DADiSP / Controls

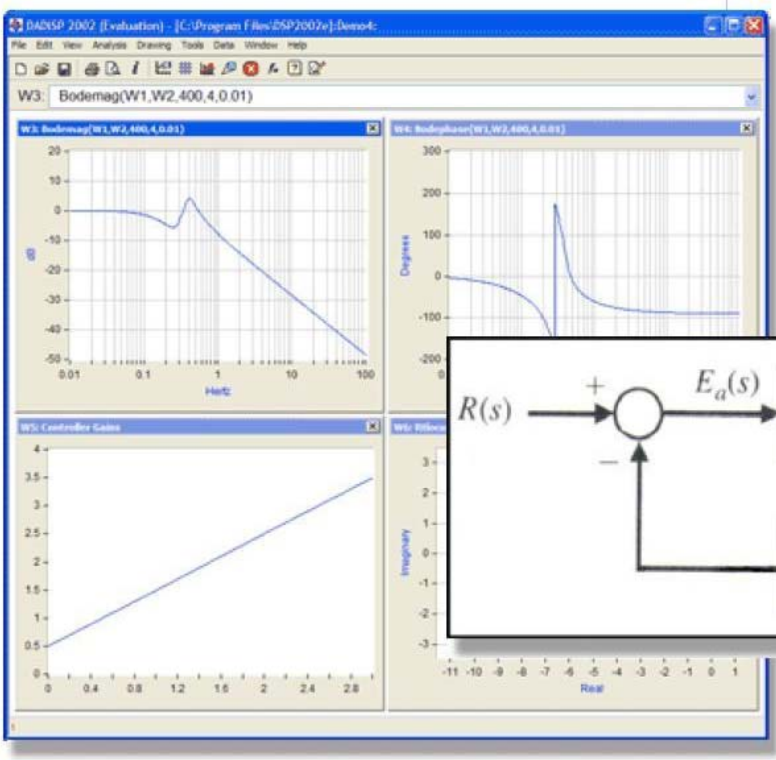
Analog and Digital Controls Module

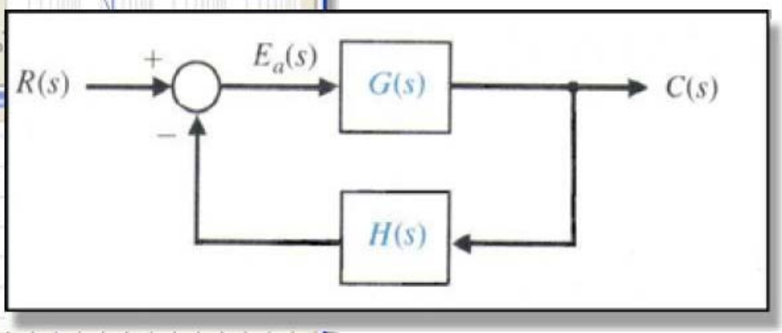
DADiSP/Controls is a menu-driven module that offers easy and accurate design, analysis, and simulation of both discrete and continuous linear time invariant single-input/single-output (SISO) controllers.

The controls module includes menus for the quick design of the most common controllers (PID), simultaneous open and closed loop frequency and time response design of continuous 2nd order systems and the iterative design of lag and lead compensators.

KEY FEATURES

- Simple User Interface
- Iterative Design Method for Common Controllers
- Impulse, Step, Ramp and Frequency Response Calculations
- Bilinear, Backwards Integration and Zero Order Hold Models
- Bode, Nyquist, Root-Locus and Pole-Zero Plots
- Open Loop and Closed Loop Conversion
- PID, PI and PD Designs
- Delay Elements, Lag and Lead Compensators
- 2nd Order Continuous System Design





