Acsystème –Matlab notebook

GETTING HELP

`help`	display help in command window (F1)
`doc`	display hel in Matlab desktop
`demo`	open demo

MATLAB FILE EXTENSIONS

`.m`	Matlab code (function or script)
`.mat`	binary files for data
`.fig`	saved files for figure

EDITOR KEYBORS SHORTCUTS

Ctrl + R / Ctrl + T	comment / uncommet
Ctrl + I	properly indent
Ctrl + Entrée	run a code section
F5	run a script
F9	run selection
Ctrl + D	open selection with editor
Ctrl + S	save
Ctrl + G	move down to a line
Ctrl + F	find a file
F1	open help/help on selection

INITIALIZATIONS

`startup`	init script of the environment (defined by the programmer) which automatically runs when opening Matlab, in the directory containing startup.m
`clc`	clear the command window
`clear`	empty workspace
`close all`	close all figures

NAVIGATION

`cd`	display or change current directory
`dir`	list current directory contents
`pwd`	display current directory
`path`	list search path
`addpath`	add a path to search path
`rmpath`	remove path from search path
`restoredefaultpath`	restore default search path

SPECIAL CONSTANTS

`ans`	give last results
`eps`	machine accuracy
`NaN`	Not a Number
`pi`	π constant
`i`, `j`	imaginary number = sqrt(-1)
`true`, `false`	true, false
`inf`	infinite
`realmax`	largest real programmable
`realmin`	smaller real programmable
`computer`	computer running Matlab

MATRIX

`ones`	create matrix of 1
`zeros`	create matrix of 0
`eye`	create identity matrix
`linspace`	generate linearly spaced vector
`logspace`	generate logarithmically spaced vectors
`rand`, `randn`	generate random numbers matrix

DIMENSION

`length`	length of matrix
`numel`	number of matrix éléments
`size`	size of matrix

SPECIAL CHARACTERS

`%`	comments
`%%`	cell-break
`!`	call DOS command
`'`	surround strings or transpose of a matrix
`,`	separate éléments on the same lines separate arguments of a function separate command on the same lines
`;`	end a command and disable display end a line when assigning a matrix
`()`	matrix indexation operator (line, column)
`[]`	matrix definition and concatenation operator
`{}`	cells array definition and indexation operator
`:`	operator to create vector `>> a = 1 : 2 : 10`
...	continue statement on the next line
`.`	decimal marker indexation operator for structure fields
`=`	assignment operator

CALCULATION

`+ - * /`	addition, substraction, multiplication, division
`\`	left array divide (system of equations solving with least squares)
`^`	power
`.`	combined with arithmetic operator to calculate element by element

MATHEMATICAL FUNCTIONS

`sqrt`	square root
`abs`	absolute value
`log`	natral logarithm
`exp`	exponential
`log10`	common logarithm (base 10)
`10^`	power of 10
`mod`, `rem`	modulo, remainder after division

TRIGONOMETRIC FUNCTIONS

`sin`, `cos`, `tan`	sine, cosine, tangent
`asin`, `acos`, `atan`	arcsines, arccosines, arctangent
`atan2`	four quadrant arctangent
`sec`, `csc`, `cot`	secant, cosecant, cotangent
`sinh`, `cosh`, `tanh`	hyperbolic sines, cosines, tangent
`sech`, `csch`, `coth`	hyperbolic secant, cosecant, cotangent

ROUNDING

`round`	round to nearest decimal or integer
`ceil`	round to positive infinity
`floor`	round to negative infinity
`fix`	round to zero

STATISTICS / DATA ANALYSIS

`cumsum`	cumulative sum
`sum`	sum
`mean`	mean value of matrix
`median`	median value of matrix
`std`	standard deviation
`var`	variance
`min`, `max`	minimum, maximum
`sort`, `sortrows`	sort matrix elementspro
`prod`	product of matrix éléments
`cumprod`	cumulative product
`mode`	most frequent value in matrix
`trapz`	trapezoidal numerical integration

RELATIONAL OPERATORS

`==, ~=, >, <, >=, <=`

LOGICAL OPERATORS

`& | ~`	element wise AND, OR and NOT
`&& ||`	short-circuit AND, OR and NOT
`all`	determine if all array éléments are nonzero
`any`	determine if any array element is nonzero

COMPLEX NUMBER

`>> a = 12 + 5i`

`real`	real part
`imag`	imaginary part
`abs`	complex magnitude
`angle`	phase angle
`conj`	complex conjugate

STRINGS

handling

`str1 = 'une' ; str2 = 'chaîne' ;`

`str = [str1 ' ' str2]`	concatenate
`lower`, `upper`	convert strings to lower/upper case
`strrep`	find and replace substring
`strvcat`	concatenate strings vertically
`strtrim`	remove leading and trailing white space from strings
`strcmp`, `strcmpi`, `strncmp`, `strncmpi`	compare strings

string/number conversion

`int2str`, `mat2str`, `num2str`	convert integer, matrix or number to string
`str2double`, `str2num`	convert strings to double or number
`sprintf`, `sscanf`	write/read formatted data from string

FIGURES AND PLOT

`figure`	create figure window
`close`, `close all`	close one or all figure(s)
`clf`	clear figure
`hold on/off/all`	retain current plot when adding new plots
`subplot`	create axes in tiled positions

ED plots

`plot`	2D line plot
`stem, stairs`	plot discrete sequence data
`semilogx`, `semilogy`	semi-logarithmic plot
`loglog`	log-log scale plot

