Comparison of SCILAB Syntax and Functions to MATLAB®

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http://www.engineering.usu.edu/cee/faculty/gurro/Software_Calculators/Scilab_Docs/ScilabBookFunctions.zip

The author's SCILAB web page can be accessed at:

http://www.engineering.usu.edu/cee/faculty/gurro/Scilab.html

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Comparing SCILAB and Matlab®

If the reader has previously used Matlab®, he or she would notice that the operation and, in many instances, the syntax, of SCILAB commands are very similar to those of Matlab®. Some of the information presented in this chapter is taken from the SCILAB web page:

http://www-rocq.inria.fr/scilab/

It is intended as a guideline highlighting the differences between SCILAB and Matlab®. The differences are presented according to the subjects of functions, comment lines, strings, Boolean variables, polynomials, operations on empty matrices, plotting, and SCICOS (SCILAB's system simulation software).

Functions

Functions in SCILAB are not considered as separate files, such as Matlab® m-files, but as variables in the SCILAB environment. One or several user-defined functions can be defined in a single file, and the name of the file is not necessarily related to the name of the function(s). Also, the function(s) are not automatically loaded into SCILAB, as they are in Matlab® after their name is invoked. Usually you have to execute the command `getf(`*`"function_name"`*`)` before being able to use a function.

Functions can also be defined on-line (referred to as *inside functions*) by using the command *deff*. Many examples of the use of *getf* and *deff* are provided throughout the book.

To execute a script file you must use `exec("filename")` in SCILAB, as in Matlab®, you just need to type the name of the file.

Comment lines

SCILAB comments begins with: //

Matlab® comments begins with: %

Variables

Predefined variables usually have the % prefix in SCILAB (%i, %inf, ...). They are write protected, i.e., they can not be redefined. Matlab® predefines variables *i* and *j* as the unit imaginary number. This predefinitions can wreck havoc in programming if you try to use *i* or *j* as index variables. Such a problem does not exist in SCILAB.

Strings

Strings are considered as 1 by 1 matrices of strings in SCILAB. Each entry of a string matrix has its own length.

Boolean variables

Boolean variables are %T, %F in SCILAB and 0, 1 in Matlab®. They correspond to the Boolean statements '*true*' and '*false*', respectively. Indexing with Boolean variables may not produce the same result in SCILAB as it does in Matlab® . For example `x=[1,2];x([1,1])` [which is NOT `x([%T,%T])`] returns `[1,1]` in SCILAB and `[1,2]` in Matlab®. Also if x is a matrix `x(1:n,1)=[]` or `x(:)=[]` are not valid in Matlab®.

Polynomials

Polynomials and polynomial matrices are defined by the function *poly* in SCILAB. They are considered as vectors of coefficients in Matlab®. For more details on SCILAB polynomials see Chapter 8 in this book.

Empty matrices

[]+1 returns 1 in SCILAB and [] in Matlab®.

Plotting

Except for the simple *plot* and *mesh* (Matlab®) and *plot3d*(SCILAB) functions, SCILAB and Matlab® graph functions are not compatible. In a subsequent section we introduce some SCILAB functions written specifically to emulate Matlab® function.

Scicos

SCICOS (SCILAB) and *Simulink* (Matlab®) are not compatible. *SCICOS* and *Simulink* are graphically-based, system modeling software programs. To obtain more information about *SCICOS,* visit SCILAB's main web page (*http://www-rocq.inria.fr/scilab/*).

A table of Matlab® and SCILAB equivalent functions

Most built in functions are identical in Matlab® and SCILAB. Some of them have a slightly different syntax. Here is a brief, partial list of commands with significantly different syntax.

