

MATLAB

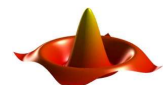
Input and Output



MATLAB Input and Output

Input with user inputs

- Strings: – Row vector of character (char):
`text = ['This is', ' ', 'a text!']`
– String functions: `help strfun`
- Input of: – Data: `variable = input(string)`
– Text: `string = input(string, 's')`
- Special signs: `\n` new line
`\\` Backslash `\`
`''` Quotation marks `'`



MATLAB Input and Output

Formatted Output

- `disp(string)`: Output of string *string*
- Formatting:
 - `string = sprintf(string, variable)`
 - Syntax corresponds to C
 - BUT: vectorised data possible
 - conversion of numbers into strings with function `num2str(variable[, format])`

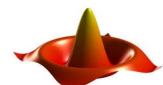


MATLAB Input and Output

Import and Export of data

- Load data: `load file [-mat| -ascii] [variable...]`
- Save data: `save file [options] [variable...]`

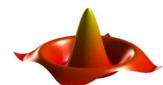
<i>options:</i>	<code>-mat</code>	Binary MAT file
	<code>-ascii</code>	8-digit ASCII format
	<code>-append</code>	append data (MAT)
	<code>-ascii -double</code>	16-digit ASCII format
	<code>-ascii -tabs</code>	Tabulator separated
- Formatted writing into txt file:
 - File open: `fid = fopen(file.extension, permission)`
 - Writing: `fprintf(fid, string, variable)`
 - File close: `fclose(fid)`



MATLAB Input and Output

Operating System call and file management

- Path:
 - current: `pwd`
 - show: `path`
- Directory:
 - change: `cd directory`
 - make: `mkdir directory`
 - show content: `dir [directory]`
`ls [directory]`
- File:
 - copy: `copyfile source destination`
 - delete: `delete file`
- Call of Operating System: `! os – command`



MATLAB Input and Output

Graphics

- 2- and 3-dimensional plotting of data
- **Generate** a graphic (figure): `figure`
- **Get current figure** (*handle*): `gcf`
- **Subplots** in a figure: `subplot(z,s,n)`
- Figure:
 - clear: `clf`
 - close: `close(number)`



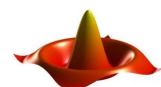
MATLAB Input and Output

Properties of a graphic

- Each **object** of a figure has its **handle** h comprising a property $PropName$ and its value $PropValue$

Important objects: figure and axes

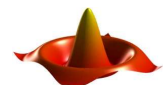
- **Query** a property: `get(h, 'PropName')`
- **Setting** a property: `set(h, 'PropName', PropValue)`
- **Delete** value: `delete(h)`
- Alternatively: *Property Editor*



MATLAB Input and Output

2D–graphics: axis, scaling and labelling

- **Current axis** (*handle*): `gca`
- **Scaling:** `axis ([x_min,x_max,y_min,y_max])`
 - automatically: `axis('auto')`
 - show grid: `grid [on | off]`
 - activate zoom: `zoom [on | off]`
- **Labelling:**
 - axis: `xlabel(string)`, `ylabel(string)`
 - title: `title(string)`
 - place text: `text(x_value,y_value,string)`
 - legend: `legend(str_1,str_2... [, position])`



MATLAB Input and Output

2D-graphics: plot commands

- plot-command: `plot(x_values,y_values... [,plotstyle])`
x_values, y_values: vectors of same dimension
- keep objects: `hold [on | off]`
- Color and style of lines can be set by *plotstyle*:

colors

k	black	r	red
b	blue	m	magenta
c	cyan	y	yellow
g	green	w	white

lines and markers

-	solid	o	circle
--	dashed	*	asteriks
:	dotted	+	plus sign
.	point	x	cross

- Example: `plot(1:0.1:2*pi,sin(1:0.1:2*pi),'r-.')`



MATLAB Input and Output

2D–graphics: specific plot commands

- Stairstep: `stairs([x,] y... [,plotstyle])`
- Discrete: `stem([x,] y... [,plotstyle])`
- logarithmic: `loglog(x, y... [,plotstyle])`
 - x–axis: `semilogx(x, y... [,plotstyle])`
 - y–axis: `semilogy(x, y... [,plotstyle])`
- Functions:
 - explicite function: `fplot(f, range)`
 - implicate function: `ezplot(f(x, y), range)`
 - parametrically def. curve: `ezplot(f_1, f_2, range)`



MATLAB Input and Output

3D–graphics: plot commands

- Points/Lines: `plot3(x,y,z... [, plotstyle])`
- Surface: `surf(x,y,z... [, color])`
- Mesh: `mesh(x,y,z... [, color])`
- Waterfall: `waterfall(x,y,z... [...])`
- Contour: `contour(x,y,z... [...])`
- x, y, z : matrices of same dimension
- `[X,Y] = meshgrid(x_vec,y_vec)` generates matrices of correct dimension from vectors x_vec and y_vec



MATLAB Input and Output

3D–graphics: Labelling, viewpoint and colors

- Scaling: `axis([x...,y...,z_min,z_max])`
- Labelling of z–Achse: `zlabel(string)`
- Show box: `box [on | off]`
- Change viewpoint: `view(azimuth,elevation)`
- Colors:
 - Colormap: `colormap(name)`
 - Scaling: `caxis(color_min,color_max)`
- Online–help: `graph2d, graph3d, specgraph`

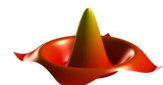


MATLAB Input and Output

Import, export and printing of graphics

- Figure
 - print: `print -fnumber`
 - save: `print -fnumber -ddevice filename`
`saveas(h, 'filename', 'fig')`
- Output options (format, driver): `-ddevice`

Formats: PS, EPS, TIFF, HPGL, JPEG, ...
Windows: EMF, BMP, printer driver, clipboard
- Image:
 - read: `A = imread(filename, format)`
 - generate: `imwrite(A, filename, format)`
 - plot: `image(A)`



MATLAB Input and Output

GUI – Graphical User Interface

- Graphical User Interface
- use of object-properties of MATLAB-graphics
- programming using GUIDE or by hand

