New Capabilities for Aerospace Control System Design

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Presentation Overview

Discuss 3 Important New Capabilities for Aerospace Control System Design

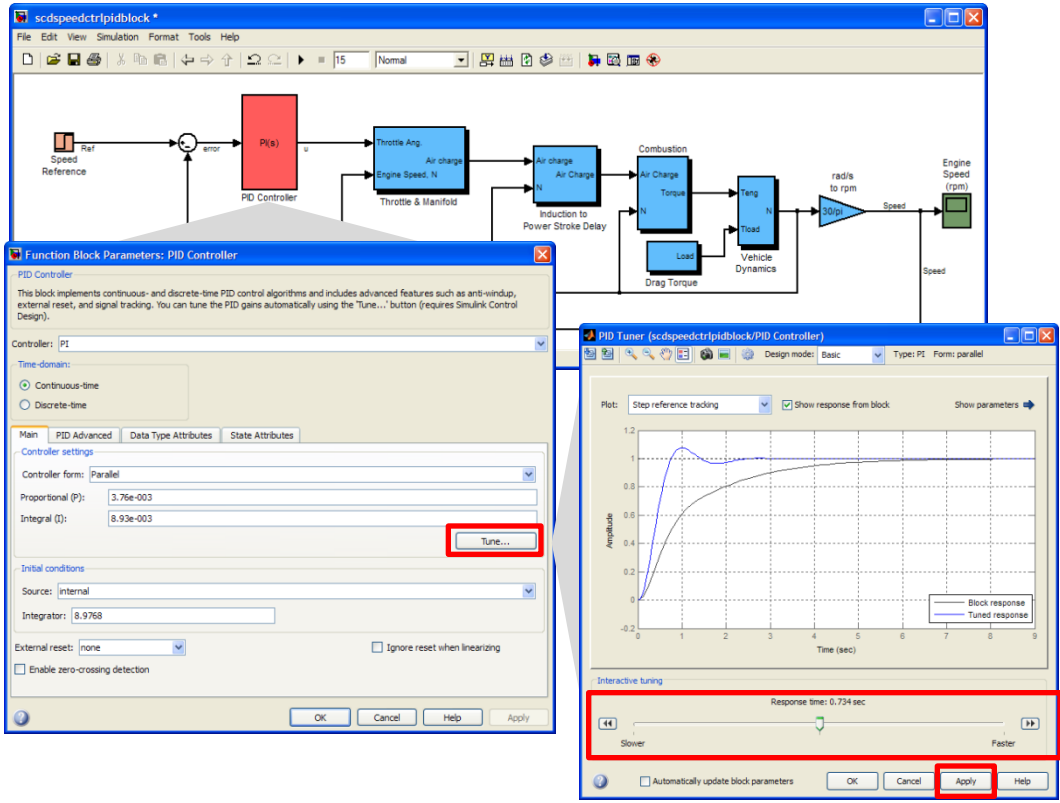
- PID Block and Automatic PID Tuning Capabilities
- Specification of Block Linearizations
- Frequency Response Analysis of Simulink Models

New features are available in R2009b in Simulink Control Design

New PID Block and Automatic PID Tuning Capabilities

Automatically compute gains of PID controllers to achieve desired performance

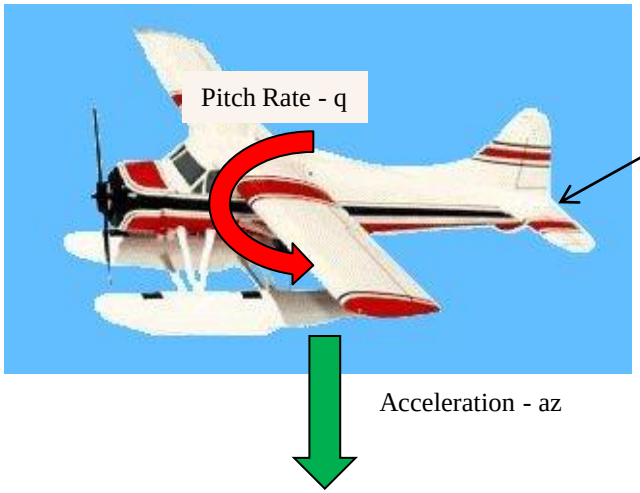
- Generate initial design by pressing “Tune…” button in the PID Controller block mask
- Tune the controller interactively in the PID Tuner
- Export controller gains back to the PID Controller block