Acsystème –Matlab notebook

couleurs

[1 1 0]	'y'	'yellow'	
[1 0 1]	'm'	'magenta'	
[0 1 1]	'c'	'cyan'	
[1 0 0]	'r'	'red'	
[0 1 0]	'g'	'green'	
[0 0 1]	'b'	'blue'	
[1 1 1]	'w'	'white'	
[0 0 0]	'k'	'black'	

marqueurs

'.'	•	'v'	▽
'o'	○	'^'	△
'x'	×	'<'	◁
'+'	+	'>'	▷
'*'	✳	'p'	☆
's'	□	'h'	✡
'd'	◇		

3D plot

surf	3D shaded surface plot
mesh	mesh plot
plot3	3D line plot
pcolor	pseudocolor (checkerboard) plot

other plots

pie	pie chart
hist	histogram plot
bar	bar graph
contour	contour plot of matrix

annotations

legend	legend
xlabel, **ylabel**, **zlabel**	axis labels
title	add title to current axis
box	axis border
text	create text object in current axis

grid and scales

grid	display grid
axis, **xlim**, **ylim**, **zlim**	axis limits
zoom	turn zoom on or off
linkaxes	synchronize limits of specified 2D axis
colorbar	colorbar showing color scale
caxis	color axis scaling

colormaps

colormap view and set current colormap

Jet, HSV, Hot, Cool, Spring, Summer, Autumn, Winter, Gray, Bone, Copper, Pink

FILE MANAGEMENT

edit	open a file with Matlab editor
which	locate functions and files
copyfile	copy files
delete	delete files
fileparts	parts of file (name, path and extension)
fullfile	build full file name from parts
filesep	file separator for current platform
mkdir	make new folder
rmdir	remove new folder

READ/WRITE FILES

high level

dlmread, **dlmwrite**	read/write ASCII delimited file of numeric data into matrix
csvread, **csvwrite**	read/write comma separated value (CSV) file
xlsread, **xlswrite**	read/write Microsoft Excel spreadsheet file
wk1read, **wk1write**	read/write Lotus file
load, **save**	read/write binary Matlab (.mat)
imread, **imwrite**	read/write image from graphics file

low level

1 – open file 2 – locate, read, write… 3 – close file

fopen, **fclose**	open/close a file
fread, **fwrite**	read/write a binary file
fprintf, **fscanf**	read/write data from text file
fgetl, **fgets**	read line from file, removing/keeping newline characters
feof	test for end of file
frewind	move file position indicator to beginning of open file
ftell	position in open file
fseek	move to specified position in files

CONTROL STRUCTURES

```
for var = vector
    % Matlab instruction
end
if logical expression 1 % Mandatory
    % Matlab instruction
elseif logical expression 2 % Optional
    % Matlab instruction
else % Optional
    % Matlab instruction
end % Mandatory
switch expression % String, double, boolean
    case value 1 % Mandatory
        % Matlab instruction
    case {value 2, value 3} % Optional
        % Matlab instruction
    otherwise % Optional but recommended
        % Matlab instruction
end
while
    % Matlab instruction
end
```

break	terminate exécution of 'for' or 'while' loop
continue	pass control to next iteration of 'for' or 'while' loop
return	return control to invoking function
pause	halt exécution temporarily

TESTING

isempty	is empty?
isnan	is NaN?
exist	exist? (variable, files, directory, …)
isequal	is equal?
isinteger, **isfloat**	is interger? is float?
isnumeric	is number? (integer, float but not boolean)
ischar	is character array ?
isfinite, **isinf**	is finite/infinite?

ERROR MANAGEMENT

```
try
    % Matlab instruction
catch
    % Matlab instruction
end
```

lasterr, **lastwarn**	last error/warning message
warning	display warning message
error	throw error and display message

FUNCTION MANAGEMENT

create a file MyFunction.m :

```
function [S1, S2, …] = MyFunction(E1, E2, …)
% MyFunction: quick description
% header(display with help)
```

nargin, **nargout**	number of function input/output arguments
nargchk	calidate number of input arguments
varargin, **varargout**	input/ouput variables of function argument as a list (cell array)

COMMUNICATION WITH USER

disp	display value of variable in command window
input	display a message and request user input
pause	halt exécution temporarily
waitbar	open or update wait bar dialog box
inputdlg	create dialog box that gathers user input
warndlg, **errordlg**, **helpdlg**	create warning/error/hel dialog box
uigetfile, **uiputfile**	create dialog box for getting/saving files

PERFORMANCE ANALYSIS

tic, **toc**	start/stop stopwatch timer (measure time)
profile	profile exécution time for function
memory	display memory information

POLYNOMIALS

poly	polynomial with specified roots(coefficients calculation)
roots	polynomial with specified coefficients(roots calculation)
polyfit	polynomial curve fitting
polyval	polynomial evaluation
conv	convolution and polynomial multiplication
deconv	deconvolution and polynomial division

DATES

format

chaîne	format defined by 'dd' 'mm' 'yy' 'HH' 'MM' 'SS'
nombre	elapsed days since January 0, 0000
vecteur	[year month day hours minutes seconds]

conversion

datenum	convert date and time to serial date number
datestr	convert date and time to string format
datevec	convert date and time to vector components

```
DateMatlab = DateExcel + datenum('30-Dec-1899');
```

autres

date, **now**, **clock**	current date
datetick	format date with tick labels

Acsystème – 4 rue René Dumont – 35700 Rennes – France
Tel. : +33 2 99 55 18 11 – www.acsysteme.com
version 2014-05