

# Introduction to Scicos

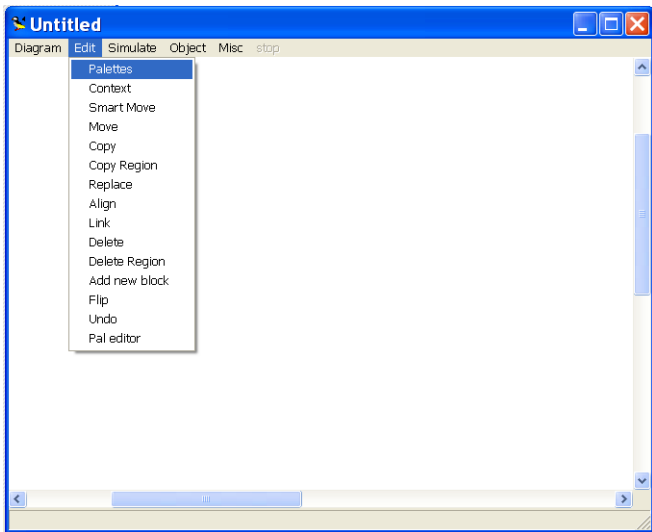
Rupak Rokade and Mahanand Mali

Indian Institute of Technology Bombay  
15th April, 2010

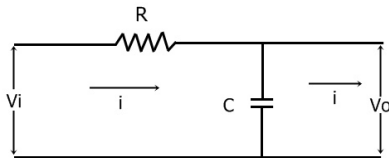
# What is Scicos?