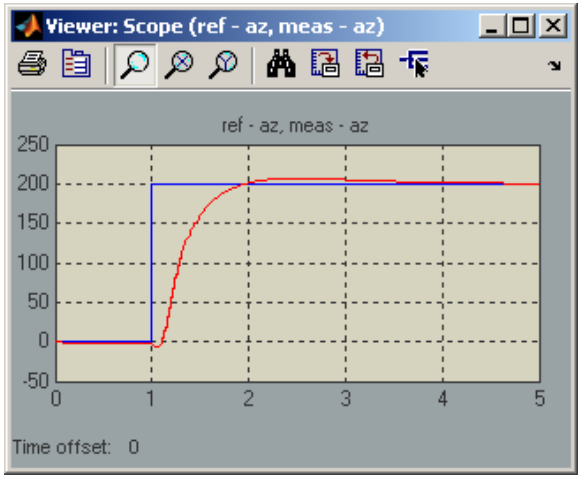


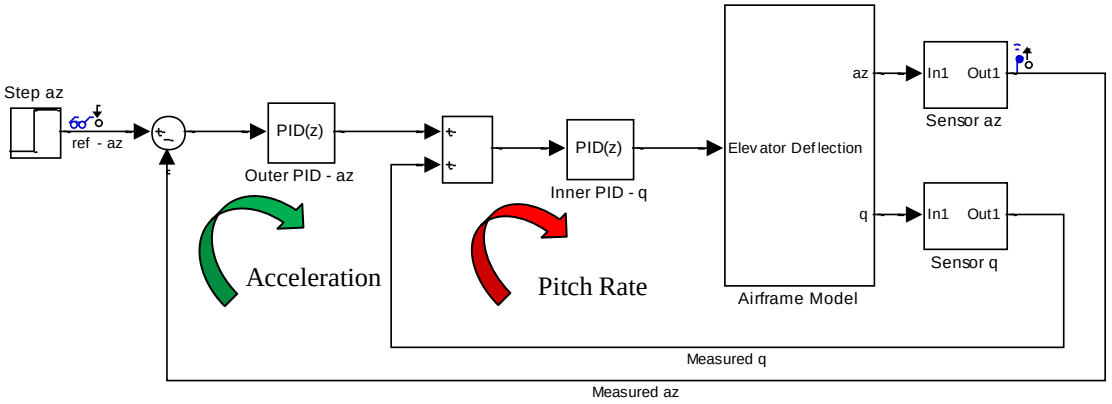
See Webinar “PID Control Made Easy”

Airframe PID Control Tuning Problem

- Want to control the vertical acceleration of the aircraft using an elevator
- Use two loop cascade feedback control



