

# Introduction to Xcos

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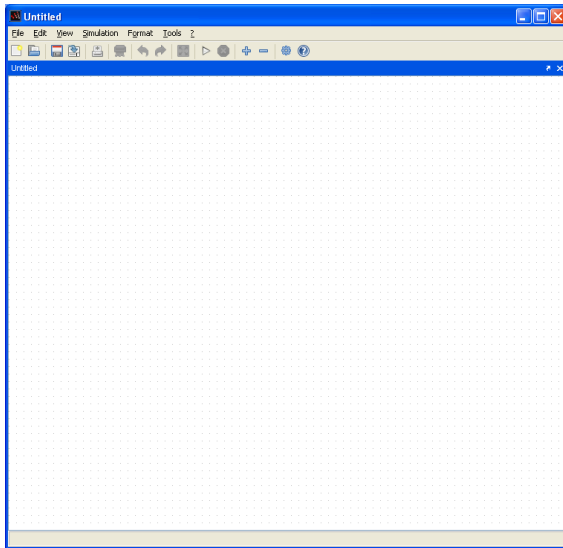


# What is Xcos?

- A Scilab connected object simulator
- Used for block diagram simulation
- Excellent GUI for Data processing



# Xcos window



# Xcos palette browser

The screenshot shows the Xcos Palette browser window. The window title is "Palette browser". On the left side, there is a list of palettes under the heading "Palettes". The "Commonly Used Blocks" palette is selected and expanded, showing a list of categories:

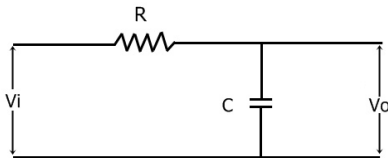
- Commonly Used Blocks
- Continuous time systems
- Discontinuities
- Discrete time systems
- Lookup Tables
- Event handling
- Mathematical Operations
- Matrix
- Electrical
- Integer
- Port & Subsystem
- Zero crossing detection
- Signal Routing
- Signal Processing
- Implicit
- Annotations
- Sinks
- Sources
- Thermo-Hydraulics
- Demonstrations Blocks
- User-Defined Functions

The main area of the palette browser displays a grid of blocks from the "Commonly Used Blocks" palette:

- ANDBLK (AND gate)
- BIGSOM\_f (Summing junction)
- CMScope (Scope)
- CONST\_m (Constant)
- CONVERT (Convert to)
- CSCOPYX (Cscope)
- DEMUX (Demultiplexer)
- DOLLAR\_f (1/z)
- INTEGRAL\_f (Integrator)
- IN\_f (Inverter)
- LOGICAL\_OP (Logical operation)
- MUX (Multiplexer)
- NRMSOM\_f (Bus creator)
- OUT\_f (Out)
- PRODUCT (Product)
- RELATIONALOP (Relational operation)
- SATURATION (Saturation)
- SWITCH2\_m (Switch)
- Text (Text block)
- TEXT\_f (Text block)



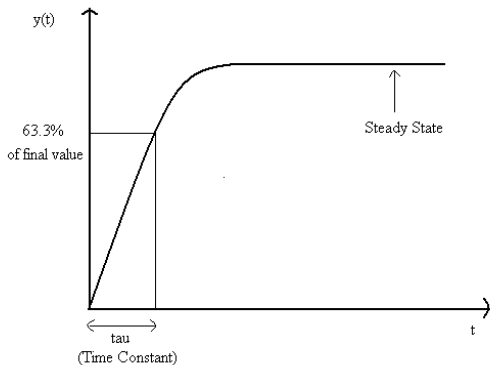
# First order Systems



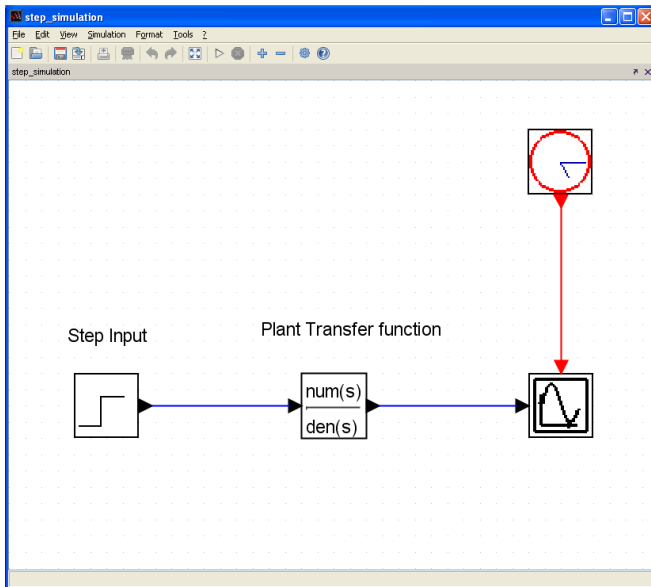
$$\frac{V_o(s)}{V_i(s)} = \frac{1}{RCs + 1}$$