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

# Scicos window

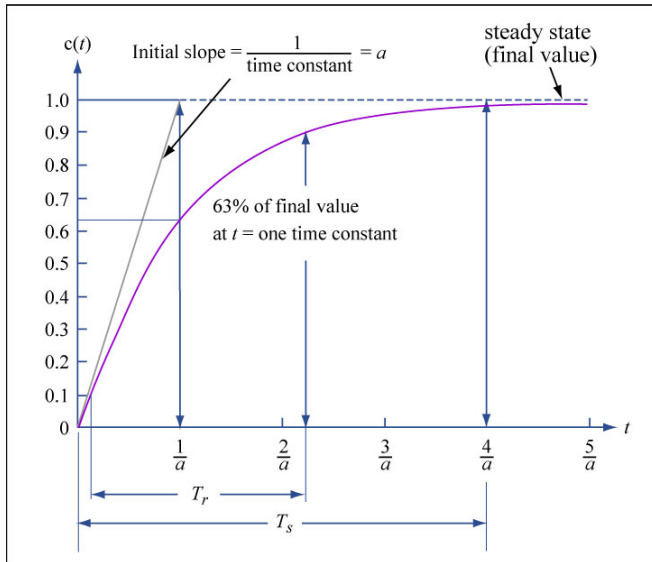


# First order Systems

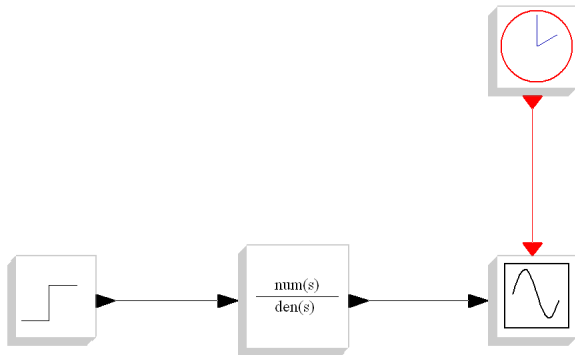


$$\frac{V_o(s)}{V_i(s)} = \frac{1}{RCs + 1}$$

# Step response of 'First order Systems'

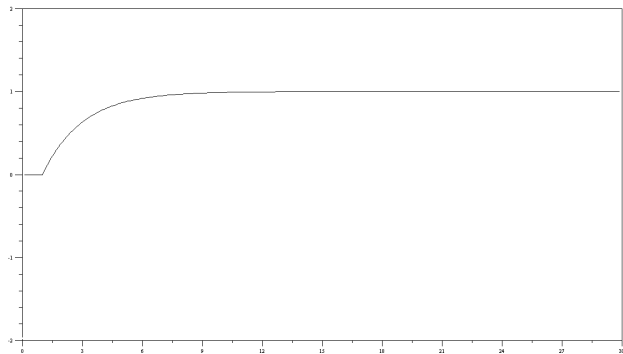


# Scicos for open loop simulation (first order)

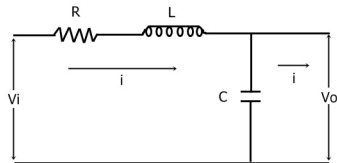


# Scicos Response for open loop simulation

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



# Second order Systems



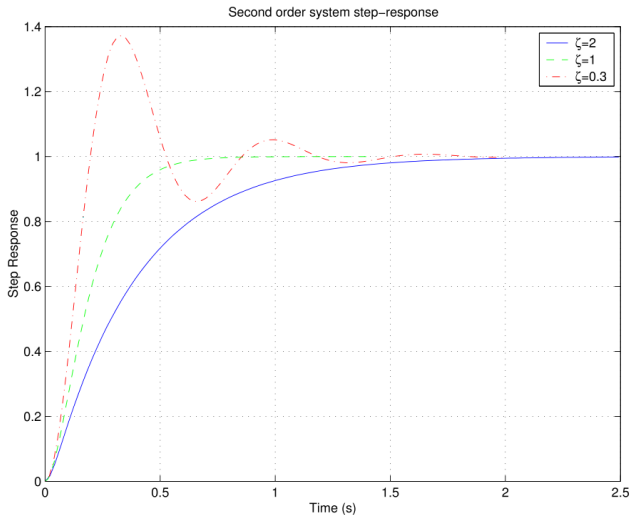
$$\frac{V_o(s)}{V_i(s)} = \frac{1}{s^2 + LCs + 1}$$



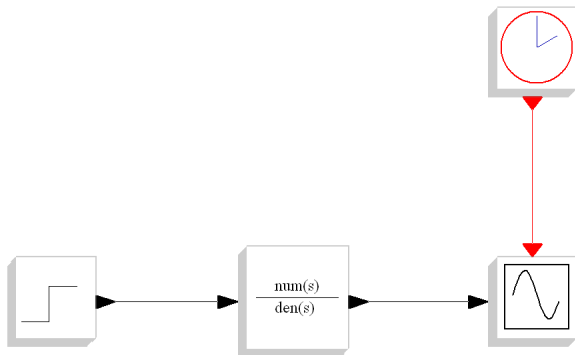
This second order transfer function can also be written in terms of  $\omega_n$ , undamped natural frequency and  $\zeta$ , damping ratio.

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

# Step response of 'Second order Systems'

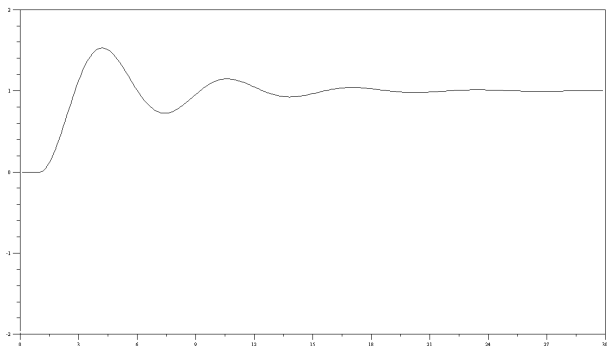


# Scicos for open loop simulation (second order)



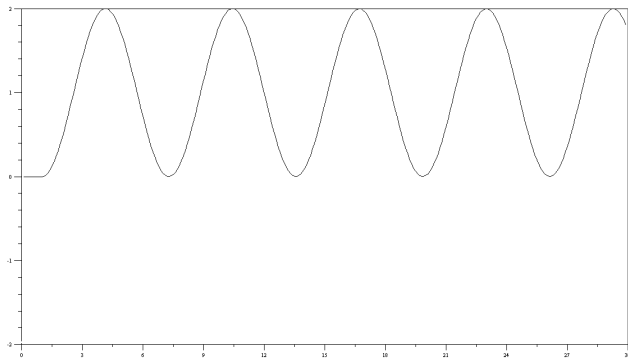
# Scicos Response for open loop simulation

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



# Scicos Response for open loop simulation

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



# Using Scilab and Scicos for Control Applications

# Single Board Heater System



# Single Board Heater System (Hardware)

- It is a lab in a box setup
- The setup consists of a heater assembly, fan, temperature sensor, microcontroller and associated circuitry
- Microcontroller ATmega16 is used for operating the board
- Serial Interface is available to communicate with the computer.