Matlab®	SCILAB .
all	and
any	or
balance	balanc
clock	unix('date')
computer	unix_g('machine')
cputime	timer
delete	unix('rm file')
dir	unix_g('ls')
echo	mode
eig	spec or bdiag
eval	evstr
exist	exists + type
fclose	file('close')
feof	
ferror	
feval	evstr and strcat
filter	rtitr
finite	(x < %inf)
fopen	file('open')
fread	read
fseek	file

ftell	
fwrite	writeb
global	
home	
isglobal	
isinf(a)	a == %inf
isnan(a)	a ~= a
isstr(a)	type(a) == 10
keyboard	pause + resume
lasterr	
lookfor	apropos
more	lines
pack	stacksize
pause	halt
qz	gspec+gschur
randn	rand
rem	modulo
setstr	code2str
strcmp(a,b)	a == b
uicontrol	
uimenu	getvalue
unix	unix_g
version	
which	whereis
nargin	[nargout,nargin]=argn(0)
nargout	

SCILAB functions that emulate Matlab® functions

For those who have used Matlab®, and for those who want to learn how to use them, SCILAB provides a number of functions that emulate Matlab® functions. These functions start with the prefix *mtlb_*. A list of the Matlab® emulating functions follows:

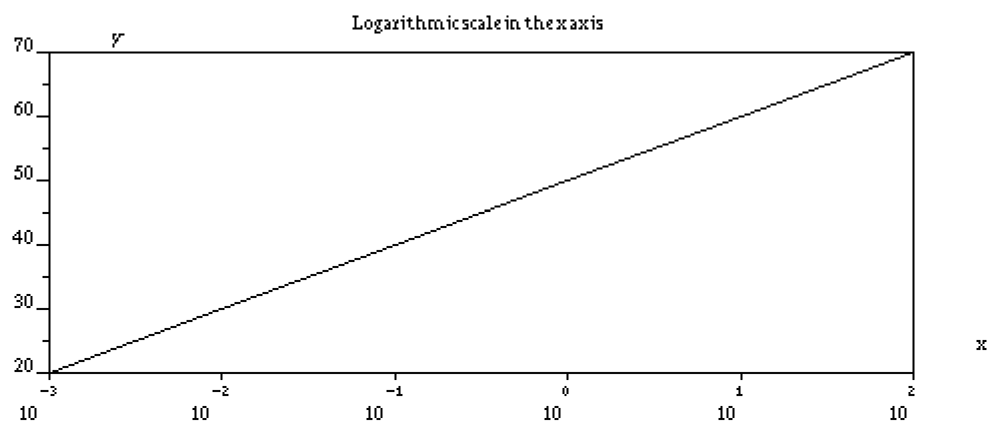
mtlb	mtlb_all	mtlb_any	mtlb_axes
mtlb_cell	mtlb_choices	mtlb_clf	mtlb_cumsum
mtlb_diff	mtlb_e	mtlb_eval	mtlb_exist
mtlb_eye	mtlb_fft	mtlb_filter	mtlb_find
mtlb_findstr	mtlb_fliplr	mtlb_flipud	mtlb_fprintf
mtlb_fread	mtlb_fscanf	mtlb_fwrite	mtlb_get
mtlb_hold	mtlb_i	mtlb_ifft	mtlb_is
mtlb_ishold	mtlb_isreal	mtlb_length	mtlb_load
mtlb_loglog	mtlb_max	mtlb_mean	mtlb_median
mtlb_mesh	mtlb_meshdom	mtlb_min	mtlb_ones
mtlb_plot	mtlb_prod	mtlb_qz	mtlb_rand
mtlb_save	mtlb_semilogx	mtlb_semilogy	mtlb_sprintf
mtlb_sscanf	mtlb_subplot	mtlb_sum	mtlb_zeros

Out of these functions we have used *mtlb_diff* to produce table of differences in the polynomial approximations of Chapter 8 and for the first differences in time series of Chapter 18, and *mtlb_subplot* in function *multiplot* presented in Chapter 17 in relation to multiple linear regression.

Graphics functions with *mtlb_* prefix

Help for these functions is not available in SCILAB. My take on this is that SCILAB developers try to encourage the use of the equivalent SCILAB functions. However, some *mtlb_* functions, particular those related to handling of graphs, may be easier to use than their SCILAB counterparts. As an example, take functions *mtlb_loglog, mtlb_semilogx, mtlb_semilogy,* and *mtlb_subplot*. Functions *mtlb_semilogx* and *mtlb_semilogy* are intended to produce plots with logarithmic scales in *x* and *y*, respectively, while function *loglog* produces plots with two logarithmic scales. Examples of using *mtlb_loglog, mtlb_semilogx,* and *mtlb_semilogy,* are shown below. Function *mtlb_subplot* will be illustrated later.

