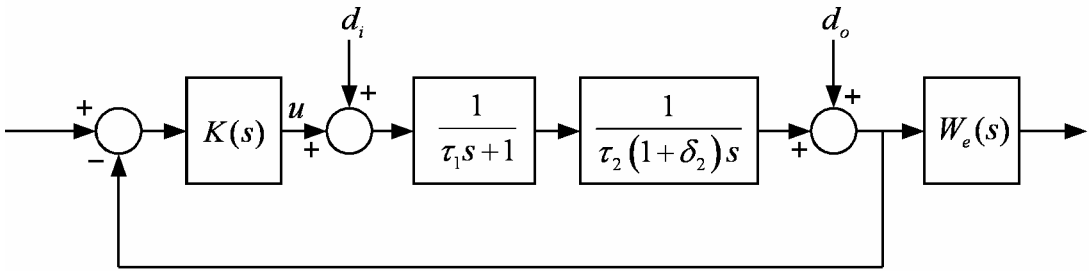
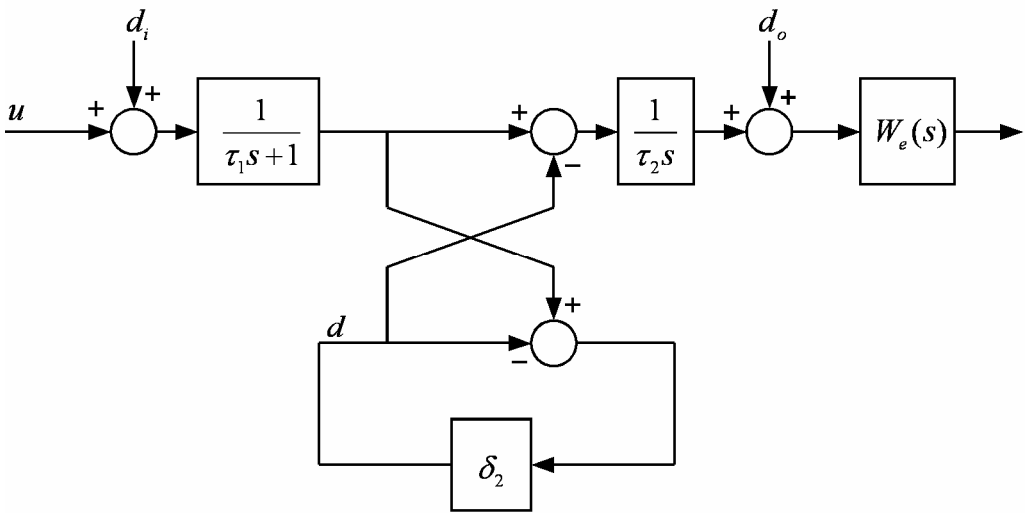
H-infinity Control Example 2



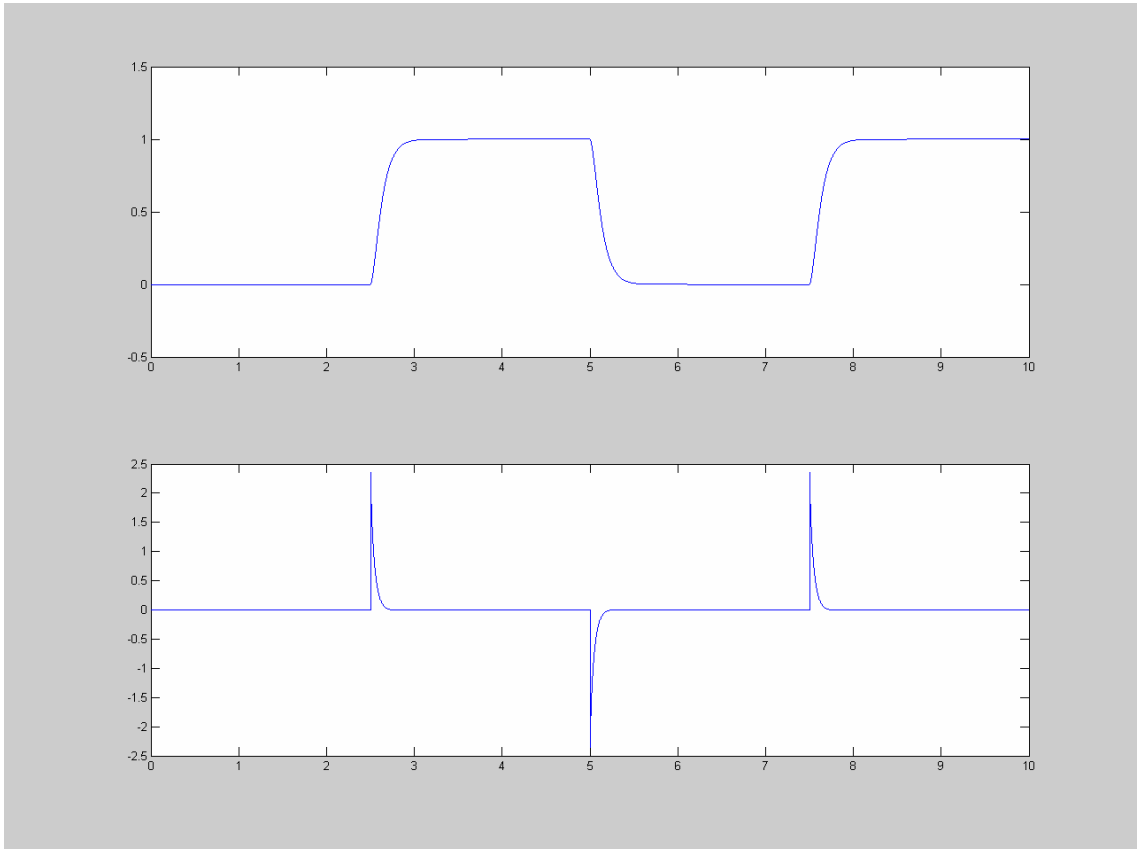
$$\frac{1}{\tau_2(1+\delta_2)} = \frac{1}{\tau_2}\left(1-\frac{\delta_2}{1+\delta_2}\right)$$