# Step response of 'First order Systems'

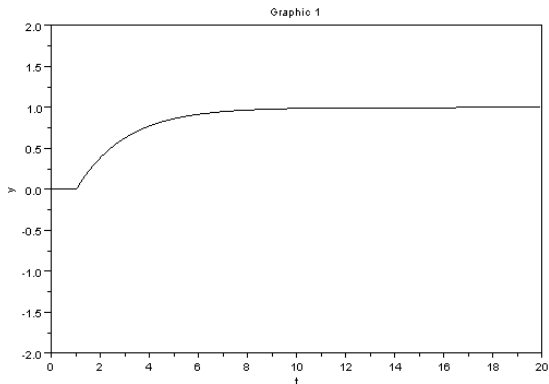


# Xcos for open loop simulation (first order)



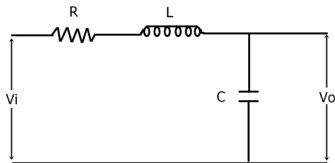
# Xcos Response for open loop simulation

Xcos simulation response for Transfer function  $\frac{1}{2s+1}$





# Second order Systems



$$\frac{V_o(s)}{V_i(s)} = \frac{1}{s^2 + LCs + 1}$$

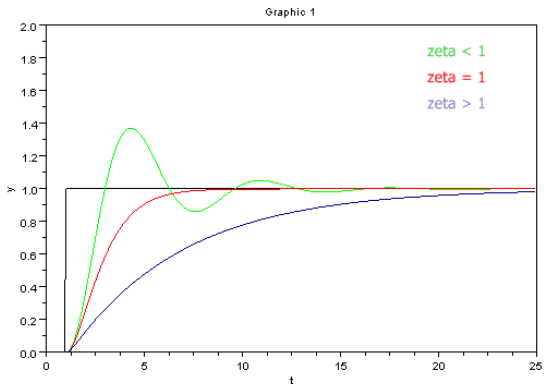


This second order transfer function can also be written in terms of  $\omega_n$ , undamped natural frequency and  $\zeta$ , damping ratio.

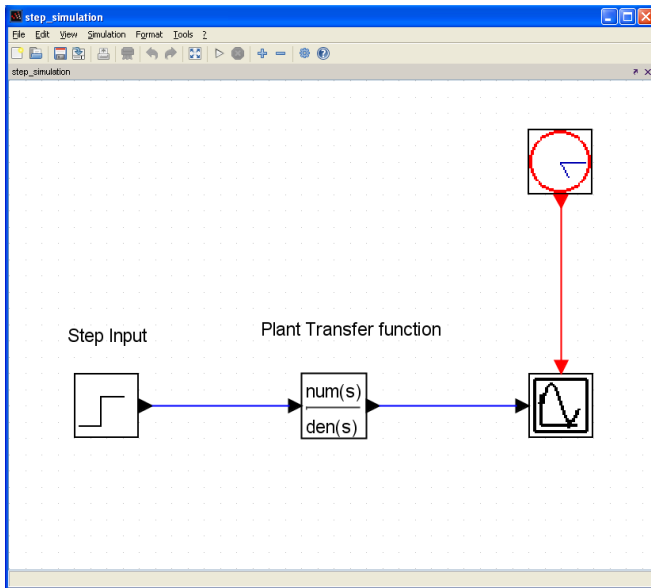
$$\frac{C(s)}{R(s)} = \frac{\omega_n}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$



