Course Code: 3112
Course Name: Advanced Mechatronics Engineering Lab

Experiment No: 04
Experiment Name: Dynamic Characteristics of PID, PD and PI using MATLAB Simulator.

Group No: 01
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Date of Experiment: 29/03/2022
Date of Submission: 13/05/2022

Aim:
To understand the dynamic characteristics of PI, PD and PID using MATLAB Simulator.

Theory:
PI Controller:
Proportional Integral controller sometimes also known as proportional plus integral (PI) controllers. It is a type of controller formed by combining proportional and integral control action. In the proportional-integral controller, the control action of both proportional, as well as the integral controller, is utilized. This combination of two different controllers produces a more efficient controller which eliminates the disadvantages associated with each one of them. Output of PI controller is given by:

$$m(t) = K_p\, e(t) + K_i \int e(t)$$

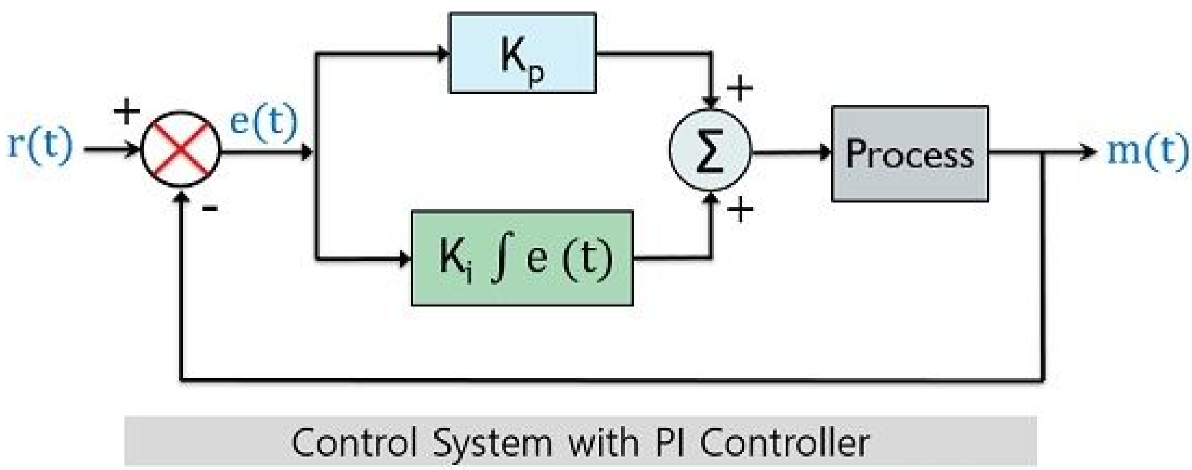


Figure-1: Block diagram of the system with PI Controller

PD Controller:
A type of controller in a control system whose output varies in proportion to the error signal as well as with the derivative of the error signal is known as the proportional derivative controller. It is also known as a proportional plus derivative controller. This type of controller provides combined action of both proportional and derivative control action. Output of the PD controller is given by:

$$m(t) = K_p\, e(t) + K_D \frac{d}{dt} e(t)$$

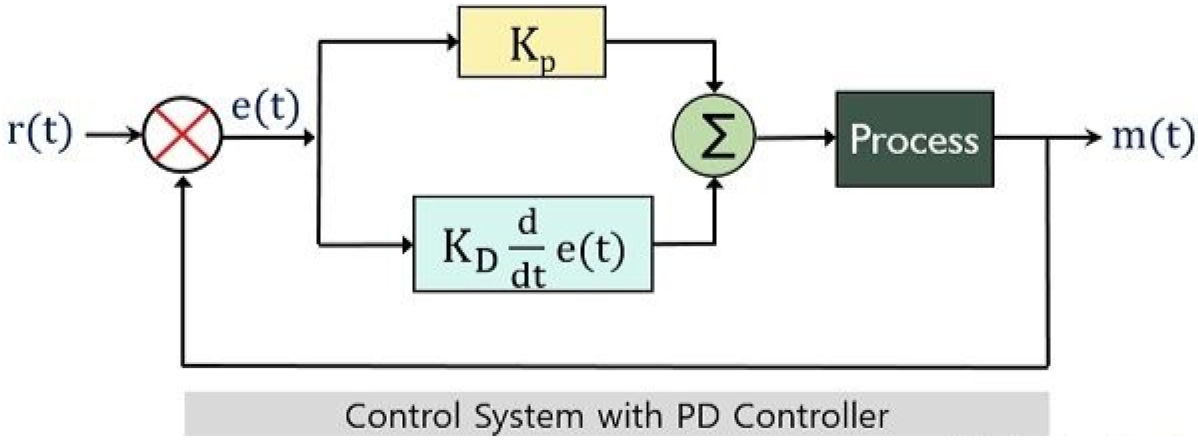


Figure-2: Block diagram of the system with PD Controller

PID Controller:

A proportional–integral–derivative controller (PID controller or three-term controller) is a control loop mechanism employing feedback that is widely used in industrial control systems and a variety of other applications requiring continuously modulated control. PID control is a well-established way of driving a system towards a target position or level. PID control uses closed-loop control feedback to keep the actual output from a process as close to the target or setpoint output as possible. Output of the PID controller is given by:

$$m(t) = K_p\, e(t) + K_i \int e(t) + K_d \frac{d}{dt} e(t)$$

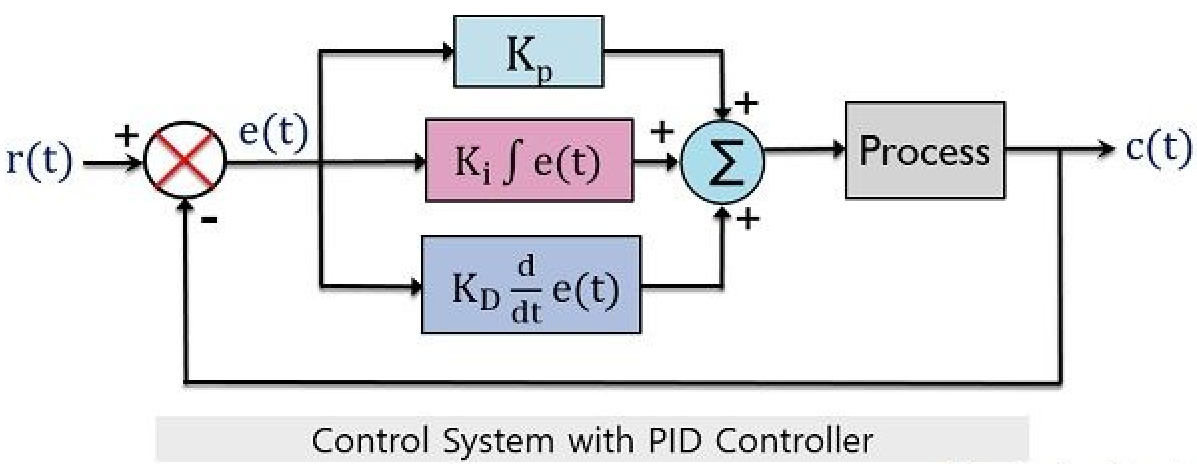
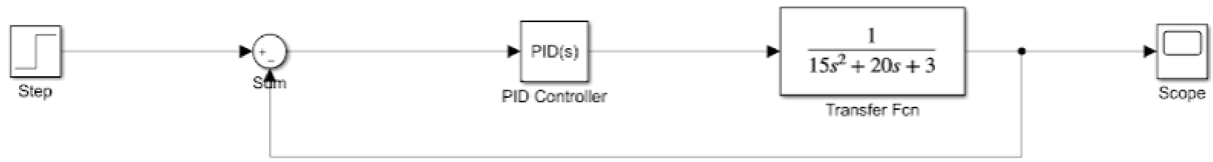


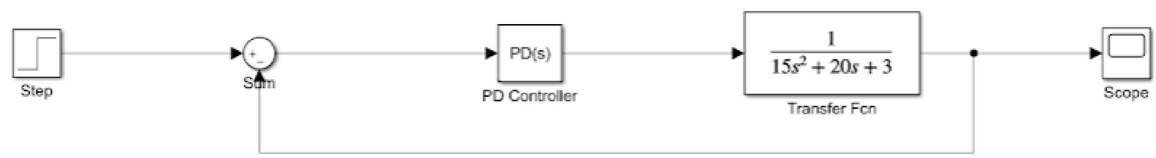
Figure-3: Block diagram of the system with PID Controller

Diagram:

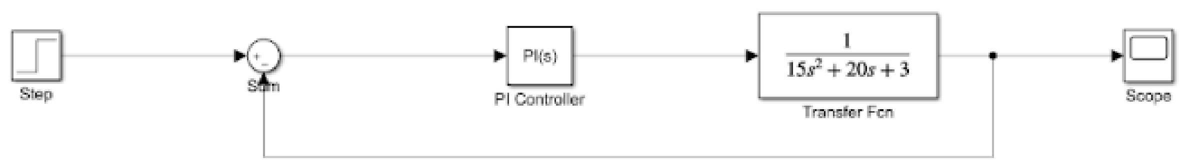
PID



PD

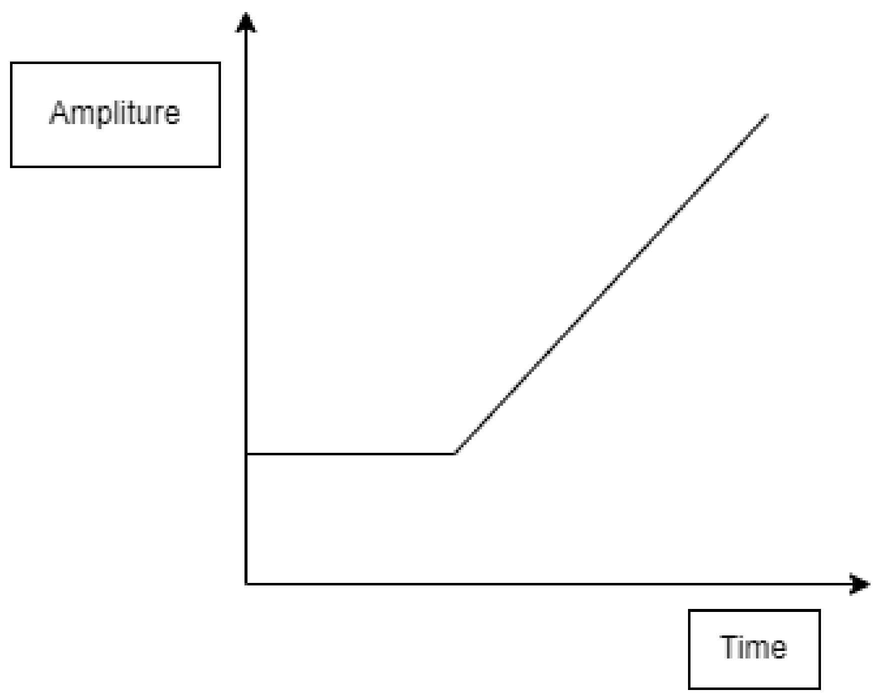


PI

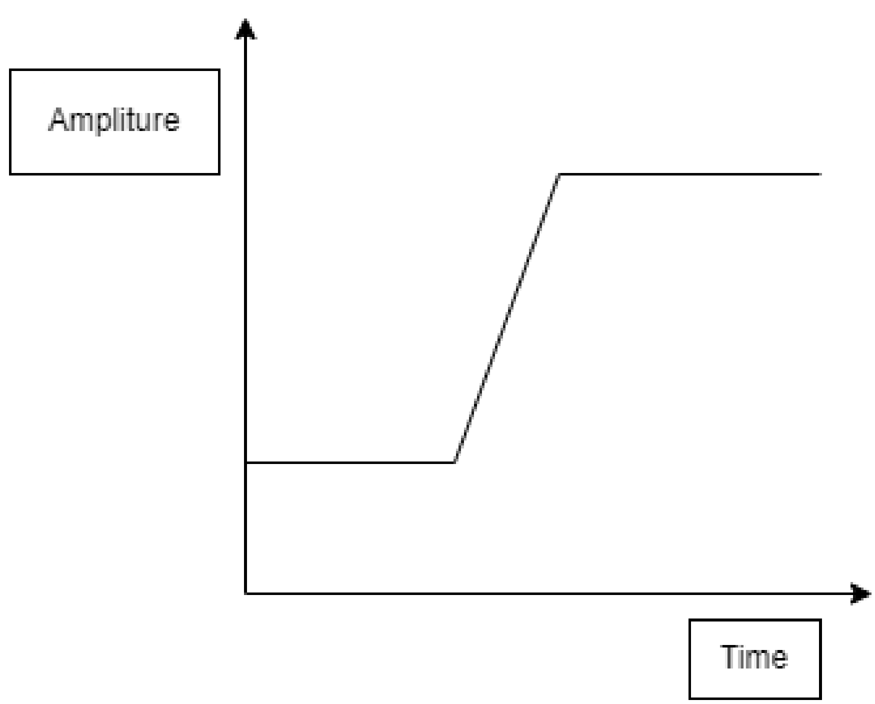


Graphs:

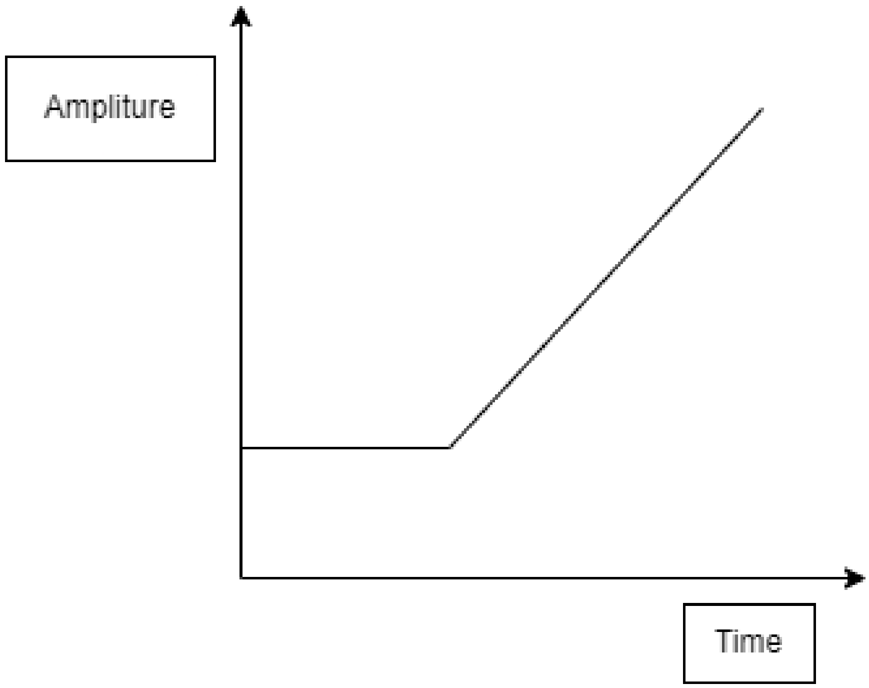
PID



PD



PI



Result and Discussion:

We used Matlab to simulate the change in behavior of the input signal provided to the PI, PD and PID controller. The transfer functions were defined for each controller. Then we get three separate graphs showing the behavior of the respective controller on an amplitude vs time graph. These graphs will change depending on the change in transfer function.

Reference:

- https://electronicscoach.com/proportional-derivative-controller.html
- https://electronicscoach.com/proportional-integral-controller.html
- https://electronicscoach.com/proportional-integral-derivative-controller.html

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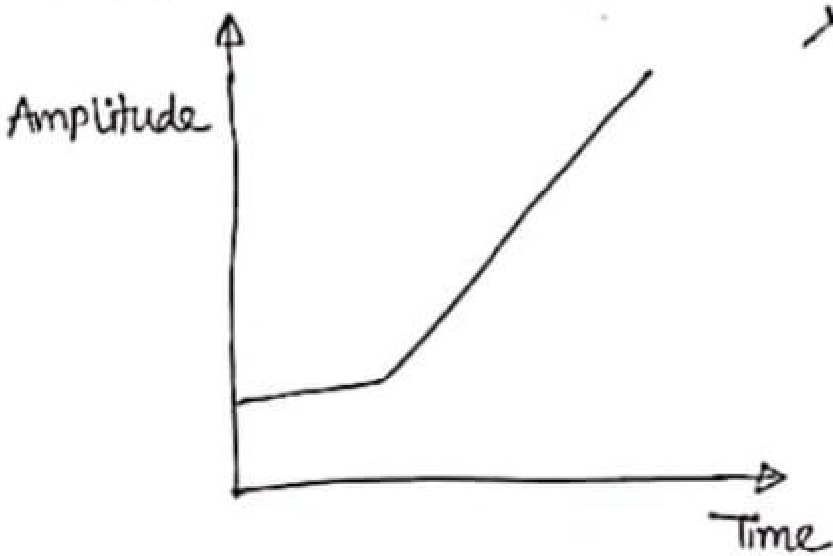
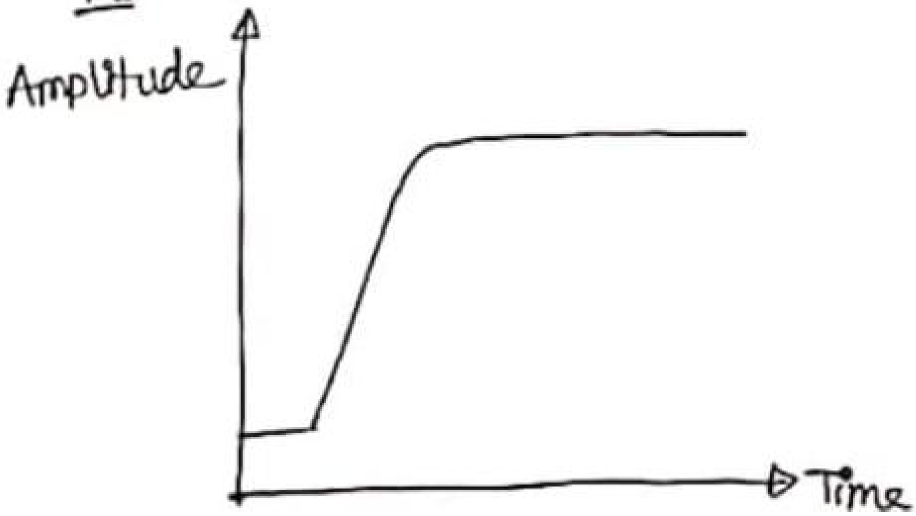
29.03.2022

PID



PD



PI