



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab

1. Entorno de Matlab
2. Control system toolbox de Matlab
3. Simulink



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Entorno del Matlab

MATLAB

The screenshot shows the MATLAB 7.5.0 (R2007b) environment. The Command Window is the central focus, displaying a list of toolboxes and their contents. The 'control/control' entry is circled in red. The Command History window shows a list of executed commands including 'bode', 'margin', 'simplot', and 'help'.

Command Window Content:

- etargets/etargets - (No table of contents file)
- etargets/mdlinfo - (No table of contents file)
- autointerface/util - (No table of contents file)
- autointerface/BaseLinkPkg - (No table of contents file)
- idelinks/pjtgenerator - (No table of contents file)
- pjtgenerator/hookpoints - (No table of contents file)
- pjtgenerator/tgtpref - (No table of contents file)
- pjtgenerator/profiler - (No table of contents file)
- pjtgenerator/mdlinfo - (No table of contents file)
- comm/comm - Communications Toolbox
- comm/commandemos - Communications Toolbox Demos.
- commandemos/commdocdemos - Communications Toolbox Documentation Examples.
- comm/commobsolete - Archived MATLAB Files from Communications Toolbox Version 1.5.
- commblks/commblks - Communications Blockset
- commblks/commmasks - Communications Blockset library block mask helper functions.
- commblks/commmex - Communications Blockset S-function MEX-files.
- commblks/commblkdemos - Communications Blockset Demos.
- commblksobsolete/v3 - (No table of contents file)
- commblksobsolete/v2p5 - (No table of contents file)
- commblksobsolete/v2 - (No table of contents file)
- toolbox/compiler - MATLAB Compiler
- control/control - Control System Toolbox
- control/ctriguiz - Control System Toolbox -- Visualization and plot manipulation.
- control/ctrlobsolete - Control System Toolbox -- obsolete commands.
- control/ctrlutil - Control System Toolbox -- Utilities and MEX files.
- control/ctrlidemos - Control System Toolbox -- Demos.
- shared/slcontrollib - Simulink Control Design Library
- curvefit/curvefit - Curve Fitting Toolbox
- curvefit/cftoolgui - (No table of contents file)
- shared/optimlib - Optimization Toolbox Library
- daq/daq - Data Acquisition Toolbox
- daq/daqguiz - Data Acquisition Toolbox - Data Acquisition Soft Instruments.
- daq/daqdemos - Data Acquisition Toolbox - Data Acquisition Demos.
- daqblks/daqblks - (No table of contents file)
- daqblks/daqmasks - (No table of contents file)
- daqblks/daqmex - (No table of contents file)
- shared/testmeaslib - (No table of contents file)
- database/database - Database Toolbox
- database/dbdemos - Database Toolbox Demonstration Functions.
- database/vqb - Visual Query Builder functions.
- datafeed/datafeed - Datafeed Toolbox
- datafeed/dfgui - Datafeed Toolbox Graphical User Interface
- des/desblks - SimEvents
- des/desmasks - (No table of contents file)
- des/desmex - (No table of contents file)

Command History Content:

```

bode(10.5, [12, 14, 0])
margin(10.5, [12, 14, 0])
bode(10.5, [12, 14, 10.5])
2/03/10 16:35 --%
simplot(t5)
simplot(t1)
simplot(t3)
simplot(t4)
simplot(t6)
3/03/10 10:01 --%
simplot(t1)
simplot(t3)
simplot(t4)
simplot(t6)
3/03/10 14:01 --%
4/03/10 13:03 --%
5/03/10 9:49 --%
simplot(t1)
simplot(t3)
antena
8/03/10 12:28 --%
help
  
```

VENTANA DE COMANDOS

CONTROL SYSTEM TOOLBOX DE MATLAB

El Control System Toolbox de Matlab ofrece la posibilidad de representar la respuesta dinámica de los sistemas lineales invariantes en el tiempo (LTI). Para ello, dispone de distintas instrucciones que facilitan y simplifican el estudio dinámico tanto en el dominio del tiempo como en el de la frecuencia.

Consideremos el siguiente sistema:

Instrucciones en Matlab

Función de Transferencia (tf)

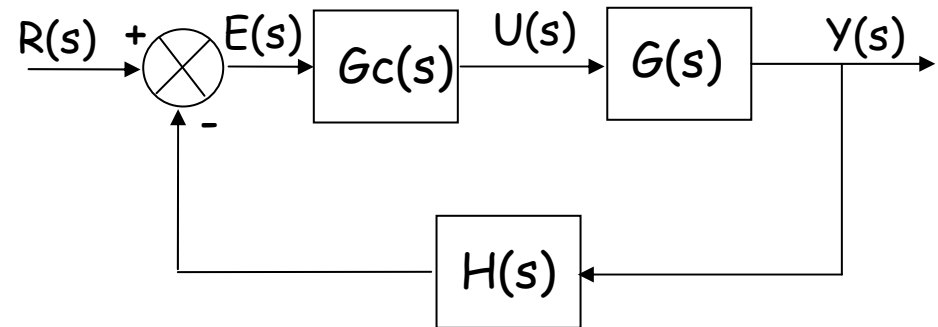
$$G = \text{tf}(\text{num}, \text{den})$$