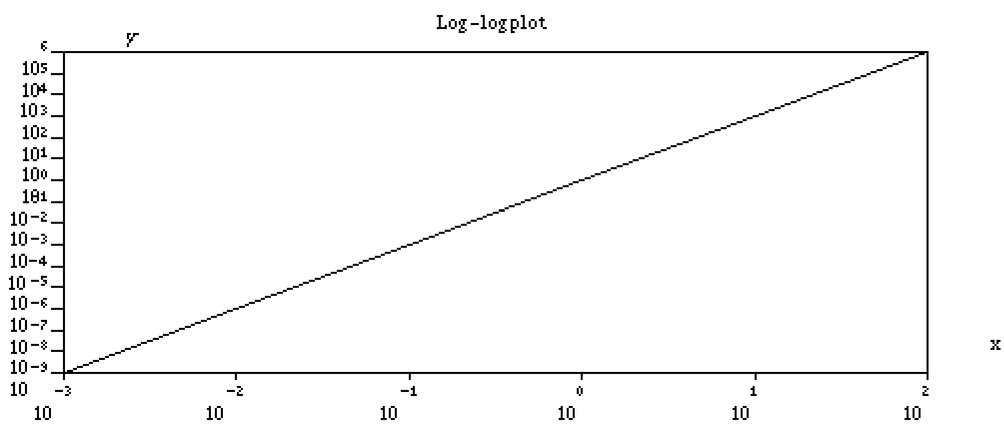
```
-->x=[0.001 0.01 0.1 1.0 10. 100]; y=[20 30 40 50 60 70];

-->mtlb_semilogx(x,y)

-->xtitle('Logarithmic scale in the x axis','x','y')
```




```
-->x=[1:0.1:10];y=2*x^2;

-->mtlb_semilogy(x,y)

-->xtitle('Logarithmic scale in y','x','y')
```



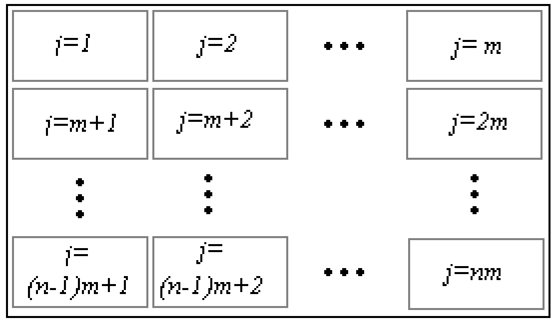
```
-->x=[0.001,0.01,0.1,1.0,10.0,100.0];y=x^3;

-->mtlb_loglog(x,y)

-->xtitle('Log-log plot','x','y')
```



The function *mtlb_subplot* can be used to produce multiple plot frames in the same window. The call to *mtlb_subplot* is

mtlb_subplot(m,n,j)

The effect of this function is to split the plot area in a window into a graphics matrix of *m* rows and *n* columns, making the sub-area *j* available for plotting. The values of *j* range from *1* to *p* = *m·n*, with subplot *j=1* corresponding to the upper left corner of the window, subplot *j=2* being the next subplot to the right, *j=3* the next subplot to the right until reaching *j=m*. Subplot *j=m+1* is the first subplot in the second line, and so on. The position and numbering of the subplots is shown in the next sketch.