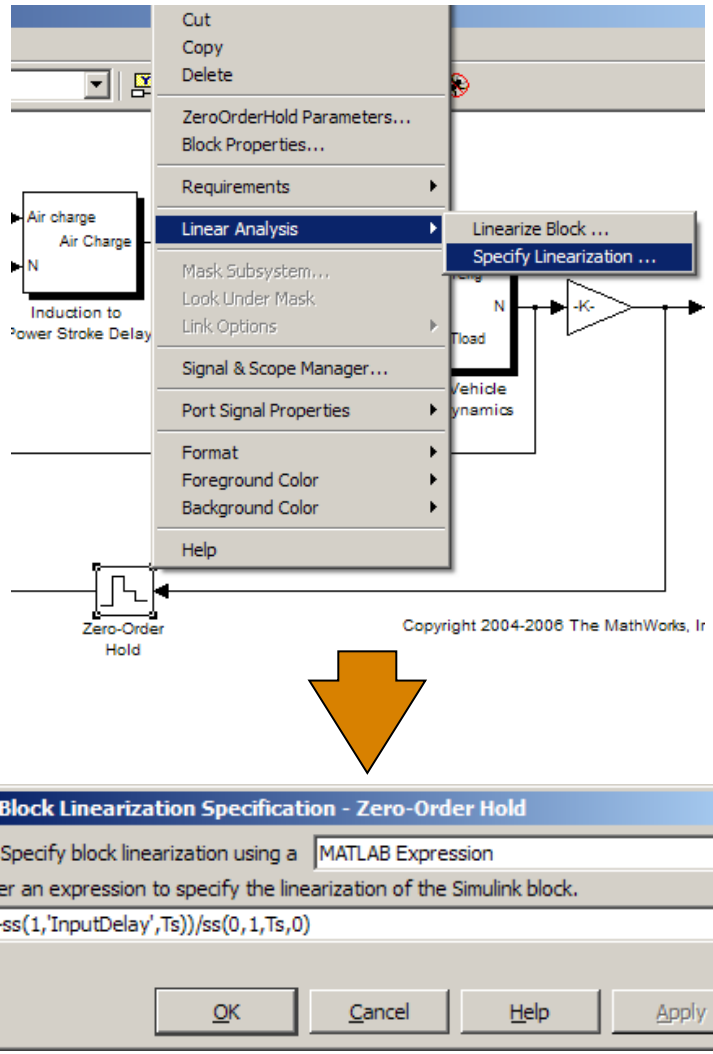




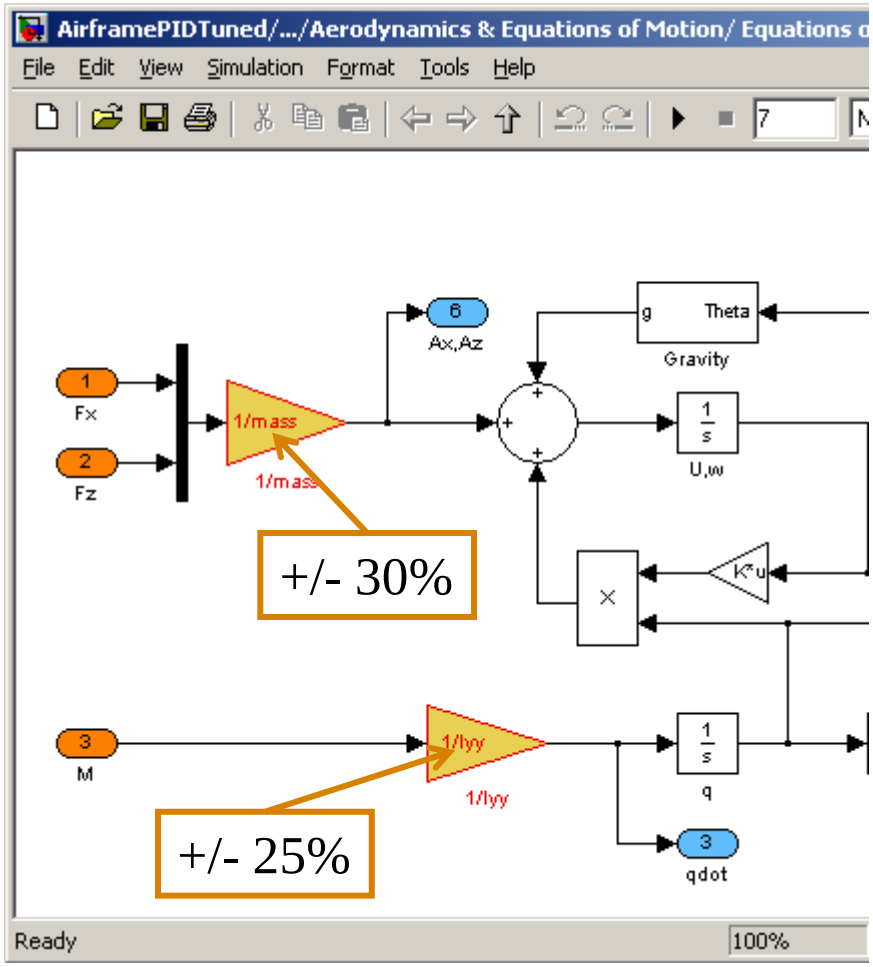
Ability to Specify the Linearization of Simulink Blocks and Subsystems

