5. OBJECTS AND 2D GRAPHICS

5.1 Object Properties

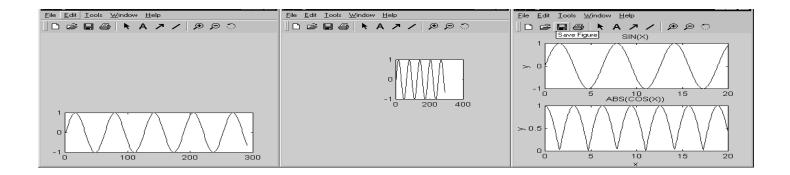
 $\langle name \rangle = \langle command \rangle$ ($\langle property_name \rangle$, $\langle property_value \rangle$)

```
%%% Example 5.1: Definition of figure properties, axes properties,
%%% and their modification
%%%
    figure; set(gcf,'Units','Normal','Position',[0.5,0.57,0.3,0.35]);
    h1=axes('Position',[0.1 0.1 0.8 0.3]);
    plot(sin(0:0.1:29))
    get(h1)
%%%
    Definition of a property
    set(h1,'Units','Normal','Position',[0.5 0.5 0.3 0.3]);
```

5.2 Two-dimensional Graphics

```
%%% Example 5.2: Plot functions f1(x)=sin(x) and
%%% f2(x)=abs(cos(x)) for x=a:h:b choosing a=0,
%%% b=20 and h=0.1 in two separate windows
%%%
a=0; b=20; h=0.1;
x=a:h:b;
figure; set(gcf,'Units','Normal','Position',[0.53,0.54,0.3,0.35]);
subplot(2,1,1); plot(x,sin(x));
ylabel('y'); title('SIN(X)');
subplot(2,1,2); plot(x,abs(cos(x)));
xlabel('x'); ylabel('y'); title('ABS(COS(X))');
```





EXAMPLES 5

- 5.1 Plot function $f(x) = sin(x)^2$ and its the first and second derivative for $x \in \langle a, b \rangle$ for a = 0, b = 20 in three separate figures
- 5.2 Plot f(x) = cos(x) and its derivative in one figure window axes using different colors for each function
- 5.3 Use GINPUT command for estimation of the smallest positive root of equation: sin(x) 0.1x = 0

6. 3D GRAPHICS

6.1 Fundamentas of 3D Graphics

Notes to the use of basic commands:

- 1. Definition of x-axis and y-axis values are defined by corresponding values of matrices \mathbf{X}, \mathbf{Y}
 - \implies function MESHGRID
- 2. Selection of 3D plotting \implies function MESH, MESHC, ...
- 3. Selection of the viewpoint \implies function VIEW
- 4. The choice of the number of contour lines and their description \implies funkce CONTOUR

```
%%% Example 6.1: Plot function
%%% f(x,y)=-x exp(-x^2-y^2) for x=-2:0.2:2 and y=-2:0.2:2
%%% together with corresponding contour lines
%%%
[X,Y]=meshgrid(-2:0.2:2);
Z=-X.*exp(-X.^2-Y.^2);
meshc(X,Y,Z);
title('f(x,y)=-x*exp(-x^2-y^2)'); xlabel('x'); ylabel('y');
colormap([0 0 1])
```

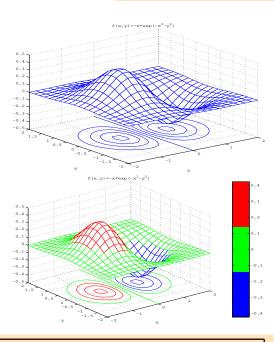
6.2 Colors

Notes to the use of basic commands:

- 1. Palette of m colors is defined by values of matrix $\mathbf{M}_{m,3}$
- 2. Each of *m* colors is defined by the combination of 3 basic colors (Red-Green-Blue) and their intensity in the range of $\langle 0, 1 \rangle$
- 3. Application of the color map \implies function COLORMAP
- 4. Plot of the color map \implies function COLORBAR

```
%%% Example 6.2: Store the present colormap into matrix M1,
%%% define a new colormap M2 consisting of three basic colors
%%% and apply it to the given 3D surface
%%%
M1=colormap
M2=[0 0 1; 0 1 0;1 0 0]
colormap(M2)
colorbar
```

