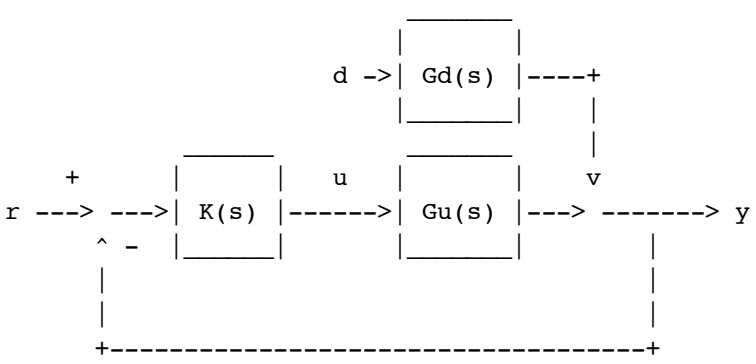
Closed Loop Control Demo

File: `Ch11_ClosedLoopDemo.m`

This script is a simple demonstration of simulating closed-loop behavior of a simple linear control system.

Contents

Feedback Control



Closed loop transfer functions

$$y(s) = \frac{Gu(s)K(s)}{1 + Gu(s)K(s)} r(s) + \frac{Gd(s)}{1 + Gu(s)K(s)} d(s)$$

$$u(s) = \frac{K(s)}{1 + Gu(s)K(s)} r(s) + \frac{K(s)Gd(s)}{1 + Gu(s)K(s)} d(s)$$

System

```
Gd = tf(1,1);
Gu = tf([-0.5 1],[4 4 1]);
```

Controller

```
Kp = 2;
Ki = 0.3;
K = tf([Kp Ki],[1 0]);
```

Test Signals

```
t = 0:.1:40;
r = (t >= 5);
d = (t >= 5);
```

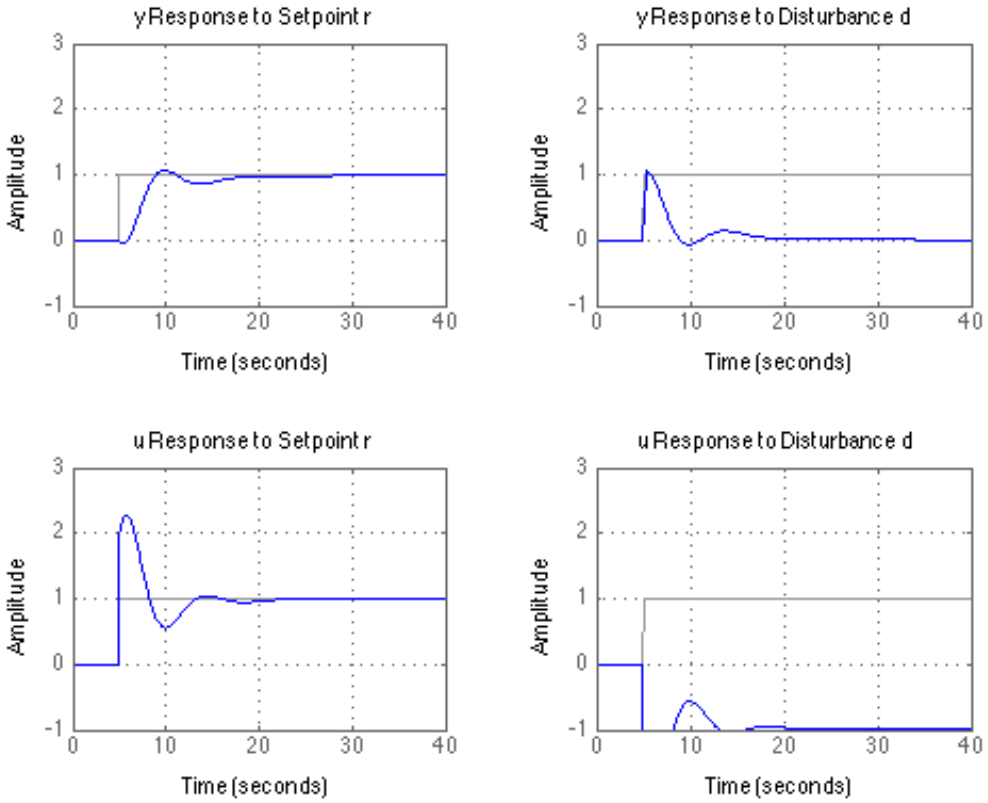
Simulation Results

```
subplot(2,2,1);
lsim(Gu*K/(1+Gu*K),r,t);
axis([0 max(t) -1 3]);
title('y Response to Setpoint r');
grid;

subplot(2,2,2);
lsim(Gd/(1+Gu*K),d,t);
axis([0 max(t) -1 3]);
title('y Response to Disturbance d');
grid;

subplot(2,2,3);
lsim(K/(1+Gu*K),r,t);
axis([0 max(t) -1 3]);
title('u Response to Setpoint r');
grid;

subplot(2,2,4);
lsim(-K*Gd/(1+Gu*K),d,t);
axis([0 max(t) -1 3]);
title('u Response to Disturbance d');
grid;
```



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