num= numerador de la función de transferencia

den= denominador de la función de transferencia

Polinomio: num=a sn+b sn-1+...+ c

$$p=[a,b,\dots,c]$$



*Numero Complejo: $1+2i, 1+2j, 1+2*I, 1+2*j$*

Raíces de un polinomio

`roots(num)`

Multiplicación de dos Funciones de Transferencia ()*

`G1=Gpid*G`

Realimentación: feedback

`Glc=feedback(G1,H)` Realimentación negativa

`Glc=feedback(G1,H,+)` Realimentación positiva

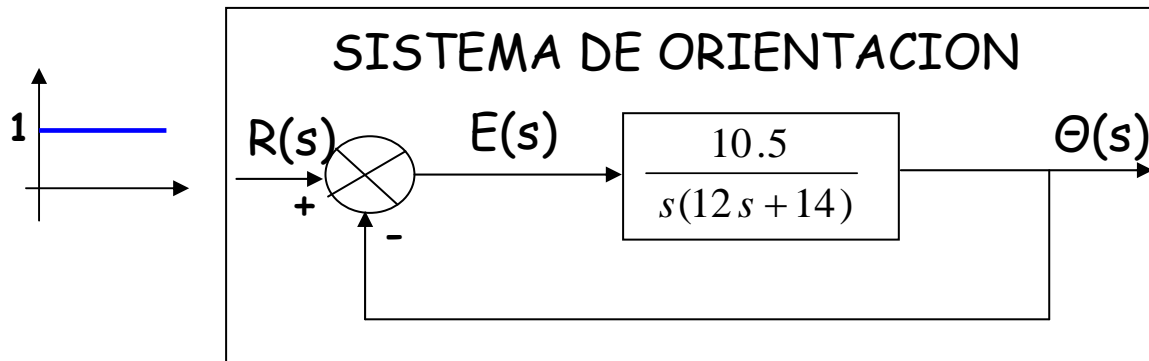
Siendo H= función de transferencia de la realimentación

Entrada escalón (step)

`step (Glc)` ----- entrada escalón para la función $Glc(s)$

`step (G1,G2,G3,..)` --- entrada escalón para la función $G1(s), G2(s), G3(s), \dots$

Ejemplo:



Programa:

`G=tf(10.5,[12,14,0])`

`Glc=feedback(G,1)`

`step(Glc)`



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Control System Toolbox

MATLAB 7.5.0 (R2007b)

Editor - Untitled3*

```
1 G=tf(10.5,[12,14,0])
2 Gc=feedback(G,1)
3 step(Gc)
```

Command History

- simplot(t3)
- simplot(t4)
- bode(10.5,[12,14,0])
- margin(10.5,[12,14,0])
- bode(10.5,[12,14,0])
- margin(10.5,[12,14,0])
- bode(10.5,[12,14,10.5])
- 2/03/10 16:35 -->
- simplot(t5)
- simplot(t1)
- simplot(t3)
- simplot(t4)
- simplot(t6)
- 3/03/10 10:01 -->
- simplot(t1)
- simplot(t3)
- simplot(t4)
- simplot(t6)
- 3/03/10 14:01 -->
- 4/03/10 13:03 -->
- 5/03/10 9:49 -->
- simplot(t1)
- simplot(t3)

script Ln 3 Col 10 OVR

Inicio Google Bandeja de e... ASIGNATUR... Microsoft Po... 7 MATLAB Grupo de Cie... Dibujo - Paint ES Búsqueda en el escritorio 10:30



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Simulink

Simulink



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Simulink

Simulink

The screenshot shows the MATLAB 7.5.0 (R2007b) environment with the Simulink Library Browser open. The browser displays a tree view of Simulink blocks. The 'Continuous' block is selected, and its details are shown on the right. The 'Transfer Fcn' block is circled in red, showing the transfer function $\frac{1}{s+1}$. The 'Derivative' block is also visible, showing the transfer function $\frac{du}{dt}$.

Simulink Library Browser

File Edit View Help

Current Directory: C:\Documents and Settings\Jon\Mis documentos\MATLAB

Derivative: Numerical derivative: du/dt.

Simulink

- Commonly Used Blocks
- Continuous
- Discontinuities
- Discrete
- Logic and Bit Operations
- Lookup Tables
- Math Operations
- Model Verification
- Model-Wide Utilities
- Ports & Subsystems
- Signal Attributes
- Signal Routing
- Sinks
- Sources
- User-Defined Functions
- Additional Math & Discrete

Transfer Fcn

$\frac{1}{s+1}$

Derivative

$\frac{du}{dt}$

Integrator

$\frac{1}{s}$

State-Space

$x' = Ax + Bu$
 $y = Cx + Du$

Transport Delay

Variable Time Delay

Variable Transport Delay

Zero-Pole

$\frac{(s-1)}{s(s+1)}$

Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Simulink

Simulink

MATLAB 7.5.0 (R2007b)