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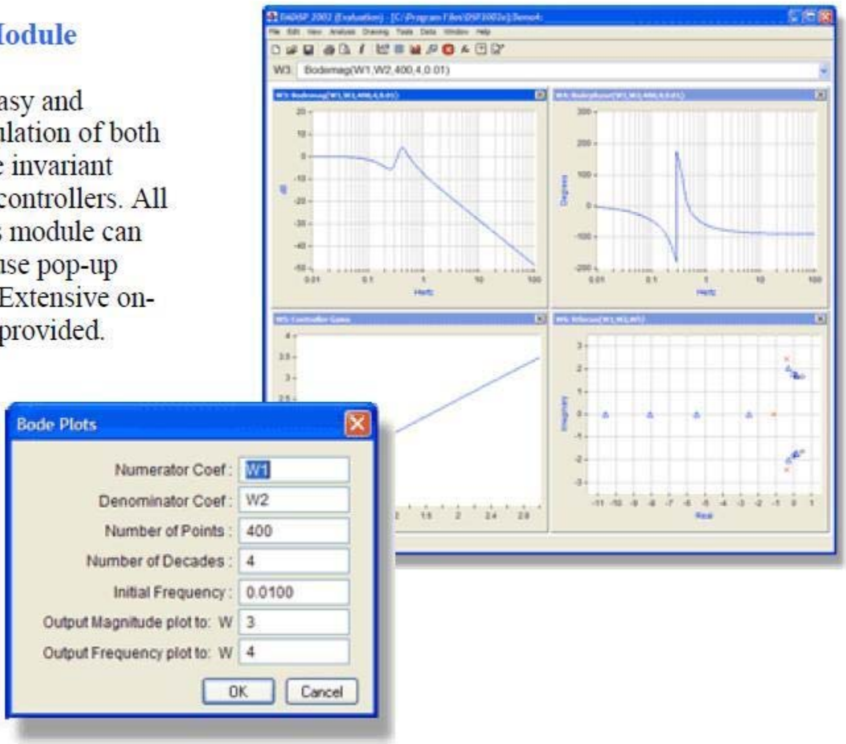
Analog and Digital Control Module

DADiSP/Controls allows for the easy and accurate design, analysis, and simulation of both discrete and continuous linear time invariant single-input/single-output (SISO) controllers. All of the functionality of the Controls module can be accessed through both easy-to-use pop-up menus and single line commands. Extensive on-line help menus and examples are provided.



Quick and Easy Control Design

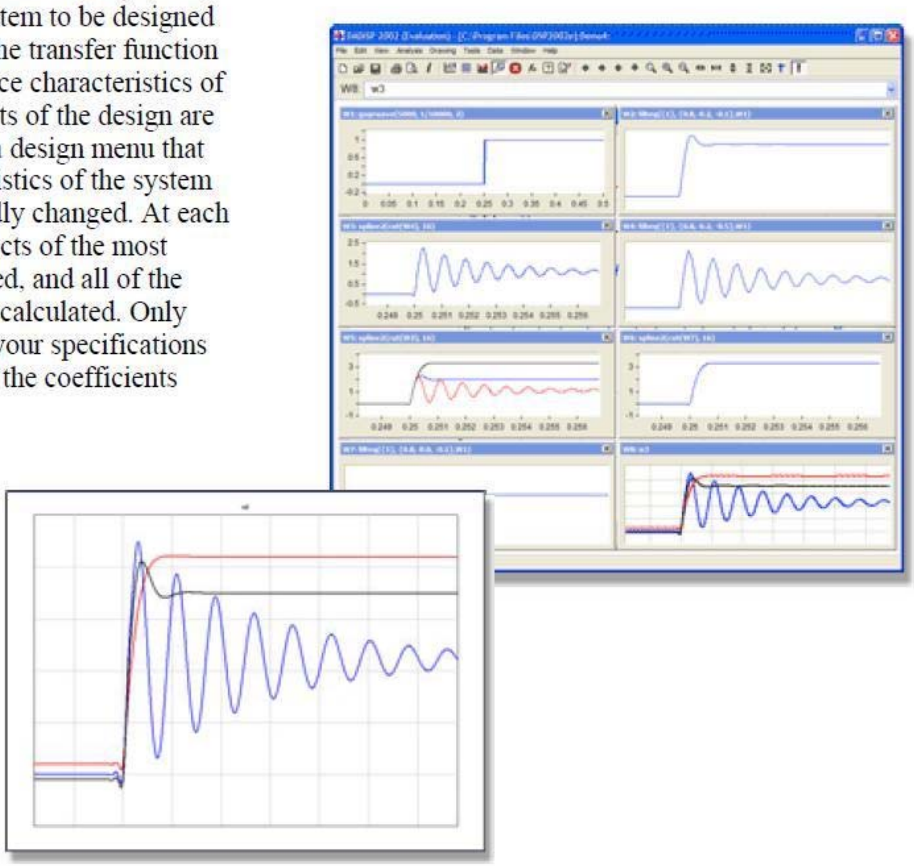
Fully integrated with the DADiSP, DADiSP/Controls is display oriented to show you what is going on in your model. DADiSP/Controls includes menus for the quick design of the most common controllers (PID), simultaneous open and closed loop frequency and time response design of continuous 2nd order systems, and the iterative design of lag and lead compensators.

