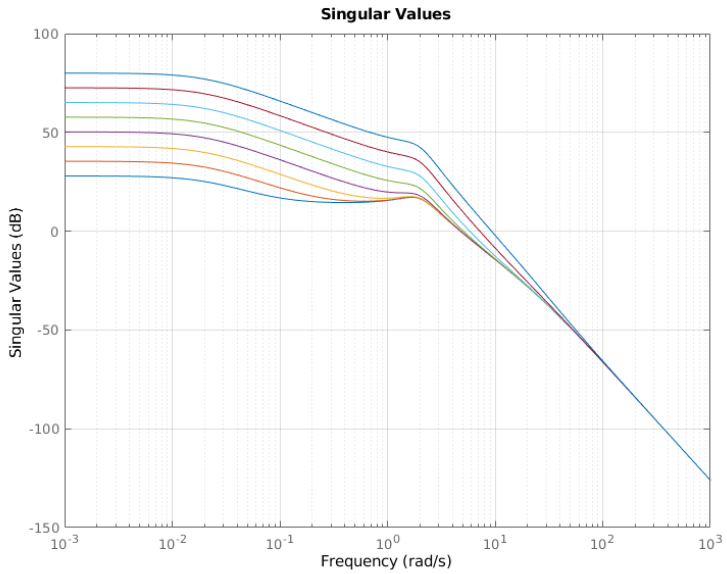

```
figure()
hold on
for i=1:kf
    step(CLdyU{i},6)
end
hold off
```




```
figure()
hold on
for i=1:kf
    step(CLduy{i})
end
hold off
```




```
figure()
hold on
for i=1:kf
    sigma(OL{i})
end
grid on
hold off
```



Estructura con 2 grados de libertad

Escogemos el último de los diseños, con sobreoscilación alta (y quizás poca robustez, pero...)

```
[K2d,cl,GAM,nf]=ncfsyn(G,Wu,Wy,'ref');
```

```
GAM
```

```
GAM = 5.4655
```

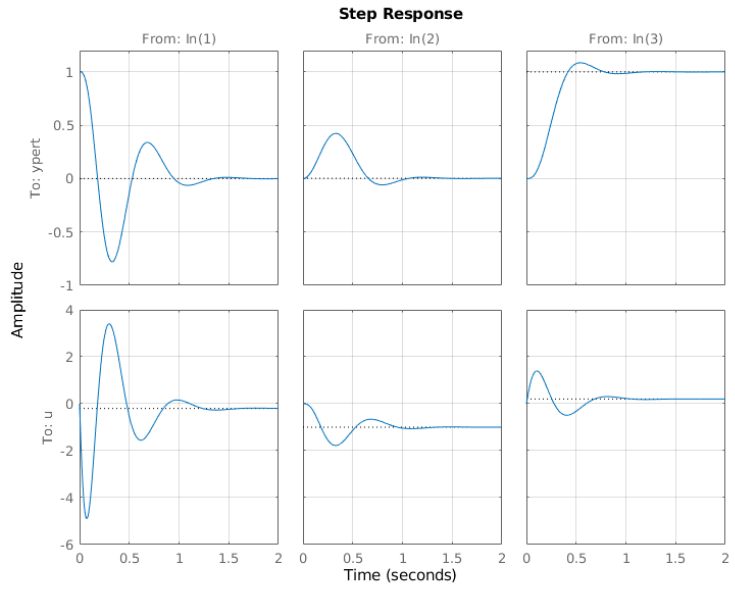
```
%segun ncfsyn.m
cl.InputName={'wy','wu','ref'};
cl.OutputName={'ypert','u'};

size(K2d)
```

```
State-space model with 1 outputs, 2 inputs, and 5 states.
```

```
size(cl)
```

```
State-space model with 2 outputs, 3 inputs, and 7 states.
```

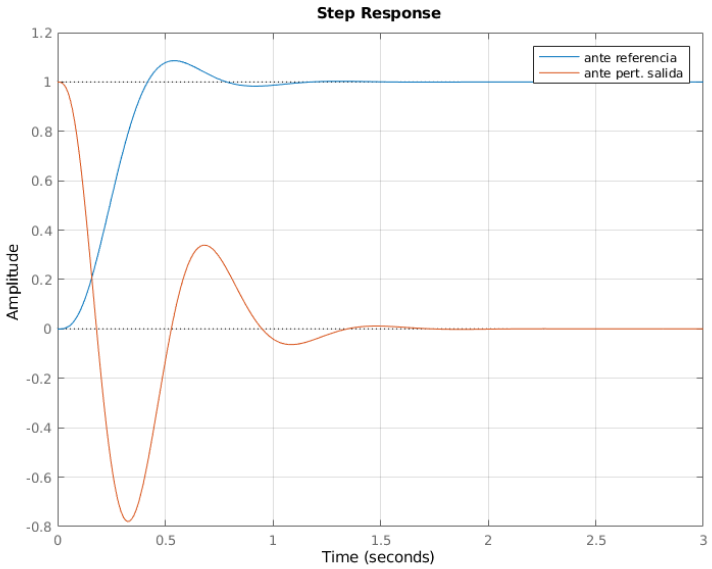
```
step(cl*blkdiag(1,1,-Wy),2), grid on
```




```
Krealim=-K2d(1);
Kref=-K2d(2)*Wy;
clamano=minreal(inv(1+G*Krealim));
clrefamano=minreal(inv(1+G*Krealim)*G*Kref);
```

```
11 states removed.
```

```
step(clrefamano,clamano,3), grid on
legend('ante referencia','ante pert. salida')
```


Step Response
ante referencia
ante pert. salida
Amplitude
Time (seconds)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
0
0.5
1
1.5
2
2.5
3