# Step response of 'Second order Systems'

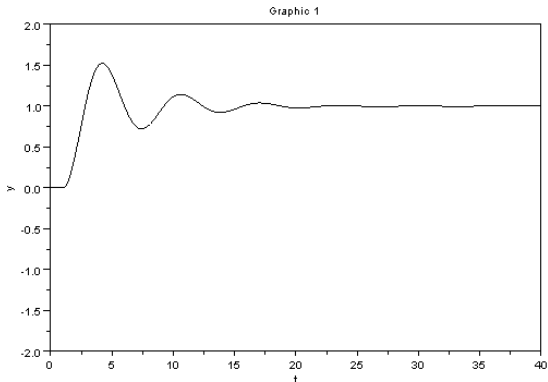


# Xcos for open loop simulation (second order)



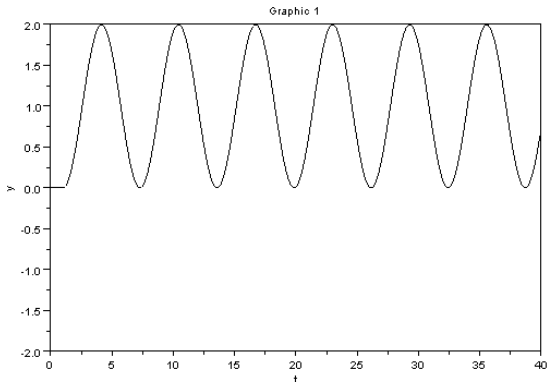
# Xcos Response for open loop simulation

Xcos simulation response for Transfer function  $\frac{1}{s^2+2*0.2*1*s+1}$

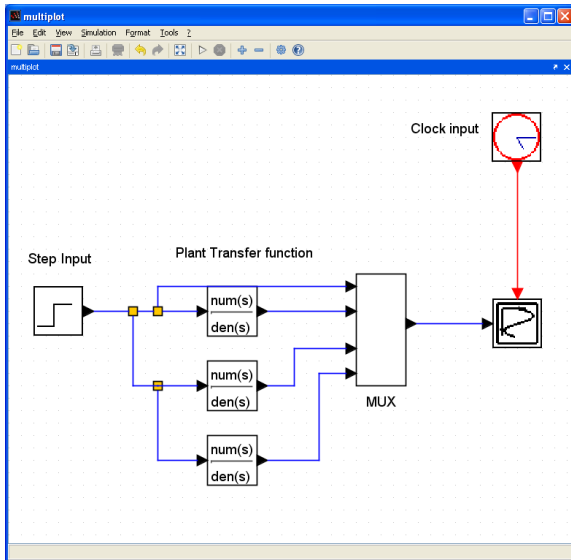


# Xcos Response for open loop simulation

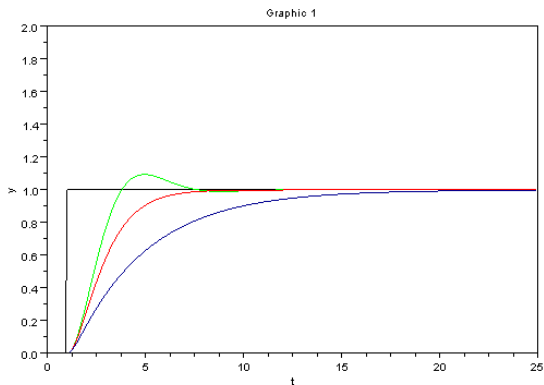
Xcos simulation response for Transfer function  $\frac{1}{s^2+1}$



# Xcos for plotting overlapped multiple plots



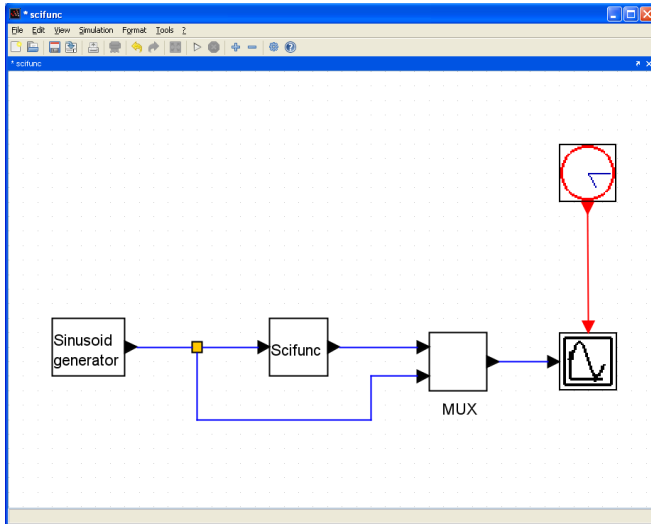
# Multiple plots in Xcos





# Using scifunc in Xcos

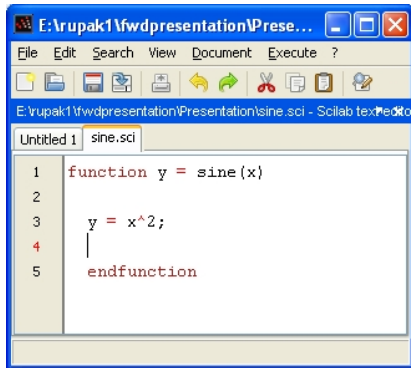
Xcos simulation diagram with scifunc block



