

- Δt (Sampling Time) \rightarrow Δt (Overshoot) \rightarrow Δt

? D (Derivative???) ——— ?????

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2. ?????? PID ????? (Tuning Guide)

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1. K_p (P) \rightarrow K_i \rightarrow K_d \rightarrow K_p
2. K_i (I) \rightarrow K_i (Overshoot)
3. K_d (D) \rightarrow K_d \rightarrow K_i

3. MATLAB ?? PID ?????

MATLAB ??????

pid

```

% 1. PID
Kp = 1.5;
Ki = 0.5;
Kd = 0.1;

% 2. PID
C = pid(Kp, Ki, Kd);

% 3. (Transfer Function)

```

```

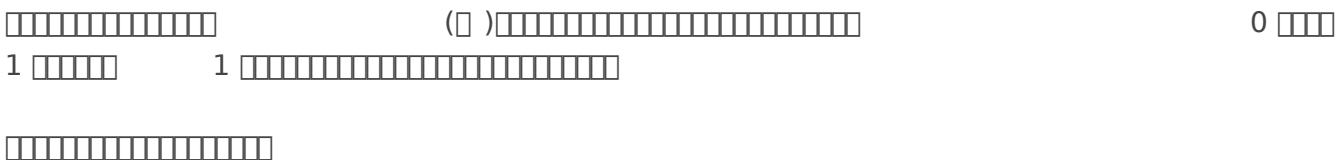
% Transfer function G(s) = 1 / (s^2 + 2s + 1)
numerator = 1;
denominator = [1, 2, 1];
G = tf(numerator, denominator);

% 4. PID Controller (Closed-loop)
sys_cl = feedback(C * G, 1);

% 5. Step Response
figure;
step(sys_cl);
title('PID Step Response');
grid on;

```

4. PID Controller (Step Response)



1. Overshoot (%OS) —

- The peak value of the response is 1.25, which is the **(1) Peak**.
- The overshoot is the amount by which the response exceeds the steady-state value of 1.
- The overshoot is 25%.
- The overshoot is calculated as $\text{Overshoot} = \frac{\text{Peak} - \text{Steady State}}{\text{Steady State}} \times 100\%$.
- The overshoot is 25%.
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2. Settling Time (T_s) —

- The settling time is the time it takes for the response to settle within a certain percentage of the steady-state value.
- The settling time is 5 seconds.
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