# Single Board Heater System (Software)

- ATmega16 is an 8-bit microprocessor, hence only  $2^8 = 256$  possibilities exist.
- Command 253 is reserved for Fan speed
- Command 254 is reserved for Heater Current
- Command 255 is reserved for Temperature
- A particular command is used to access a particular parameter

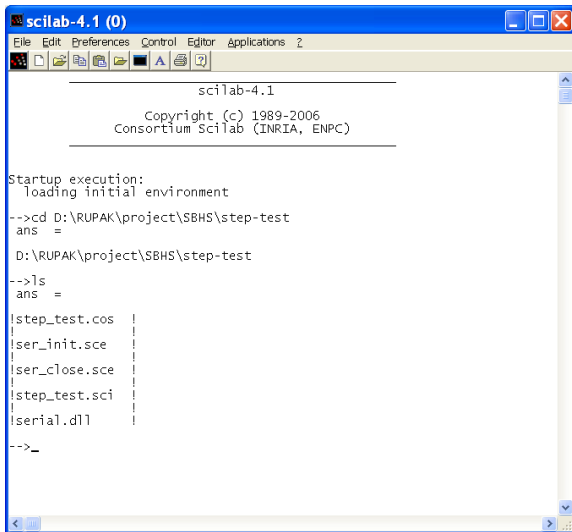
# Using Scilab for performing Control Experiments

- Requires 'Serial.dll' to establish serial communication between computer and Hardware
- 'Serial.dll ' can be downloaded from Scilab.org website
- Building appropriate block diagram in Scicos, writing necessary scilab code and performing the experiment

# Performing Step test on SBHS

- Change the directory to the one which includes files
  - ① ser\_init.sce
  - ② step\_test.sci
  - ③ step\_test.cos
- These files are available for download on <http://fossee.in/moodle/course/view.php?id=3>
- Make sure that the directory also includes the serial.dll file.
- Please note that the serial.dll file is only meant for Scilab 4. versions

# Scilab window



The screenshot shows the Scilab 4.1 (0) window with a menu bar (File, Edit, Preferences, Control, Editor, Applications) and a toolbar. The main window displays the following text:

```
scilab-4.1
Copyright (c) 1989-2006
Consortium Scilab (INRIA, ENPC)

Startup execution:
  loading initial environment

-->cd D:\RUPAK\project\SBHS\step-test
ans =

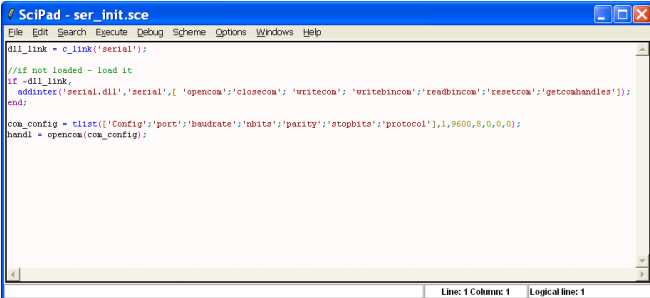
D:\RUPAK\project\SBHS\step-test

-->ls
ans =

|step_test.cos |
|ser_init.sce  |
|ser_close.sce|
|step_test.sci|
|serial.dll    |

-->_
```

