2(f) PID Analysis

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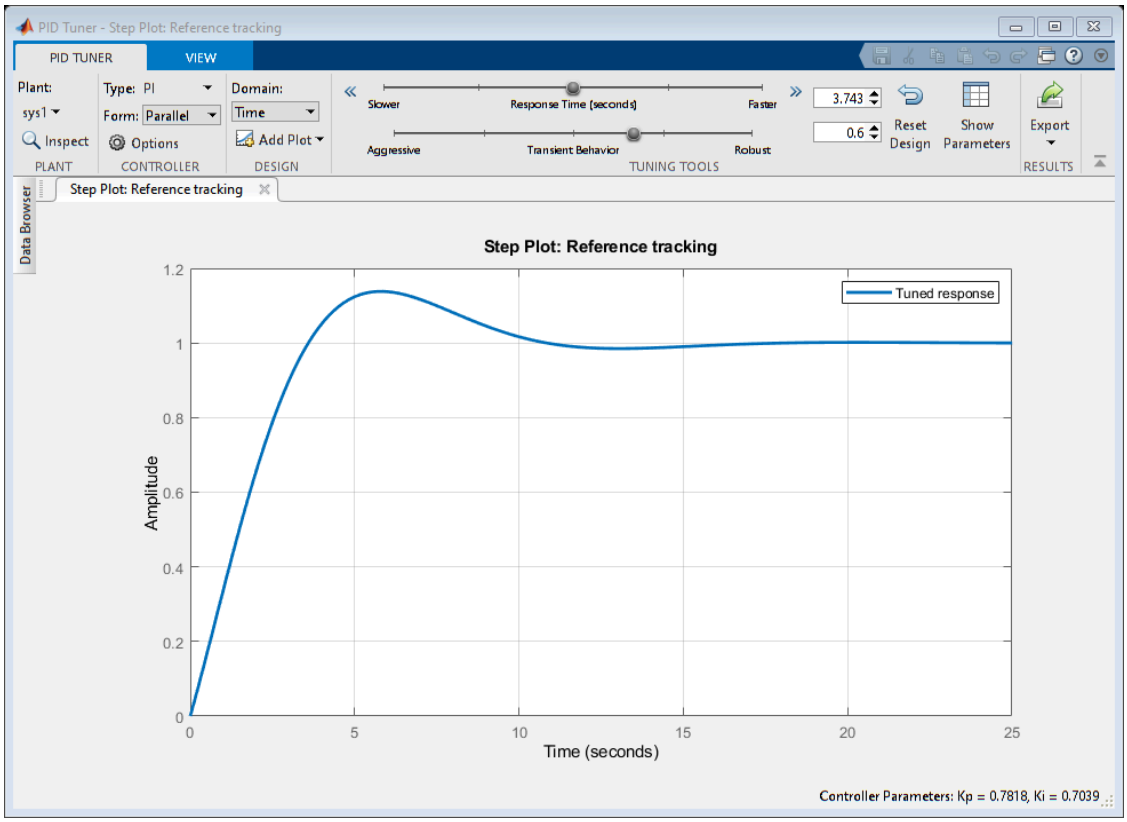
First Order System PID Analysis

```
clc;
B1= 0.5;
M1= 5;
P1 = 2;
sys1 = tf([P1],[M1,B1+1])
pidTuner(sys1)
```

```
sys1 =

      2
  ---------
  5 s + 1.5

Continuous-time transfer function.
```



Second Order System PID Analysis

```
B2= 0.5
M2= 5;
K2 =1;
P2=5;
sys2 = tf([P2*K2],[M2,B2,2*K2])
pidTuner(sys2)
```