Customize the linearization of Simulink models

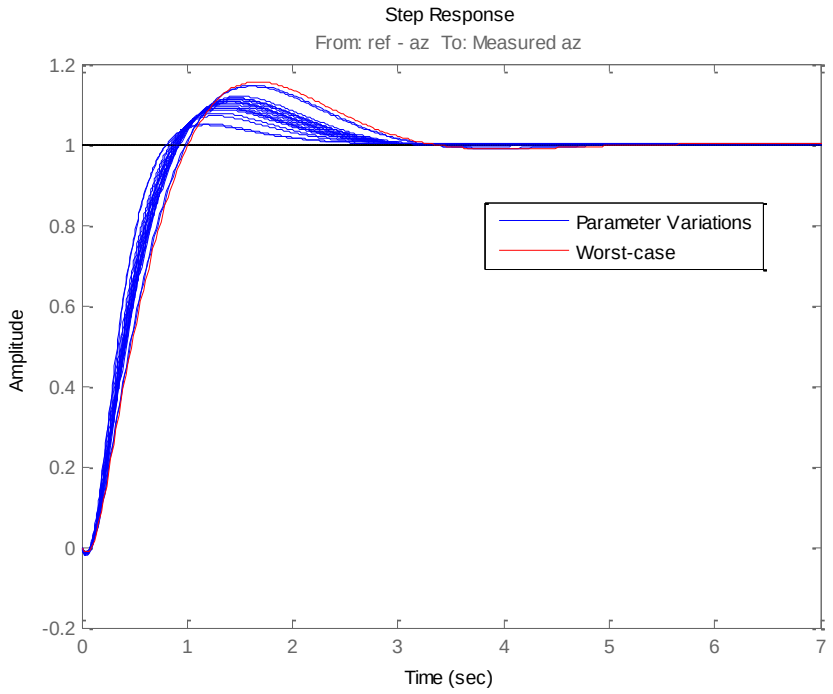
- Specify block linearizations as LTI models or Robust Control Toolbox uncertain models
- Change block linearization without impacting simulation
- Specify linearization for one block or multiple blocks



Application: Computing Worst Case Gains



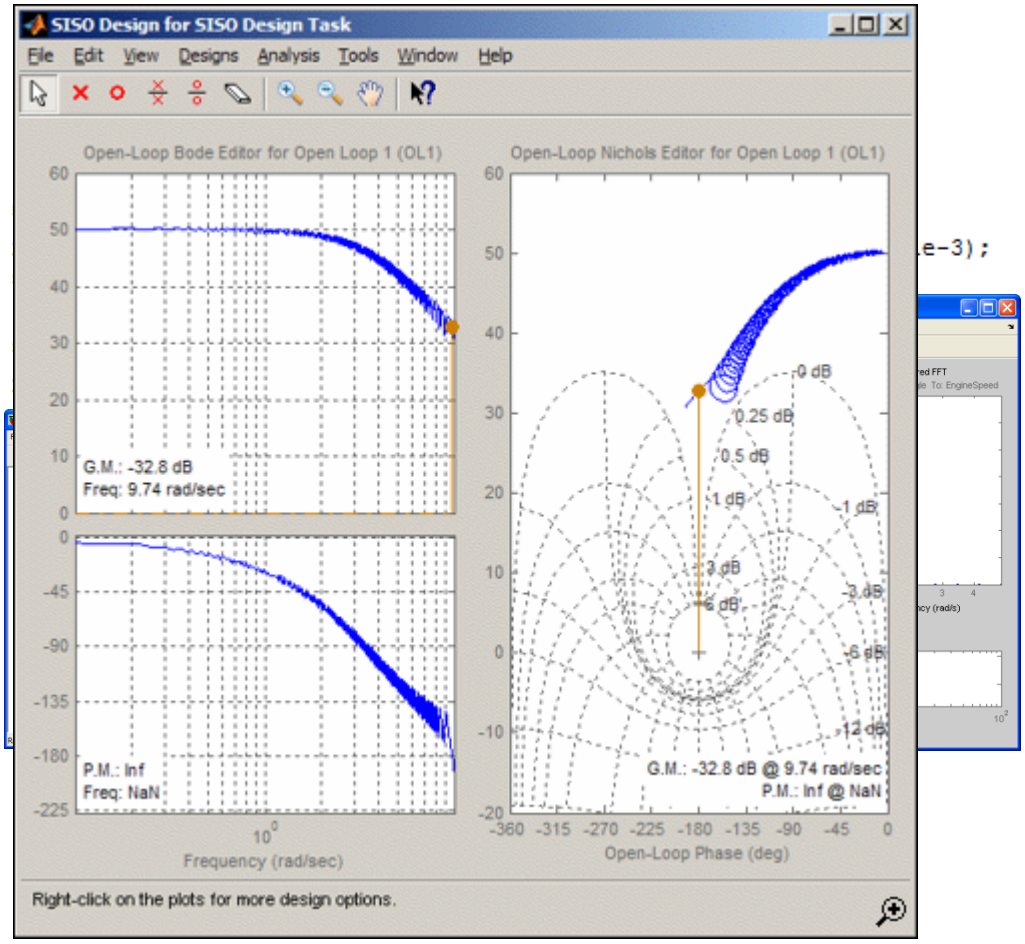
What is the worst case variation of parameters?