File Edit View Graphics Debug Distributed Desktop Window Help

Current Directory: C:\Documents and Settings\Jon\Mis documentos\MATLAB

Shortcuts

Current Directory

Name

Continuous: simulink/Continuous

Simulink

- Commonly Used Blocks
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Command Window

MATLAB? Watch this Video, see Demos, o

Ready

Simulink

- Commonly Used Blocks
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- Signal Routing
- Sinks
- Sources
- User-Defined Functions
- Additional Math & Discrete
- Aerospace Blockset
- Communications Blockset
- Control System Toolbox
- Data Acquisition Toolbox
- Fuzzy Logic Toolbox
- Gauges Blockset
- Image Acquisition Toolbox
- Instrument Control Toolbox
- Link for Analog Devices VisualDSP++
- Link for Cadence Incisive
- Link for Code Composer Studio(tm)
- Link for ModelSim
- Model Predictive Control Toolbox
- Neural Network Toolbox
- OPC Toolbox
- RF Blockset
- Real-Time Windows Target
- Real-Time Workshop
- Real-Time Workshop Embedded Code
- Report Generator
- Robust Control Toolbox
- Signal Processing Blockset
- SimEvents
- SimPowerSystems
- Simscape
- Simulink Control Design
- Simulink Design Verifier

Clock

Constant

Counter Free-Running

Counter Limited

Digital Clock

From File

From Workspace

Ground

In1

Pulse Generator

Ramp

Random Number

Repeating Sequence

Repeating Sequence Interpolated

Repeating Sequence Stair

Signal Builder

Signal Generator

Sine Wave

Step



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Simulink

Simulink

The screenshot shows the Simulink Library Browser interface. The left pane displays a tree view of Simulink blocks, with 'Sinks' highlighted. The right pane shows a list of blocks, with 'Scope' circled in red. A red arrow points from the 'Sinks' block in the tree to the 'Scope' block in the right pane. The 'Scope' block is also circled in red. Other blocks visible in the right pane include 'Display', 'Floating Scope', 'Out1', 'Stop Simulation', 'Terminator', 'To File', and 'XY Graph'.



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Simulink

Simulink

The screenshot shows the MATLAB 7.5.0 (R2007b) Simulink Library Browser. The main window is titled 'Simulink Library Browser' and displays a tree view of Simulink blocks. The 'PID Controller' block is highlighted in the tree view. The detailed view of the 'PID Controller' block is shown on the right, with a red circle around it. The detailed view shows the block's parameters and transfer function options.

Block Icon	Block Name
	PID Controller
	PID Controller (with Approximate Derivative)
	State-Space (with initial outputs)
	Transfer Fcn (with initial outputs)
	Transfer Fcn (with initial states)
	Zero-Pole (with initial outputs)
	Zero-Pole (with initial states)



Tema 7. Análisis y diseño asistido por ordenador de sistemas de orientación utilizando Matlab. Simulink

SISTEMA DE ORIENTACION

Block diagram showing a feedback control system. The input is $R(s)$, which is summed with a feedback signal (indicated by a minus sign) to produce the error signal $E(s)$. This error signal is the input to a transfer function block with the transfer function $\frac{10.5}{s(12s + 14)}$. The output of the transfer function is $\Theta(s)$.

The simulation results window shows a plot of the system response over time, with the signal starting at 0 and rising to a steady-state value of approximately 0.85.

Default value of 0.2 for maximum step size. The simulation step size will be equal to or less than the default value. You can disable this diagnostic by setting 'Automatic solver parameter selection' diagnostic to off on the Diagnostics page of the configuration parameters dialog.

SIMULINK: SCOPE

MATLAB

The image displays a MATLAB environment with several windows open:

- Scope2:** A plot window showing simulation results. The x-axis is labeled 'Time' and ranges from 0 to 10. The y-axis ranges from 0 to 2. Multiple colored lines (red, yellow, green, cyan) represent different signals. A horizontal purple line is drawn at y=1.0.
- 'Scope2' parameters:** A dialog box with the 'General' tab selected. It includes:
 - Tip: try right clicking on axes
 - Limit data points to last: 5000
 - Save data to workspace
 - Variable name: t5
 - Format: Structure with time
 - Buttons: OK, Cancel, Help, Apply
- Command Window:** Shows the following text:

```
Warning: Input port 4 of 'Antena_simple_step/Mux1' is not connected.  
Warning: Using a default value of 0.2 for maximum step size. The simulation step size will be equal to or less than this value. You can disable this diagnostic by setting 'Automatic solver parameter selection' diagnostic to 'none' in the Diagnostics  
>>  
>>  
>>  
>>  
>> simplot(t5)  
>>
```
- Figures - Figure 1:** A plot window showing the same simulation results as Scope2. The x-axis is labeled 'Time' and ranges from 0 to 10. The y-axis ranges from 0 to 1.8. A horizontal purple line is drawn at y=1.0.
- Property Editor - Axes:** A dialog box for the plot axes with the following settings:
 - Grid: X, Y, Z
 - Box
 - X Axis: X Limits: 0 to 10, Auto
 - X Scale: Linear
 - Reverse