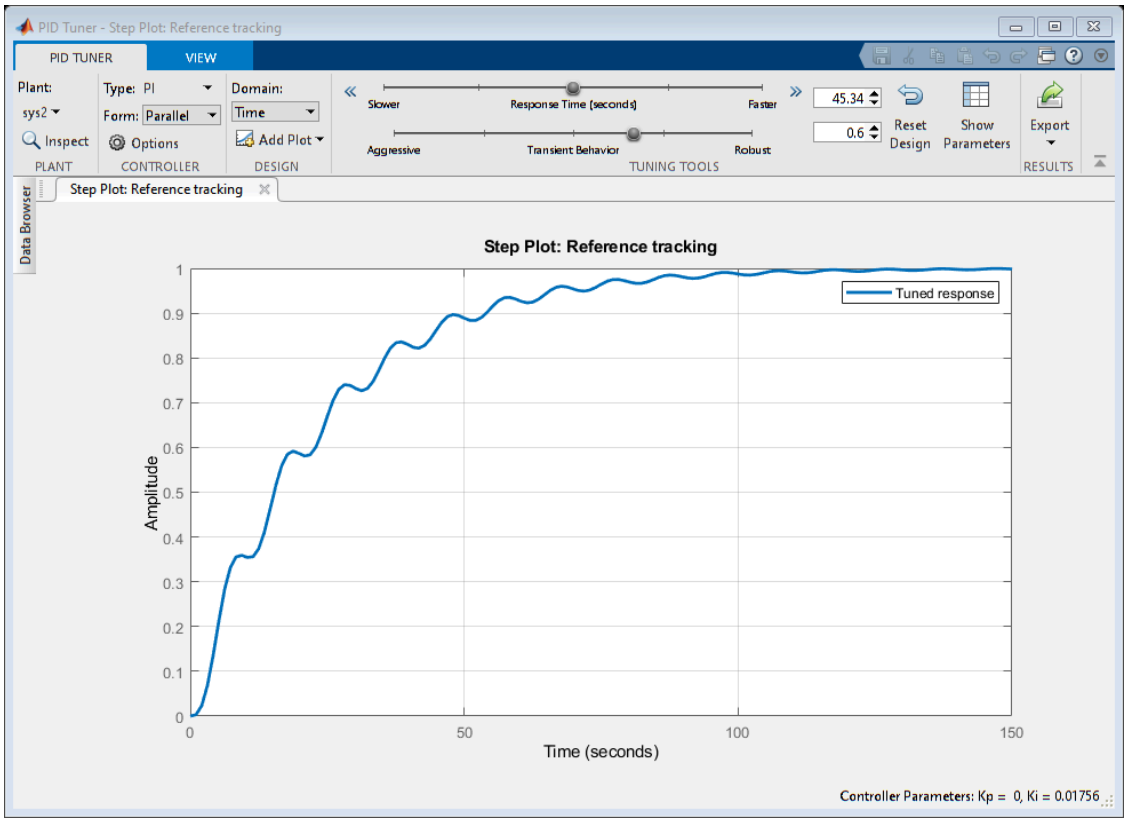
```
B2 =

    0.5000


sys2 =

          5
  -----------------
  5 s^2 + 0.5 s + 2

Continuous-time transfer function.
```



Comparison Analysis:

First Order sys: PI: Ideal system: Kp= 0.78 (Un-Tuned) Ki= 0.7 Tr= 2.7 Ts= 9.87 Overshoot= 13.8%

```
             Best system:  Kp= 1.25
            (After Tuning) Ki= 0.46
                           Tr= 3.59
                           Ts= 5.39
                           Overshoot= 1.33%

PD: Ideal system: Kp= 53.18
     (Un-Tuned)   Kd= 0
                  Tr= 0.102
                  Ts= 0.181
                  Overshoot= 0

             Best system:  Kp= 53.18
            (After Tuning) Kd= 0
                           Tr= 0.102
                           Ts= 0.181
                           Overshoot= 0

        PID: Ideal system: Kp= 1.07
              (Un-Tuned)   Ki= 0.53
                           Kd= 0
                           Tr= 3.04
                           Ts= 10.6
```

```
                            Overshoot= 6.08%

              Best system:  Kp= 1.07
             (After Tuning) Ki= 0.53
                            Kd= 0
                            Tr= 3.04
                            Ts= 10.6
                            Overshoot= 6.08%
```

```
% Second Order sys:
%   PI: Ideal system: Tr= 51.1
%        (Un-Tuned)   Ts= 94.3
%                     Overshoot= 0%
%
%       Best system:  Tr= 50.4
%      (After Tuning) Ts= 93.4
%                     Overshoot= 0.00235%
%
%   PD: Ideal system: Kp= 2697.9
%        (Un-Tuned)   Kd= 63.48
%                     Tr= 0.0179
%                     Ts= 0.13
%                     Overshoot= 24.3%
%
%       Best system:  Kp= 27.35
%      (After Tuning) Kd= 6.251
%                     Tr= 0.175
%                     Ts= 1.35
%                     Overshoot= 24.71%
%
%  PID: Ideal system: Kp= 3.053
%        (Un-Tuned)   Ki= 0.68
%                     Kd= 2.66
%                     Tr= 0.495
%                     Ts= 9.3
%                     Overshoot= 12.4%
%
%       Best system:  Kp= 3.053
%      (After Tuning) Ki= 0.68
%                     Kd= 2.66
%                     Tr= 0.495
%                     Ts= 9.3
%                     Overshoot= 12.4%
```

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