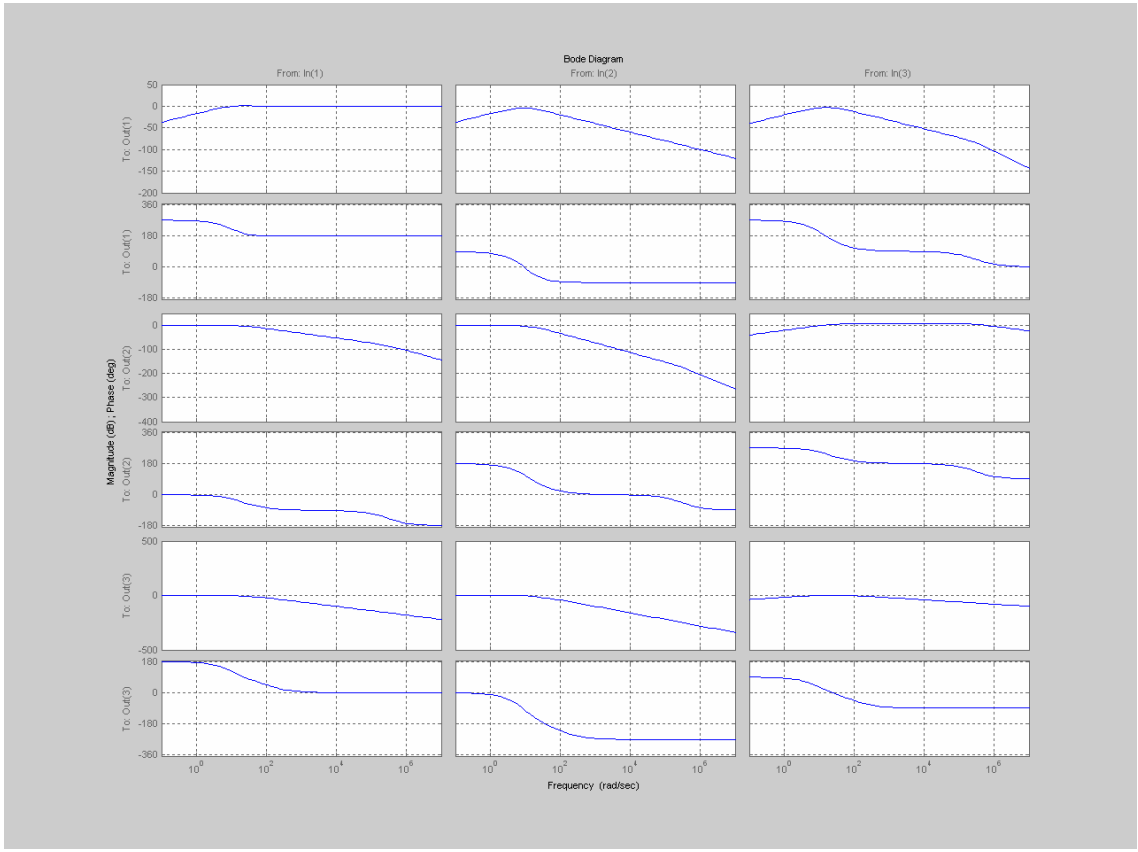



```
% H-inf control example 2 for Robust Control Course
% model uncertainty
% limdj 2004.5.22
clear;

tau1=0.1;
delta1=0;
tau2=0.1;
delta2=-0.8;

g1=nd2sys([1],[tau1 1]);
g2=nd2sys([1],[tau2 0]);
We=nd2sys([1],[0.01 1]);

P = nd2sys([1/(tau2*(1+delta2))],[tau1*(1+delta1) 1 0]);

systemnames = 'g1 g2 We';
inputvar = '[d;di;do;u]';
outputvar = '[g1-d;u;We;-g2-do]';

input_to_g1 = '[u+di]';
input_to_g2 = '[g1-d]';
input_to_We = '[g2+do]';

sysoutname = 'G';
cleanupsysic = 'yes';
sysic;
```

