ENR355 Robotics and Sensors

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Spring 2026

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For control, we need to talk about PID

The PID Controller & Theory Explained

Updated Mar 7, 2025

Overview

Proportional-Integral-Derivative (PID) control is the most common control algorithm used in industry and has been universally accepted in industrial control. The popularity of PID controllers can be attributed partly to their robust performance in a wide range of operating conditions and partly to their functional simplicity, which allows engineers to operate them in a simple, straightforward manner.

As the name suggests, PID algorithm consists of three basic coefficients; proportional, integral and derivative which are varied to get optimal response. Closed loop systems, the theory of classical PID and the effects of tuning a closed loop control system are discussed in this paper. The PID toolset in LabVIEW and the ease of use of these VIs is also discussed.

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https://www.ni.com/en/shop/labview/pid-theory-explained.html

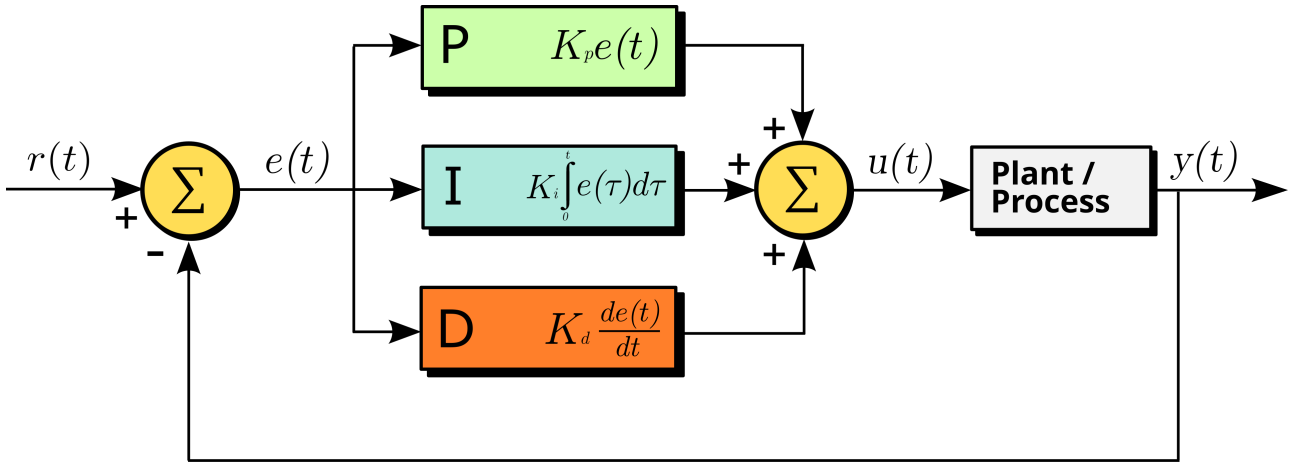
For control, we need to talk about PID

Control function [edit]

The overall control function is

$$u(t) = K_{\mathrm{p}} e(t) + K_{\mathrm{i}} \int_0^t e(\tau)\,\mathrm{d}\tau + K_{\mathrm{d}} \frac{\mathrm{d}e(t)}{\mathrm{d}t},$$

where K_{p}, K_{i}, and K_{d}, all non-negative, denote the coefficients for the proportional, integral, and derivative terms respectively (sometimes denoted *P*, *I*, and *D*).



