Using Matlab SISOTOOL 2016 part 1

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http://controleducation.group.shef.ac.uk/indexwebbook.html
Introduction

• Many earlier videos by this author use the original version of sisotool.

• However, there has been a relatively major change in the presentation and functionality of this tool in MATLAB 2016, so this resource gives a quick overview of the new tool.

• Focus is on students doing a single course in classical control methods such as Bode, Nyquist, gain and phase margins and lead and lag design.
Core skills

• Changing compensator gain by hand (drag) and explicitly (enter a number).

• Interactive views as all plots update instantly as compensator changes are made.

• Changing compensator poles and zeros by hand (drag) and explicitly (enter a number).

• Overlaying step responses and frequency response graphs from different compensators.

• The first video focuses on views and options; the later ones deal with compensator design.
Assumptions

This resource assumes a simple feedback structure as follows (although sisotool will deal with more complicated structures).

![Feedback System Diagram]

- **Target (a unit step)**
- **Compensator or controller**
- **System or process to be controlled**
Overview

First the slides outline the core skills and notation:

• Loop structure and naming assumptions.
• Obtaining core plots.
• Changing the compensator gain.

Secondly a live demonstration will be given on MATLAB.
Getting started

Define the system transfer function in the command window and then start sisotool as follows.

I tend to use $G(s)$ as this is conventional and matches sisotool notation.
Next we will go through options and functionality.
Loop structure assumed in sisotool

Options are available under the architecture tab.

Compensator or controller

System or process to be controlled

Negative feedback

We assume $F=H=1$

Other possibilities

Change $G$ or $C$ from workspace

Slides by Anthony Rossiter
Viewing closed-loop input responses

These are available under the tab ‘new plot’

We want:
- IOTransfer_r2u
- IOTransfer_r2y

Options are selected here with obvious notation.
IO Transfer Function

- **IOTransfer_r2u**
- **IOTransfer_r2y**
Viewing Nyquist plots

These are available under the tab ‘new plot’

Select New Nyquist

Select LoopTransfer_C

Select Response to Plot: LoopTransfer_C

Open-Loop Transfer Function
Name: LoopTransfer_C
Locations: uc

Architecture:
Nyquist diagram here

Notice tabs with all optional plots available
The root-loci plot marks the position of the closed-loop poles with the current value of compensation.

Pink blobs for current closed-loop poles.

How do we change compensator gain?
Compensator gain

Right click on the Bode diagram and select ‘edit compensator’. The following appears.

Change gain here.

Poles and zeros in next resource.
Live demonstration

• Opening sisotool
• Adding closed-loop inputs
• Adding a Nyquist plot
• Changing the compensator gain.
• Importing a different G(s).
Conclusion

This short video has demonstrated the basic use of sisotool in MATLAB 2016.

We have not covered every option, but rather focussed on core functionality to support students doing a 1st course in classical control.

The following videos show how to use the tool for comparing compensator designs and then doing design.