- Open the Editor and load the files *ser\_init.sce* and *step\_test.sci* in the given order in to scilab work space
- Make sure you put the correct Com port number in *ser\_init.sce*



```
SciPad - ser_init.sce
File Edit Search Execute Debug Scheme Options Windows Help

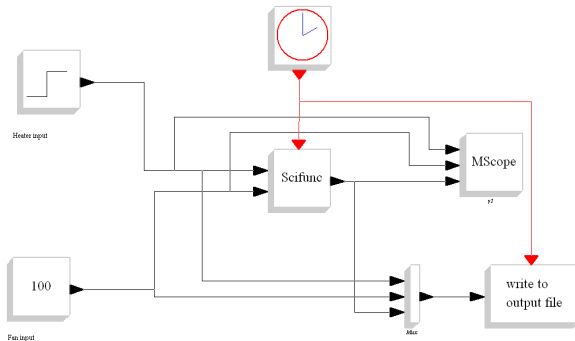
dll_link = c_link('serial');

//if not loaded - load it
if ~dll_link,
  addinter('serial.dll','serial',[ 'opencom';'closecom'; 'writecom'; 'writebincom';'readbincom';'resetcom';'getcomhandles']);
end;

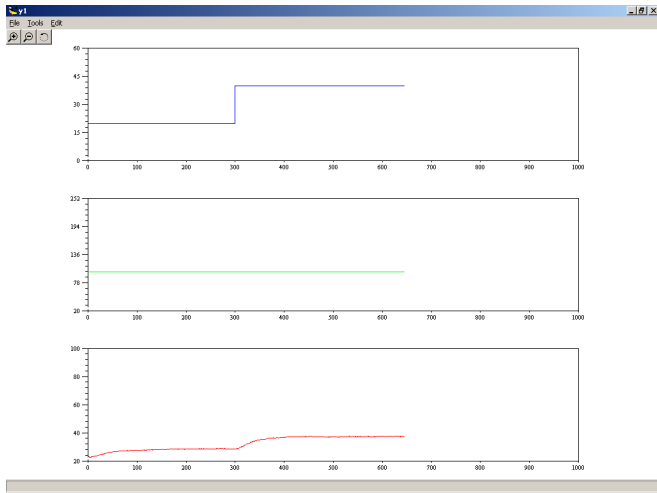
com_config = tlist(['Config':'port':'baudrate':'nbits':'parity':'stopbits':'protocol'],1,9600,8,0,0,0);
handl = opencom(com_config);

Line: 1 Column: 1 Logical line: 1
```

- Open the appropriate Scicos file and run it



- Plot of various parameters for step test

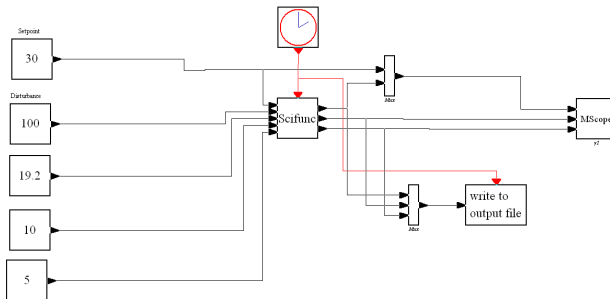


# Performing PID control experiment on SBHS

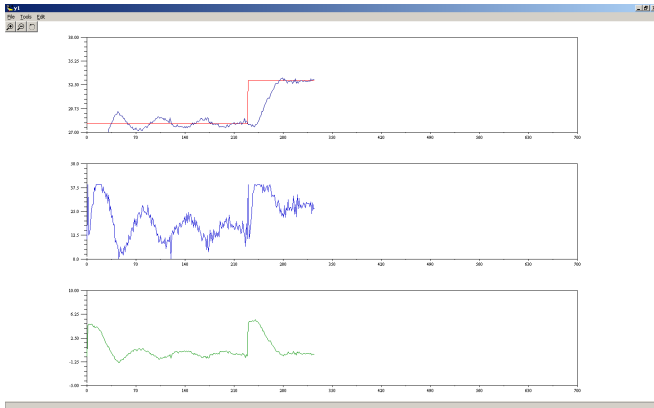
- Repeat the initial procedure as explained in the Step test experiment
- Do the PID tuning first to obtain the various PID parameters



- Scicos for PID experiment



- Plot of various parameters for PID



Thank You