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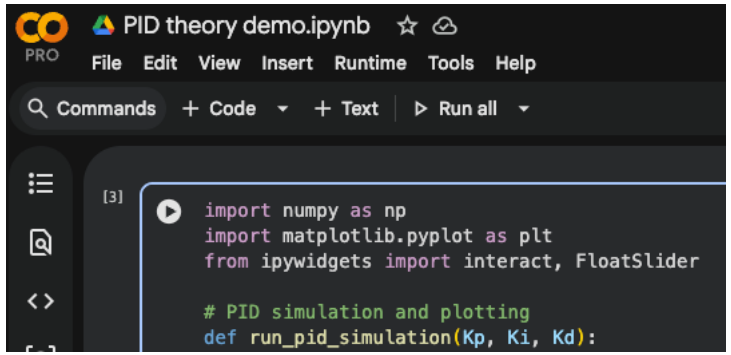
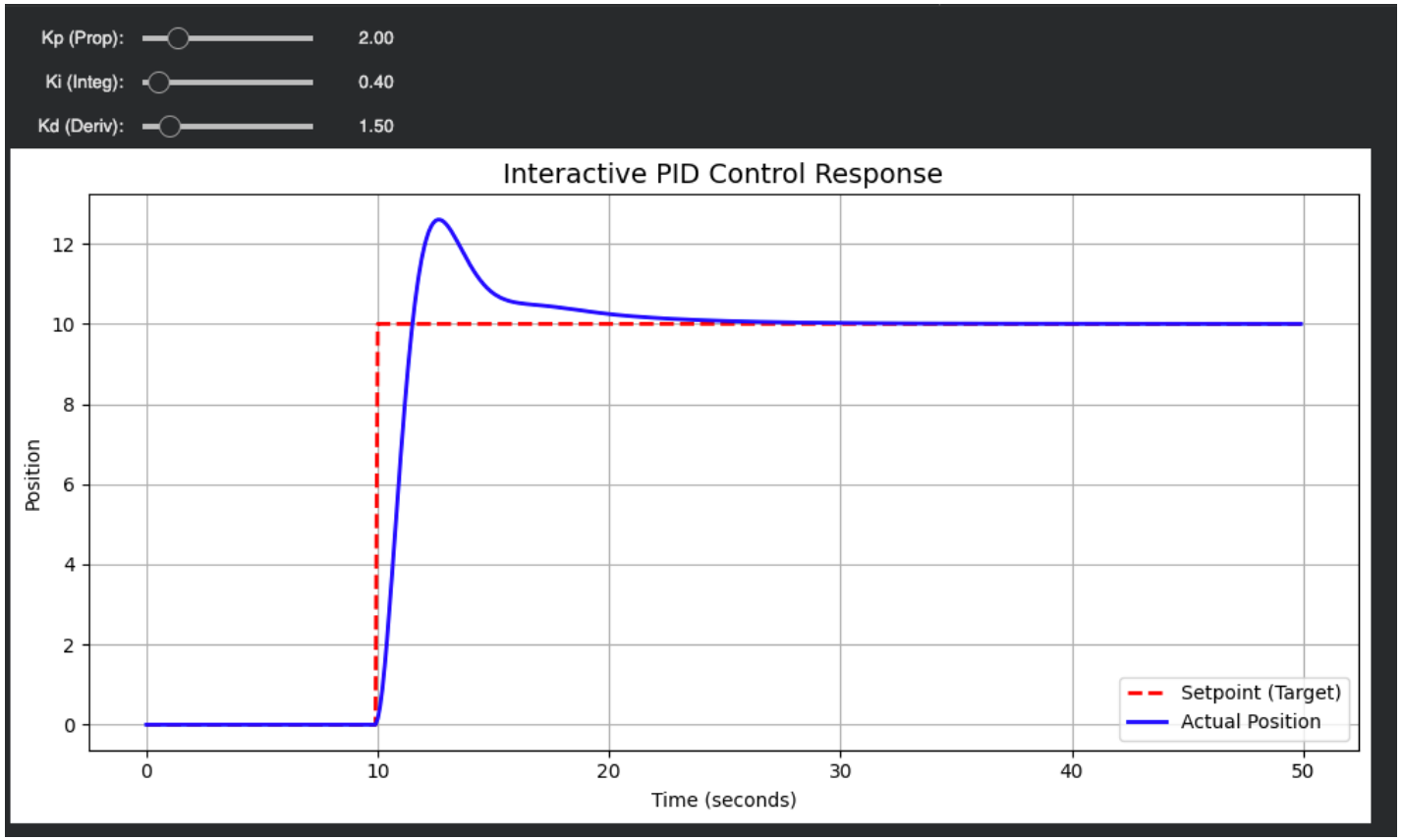
https://en.wikipedia.org/wiki/Proportional%E2%80%93integral%E2%80%93derivative_controller

Why PID is great:

Try out the interactive tool at Google Colab:





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How to find the Colab notebook

ENR 145: Computational Methods for Physicists and Engineers

Department of Engieering Physics, Coe College | Cedar Rapids, Iowa

Download Syllabus Upload to Moodle

Module 1: Codes, Visuals, and Algos (4 weeks)

Week 2: Google Sheets helper file

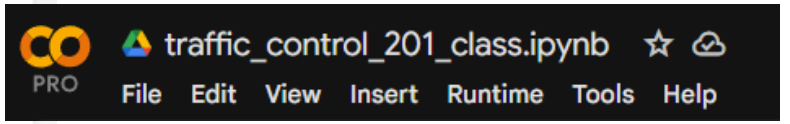
Slides #3

Week 3: Hamming python 101(right click and "save link as" to download)

Assignment #4

Week 4: Slides #4 Traffic control 201(right click and "save link as" to download)

Week 5:



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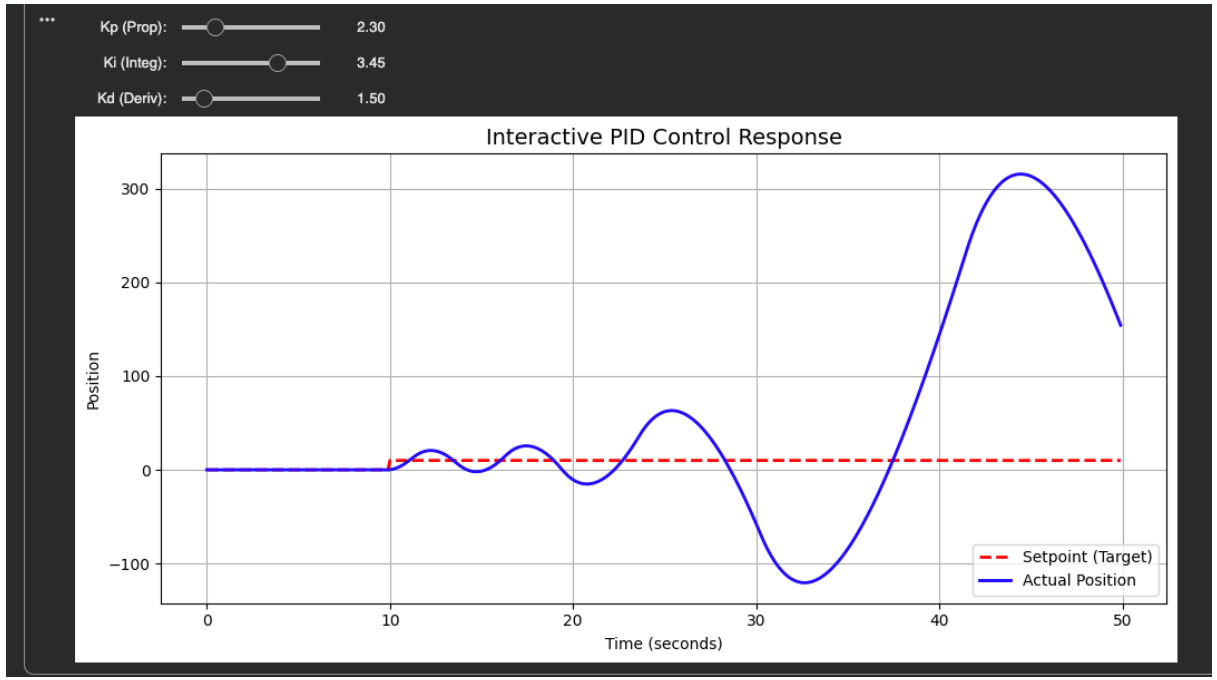
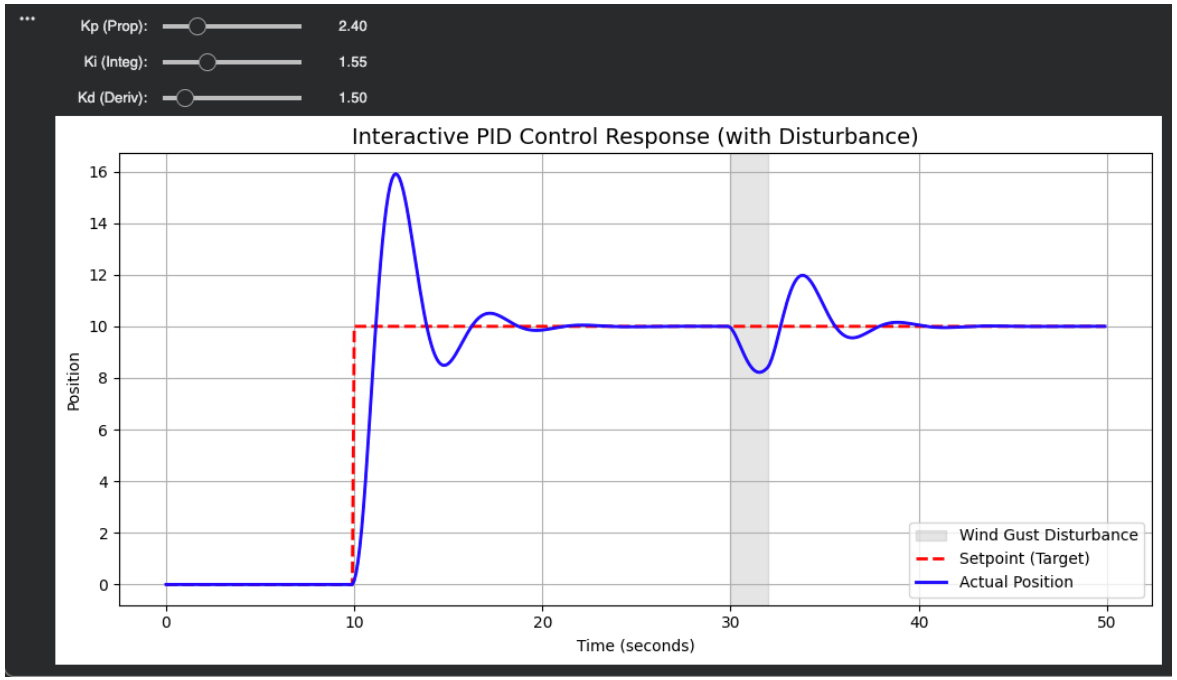
Why PID is great:

Mess up the setting, un-stable system



When you kick a robot, how does it recover?



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