Frequency Response Estimation of Simulink Models Using Simulation

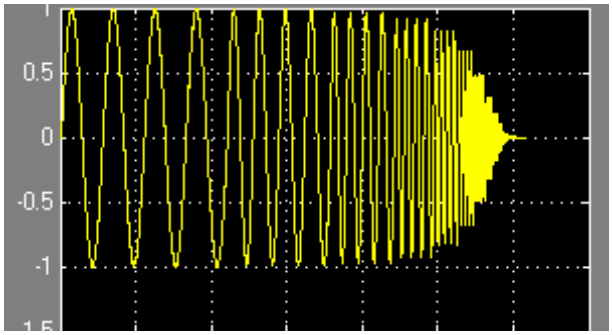
Easily compute frequency response of Simulink models using simulation

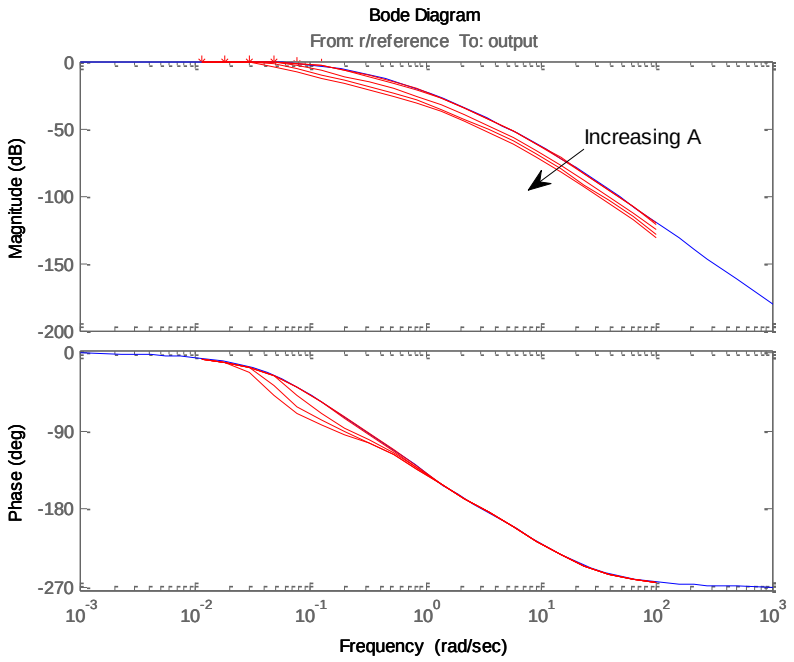
- Compute a frequency response estimate using 3 lines of code
  - Verify results of linearization or
  - Compute frequency response of models for which exact linearization techniques do not work
- Built-in rapid accelerator/distributed computing support
- Result supported in SISOTOOL



Frequency Response Estimation Example

1. Linearize a Simulink model
2. Estimate the frequency response using FRESTIMATE
3. Compute amplitude dependent frequency response functions





Summary

Presented 3 New Capabilities for Control Design

- PID Block and Automatic PID Tuning Capabilities
- Specification of Block Linearizations
- Frequency Response Analysis of Simulink Models

New features are available now in R2009b in Simulink Control Design

Questions?