Continuous to Discrete & Discrete to Continuous Transformation

DADiSP/Controls has a variety of methods to calculate the discrete equivalent of a continuous system as well as the continuous equivalent of a discrete system. Methods include: zero-order hold, bilinear method (Tustin Transform or trapezoidal rule), backward integration method, and zero order hold with processing delay. DADiSP/Controls models delays in continuous systems with either the first or second order Padé approximation to an exponential.

Iterative Design of Common Systems

DADiSP/Controls introduces an iterative method for the design of the most common types of control systems (continuous and discrete phase compensators and continuous 2nd order systems). This method allows for the system to be designed through specification of both the transfer function coefficients and the performance characteristics of the system. The iterative aspects of the design are made possible through use of a design menu that echoes the dominant characteristics of the system and allows them to be repeatedly changed. At each step during the design, the effects of the most recent modification are included, and all of the characteristics of the system recalculated. Only when the entire system meets your specifications and the design is accepted, are the coefficients output to the desired windows.



Simulation with Initial Conditions

To develop a continuous simulation with initial conditions, DADiSP/Controls uses state space realization and eigenvector methods for solving differential equations. Examples provided explain which functions should be used, and demonstrate the proper procedure for developing this type of simulation.

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Controls Functions

DADiSP/Controls includes over 40 standalone functions. The following table is a summary of each function.

Off the Shelf Controllers

pid	Design a proportional plus integral plus derivative controller
pi	Design a proportional plus integral controller
pd	Design a proportional plus derivative controller
lagleadm	Design a lag or lead compensator
dpid	Design a discrete proportional plus integral plus derivative controller
dpi	Design a discrete proportional plus integral controller
dpd	Design a discrete proportional plus derivative controller compensator
dlagleadm	Design the discrete equivalent of a continuous lag or lead
dsgn2ordm	Design a 2nd order continuous system

Model Transformation Functions

connect	Produce one composite model from two smaller ones
cloop	Transform open-loop model into its closed-loop equivalent
cloopf	Produce closed-loop transfer fcn for a system with open-loop & feedback dynamics
delay	Model a simple delay in a continuous system
delay2	Model a delay in a continuous system with a higher order approximation
c2disc	Produce discrete model: take Z-transform with zero order hold of the continuous system
c2dbil	Produce the bilinear discrete equivalent of a continuous system
c2dback	Calculate discrete equivalent via the backward integration method
c2delayY	Produce discrete model: take Z-transform with zero order hold with processing delay
dcgain	Calculate DC gain of a continuous system
cresolv	Produce the resolvant matrix of a continuous system
d2cont	Perform inverse Z-transform with zero order hold to produce the continuous model
d2cbil	Produce inverse of the bilinear transform to convert discrete model to continuous equivalent
d2cback	Transform discrete transfer function to continuous equivalent via the inverse of the backward integration method

Analysis and Simulation

bode	Produce Bode magnitude and phase plots
nyquist	Generate Nyquist Plot
fstats	Calculate frequency response characteristics from Bode plot
dbode	Generate Bode plots for a discrete system
dnyquist	Produce Nyquist plot for a discrete system
dfstats	Calculate frequency response characteristics from discrete Bode plot
setfunit	Set units to be used by frequency response macros
pzmap	Plot pole and zero locations in the complex plane
rtlocus	Generate Root Locus Plot
pzgrid	Overlay a grid of constant natural frequencies and damping ratios
dpzmap	Plot location of the poles and zeros of a discrete system
drtlocus	Generate Root Locus Plot for a discrete system
dpzgrid	Overlay a grid of constant discrete natural frequencies and damping ratios
cimpulse	Calculate impulse response of a continuous system
cstep	Evaluate step response of a continuous system
cramp	Calculate response of a continuous system to ramp input
csim	Calculate response of a continuous system to specified input
csiminit	Calculate response of a continuous system to specified input and initial conditions
dimpulse	Calculate impulse response of a discrete system
dstep	Evaluate step response of a discrete system
dramp	Calculate response of a discrete system to ramp input
dsim	Calculate response of a discrete system to specified input
dsiminit	Calculate response of a discrete system to specified input and initial conditions
tstats	Calculate performance characteristics from continuous or discrete step response plot

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