# Configuring Scifunc block

- Open the block properties of Scifunc block by double clicking on it
- Click on ok and you will be prompted to ask to enter the function name.
- Write,  $y = \text{sine}(u1)$  and click ok five times.
- Open editor, write the code as shown in the slide 19 and save it with some name (e.g. sine.sci).
- After making sure that you are in the same directory where the .xcos and .sci file resides, run the .sci file.
- After running the .sci file, open the xcos code and execute it.





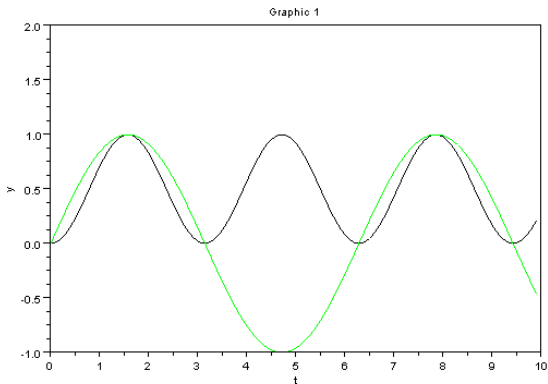
The screenshot shows a Scilab text editor window titled "E:\rupak1\fwdpresentation\Prese...". The menu bar includes "File", "Edit", "Search", "View", "Document", "Execute", and "?". The toolbar contains icons for file operations and editing. The active window is "Untitled 1" with the filename "sine.sci". The code is as follows:

```
1 function y = sine(x)
2
3     y = x^2;
4     |
5 endfunction
```

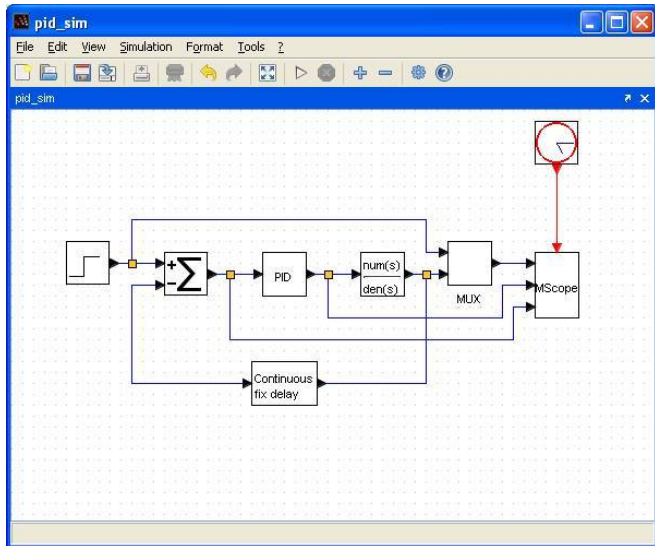
- Remember to use the same function name in the .sci as well as .xcos file.



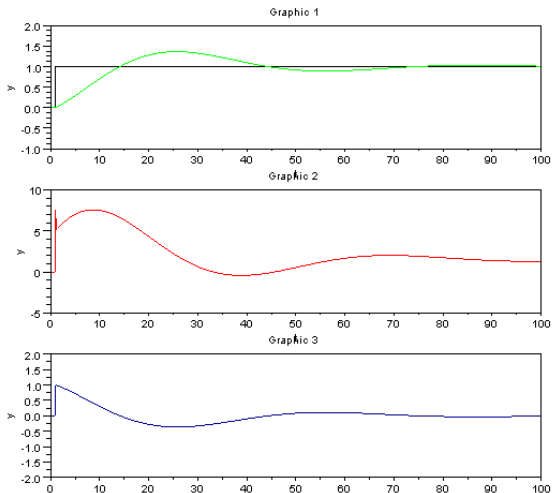
# Response of Xcos simulation diagram with scifunc block



# Xcos for closed loop controllers



# Xcos response for closed loop controller



Thank You