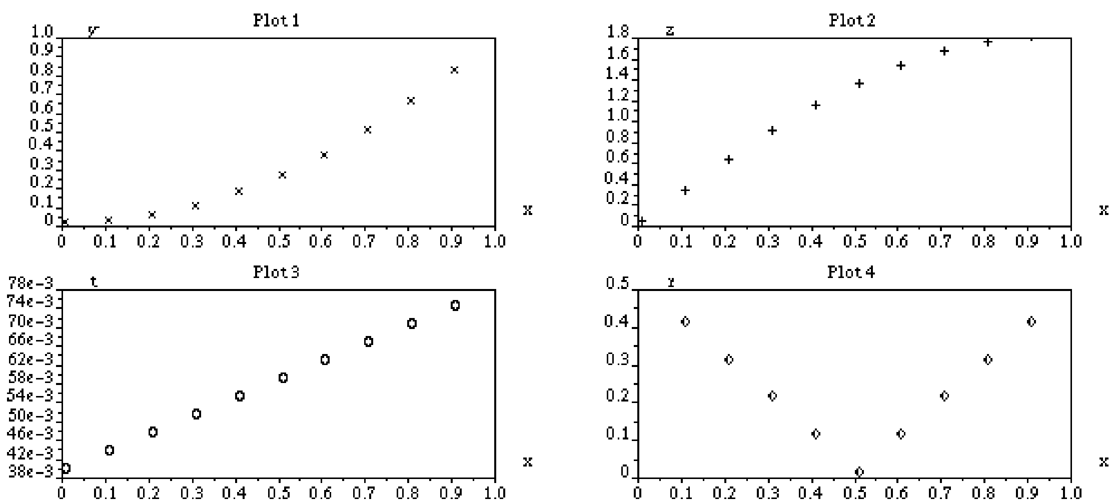


Thus, the plot at location *(i,k)* is subplot number *j = (i-1)m+k*. To fill the window with plots you need to call function *mtlb_subplot* a total of *p* times using fixed values of *m* and *n* and varying *j* according to the position of the plot.

An example of application of function *mtlb_subplot* is provided next in the form of a SCILAB script:

```
//Script to produce four plots in the same window
x=[0.0:0.1:1.0];y=x^2;z=sin(x)+sin(2*x);t=(1./(1+x))';r=abs(x-0.5);
mtlb_subplot(2,2,1);plot2d(x,y,-2);xtitle('Plot 1','x','y');
mtlb_subplot(2,2,2);plot2d(x,z,-1);xtitle('Plot 2','x','z');
mtlb_subplot(2,2,3);plot2d(x,t,-9);xtitle('Plot 3','x','t');
mtlb_subplot(2,2,4);plot2d(x,r,-5);xtitle('Plot 4','x','r');
```

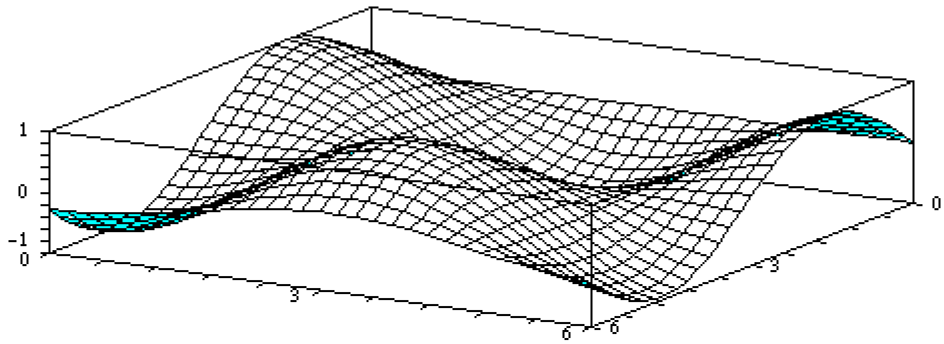
The result of the script is shown next:



Function *mtlb_mesh*

Function *mtlb_mesh* can be used to produce a three-dimensional surface plot that emphasizes the coordinate mesh in the final plot. The function produces a plot similar to that produced with function *plot3d*.

```
-->deff('[w]=f(x,y)','w=sin(x)*cos(y)')
--> x=[0:0.2:6];y=[0:0.2:6]; z = feval(x,y,f);
-->mtlb_mesh(x,y,z);
```



Note: Function *mtlb_e* does not have a Matlab® equivalent (at least not with the name *e*). The function is intended to extract characters out of a string, for example:

```
--> a = 'tres tristes tigres'

--> mtlb_e(a,[1:3])
ans  =  t
```

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