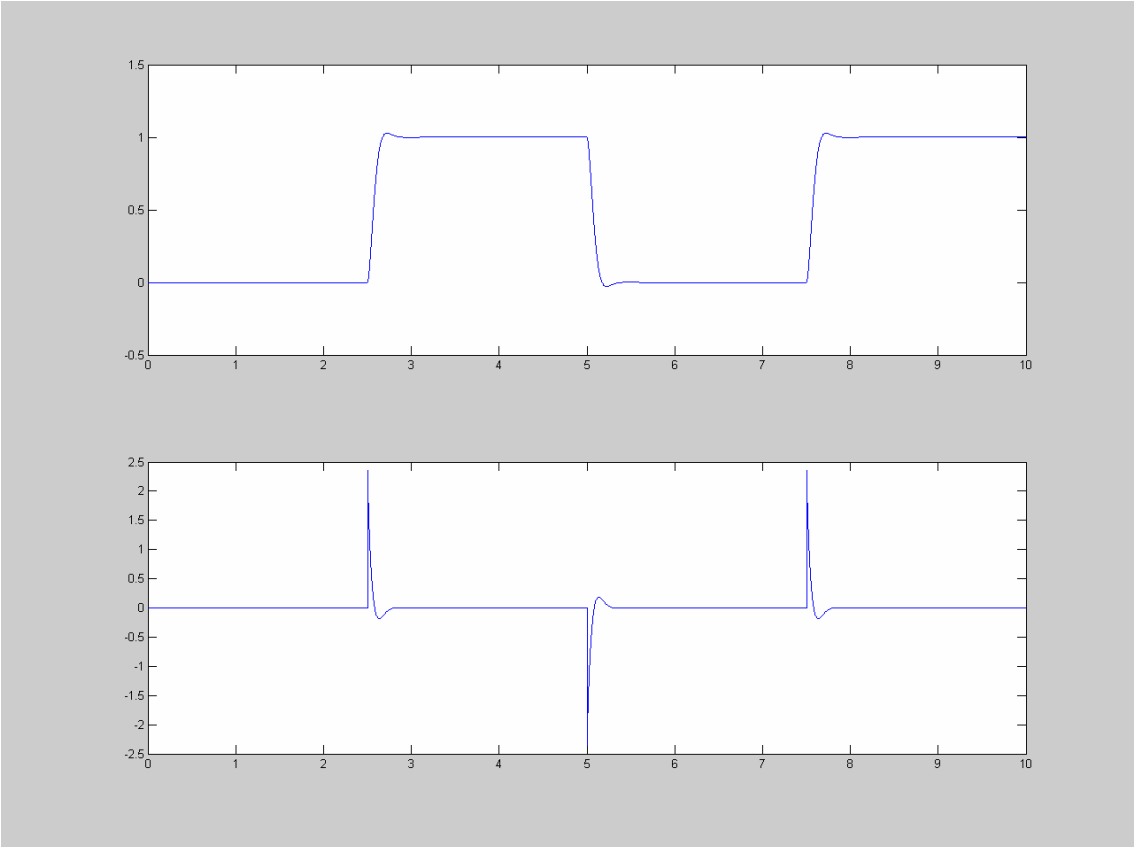
```
[K,Gp,gamma]=hinfsyn(G,1,1,0,5000,0.0001)

Gp=starp(G,K,1,1);

[ak,bk,ck,dk]=unpck(K)
[z,p,k0]=ss2zp(ak,bk,ck,dk)
[agp,bgp,cgp,dgp]=unpck(Gp);
sys_Gp=ss(agp,bgp,cgp,dgp);
Gp_bode=bode(sys_Gp);

KP=mmult(K,P);
[akp,bkp,ckp,dkp]=unpck(KP);
sys_KP=ss(akp,bkp,ckp,dkp);
[gm,pm]=margin(sys_KP)

% closed-loop system %
systemnames = 'P K';
inputvar = '[ref]';
outputvar = '[P;K]';
input_to_P = '[K]';
input_to_K = '[ref-P ]';

sysoutname = 'KG';
cleanupsysic = 'yes';
sysic;

[acl,bcl,ccl,dcl]=unpck(KG);
h=ss(acl,bcl,ccl,dcl);
zpk(h)
t = 0:0.001:10;                    % vector of time samples
ref = (rem(t,5)>=2.5)*1;     % square wave values
[ys ts xs]=lsim(h,ref,t);

% plot states
subplot(2,1,1);
plot(ts,ys(:,1),'-');
axis([0 10 -0.5 1.5])

%plot control
subplot(2,1,2)
plot(ts,ys(:,2),'-');
```

$$W_e(s)=\frac{1}{0.01s+1},\delta_2=0.0$$





$$W_e(s)=\frac{1}{0.01s+1},\delta_2=-0.5$$



$$W_e(s)=\frac{1}{0.01s+1},\delta_2=-0.875$$