COMMANDS MESHGRID MESH MESHC GRID ON GRID OFF LINE VIEW HOLD ON HOLD OFF CONTOUR COLORMAP COLORBAR



EXAMPLES 6

- 6.1 Plot function $f(x, y) = -x \exp(-x^2 y^2)$ using four selected colors and use a separate window to plot its contour plot for $x \in \langle -2, 2 \rangle$ and $y \in \langle -2.5, 2.5 \rangle$
- 6.2 Plot function $f(x,y) = -x^2y^2$ for $x \in \langle -2,2 \rangle$ and $y \in \langle -2,2 \rangle$
- 6.3 Visualize contour plot of function $f(x,y) = -x^2y^2$ for $x \in \langle -2,2 \rangle$ and $y \in \langle -2,2 \rangle$ with line description

7. DATA FILES MANIPULATION

7.1 Data Saving

save $\langle file_name \rangle$ [$\langle list_of_variables \rangle$] [-ascii]

Notes to data saving:

- 1. In case that the list_of_variables is not defined the whole workspace is saved
- 2. Parameter -ascii allows data store as a plain text (without its name)

%%% Example 7.1: Saving of variables

A=[1 2 3; 4 5 6; 7 8 1]; b=[6 15 16]'; save dat1 A b;

7.2 Data Retrieving

load $\langle file_name \rangle$

Notes to the data retrieving:

- 1. In case of the binary file (with MAT extension) all variables are retrieved together with their names
- 2. In case of the plain text file all its values are retrieved under the file_name
- %%% Example 7.2: Data retrieving
 - load dat1

7.3 Data Import from EXCEL

Steps:

- 1. Opening of the MATLAB environment and EXCEL $\langle file_neme \rangle. {\it xls}$
- 2. Data transport from EXCEL to MATLAB: chan=ddeinit('excel','\langle file_name\.xls');
 - D1=ddereq(chan, $r\langle r1 \rangle c\langle c1 \rangle : r\langle r2 \rangle c\langle c2 \rangle');$

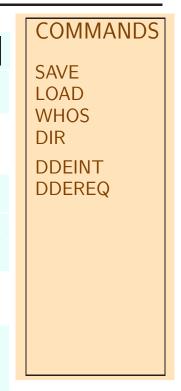
where r1,r2,c1,c2 stand for initial and final number of rows and columns

%%% Example 7.3: Reading of the EXCEL table chan=ddeinit('excel','g2010.xls'); D1=ddereq(chan,'r10c3:r1000c3'); plot(D1)

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-	6	High	1000	2400	600	1600	1700	1600	1600
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b 3x1 24 double array	8	06:17:34	L 0	0	0	600	600	600	600
	9	06:18:35	270.313	1260.75	82.066	1495.65	1570.8	1526.16	600
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	11	06:20:35		1264.5	81.275		1570.8		1415.31
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dat1.mat	13	06:22:35	270.25	1263.75	80.78	1495.41	1570.07	1529.35	1415.31
Jart . mar	14	06:23:35	270.25	1264.5	80.978	1494.02	1569.98	1530.74	1415.31
	15	06:24:35	5 270.25	1267.5	81.473	1495.65	1570.71	1531.15	1415.31
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whos % √γpis promennych	18	06:27:35	5 270.188	1265.25	83.056	1494.51	1569.98	1532.54	1415
> load dat1	19	06:28:35	270 188	1266.75	82.759	1495.57	1570.89	1532.87	1415
» whos Z Figure No. 2			- 🗆 ×	1266	81.967	1494.59	1570.53	1533.03	1415
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b 3x1 24 double array				1266.75	80.483		1570.71	1534.17	1415
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» %%% tabulky v EXCELu	1^1			1263.75	82.561	1496.14	1570.16	1538.3	1415
» chan=ddeinit('excel','g2010.xls'); 1260 1260 1260 1260 1260 1260 1260 1260	անին 1	W	-	1267.5	83.848		1569.89		1415.31
» D1=ddereg(chan,'r10c3:r1000c3');	ղել	η.		1268.25	84.541	1496.72	1570.43		1415.31
> plot(D1) 1250 - N			-	1262.25	85.036		1569.89	1541.86	1415.62
				1265.25	85.63		1569.98		1415.31
A 3x3 12 double array b 3x1 24 double array Grand total is 12 elements using 96 bytes %%% Priklad 7.3 Cteni 3. sloupce (radek 10 az 1000) %%% tabulky v EXCELu chan=ddeint(fexcel' q2010, xls); D1=ddereq(chan, r10c3;r1000c3); plot(D1) b dereq(chan, r10c3;r1000c3); b dereq(chan, r10c3;r100;r100;r100;r100;r100;r100;r100;r10			-	1265.25	85.432		1569.71	1544.61	1415.31
1230 - 1 au 1. (1266	85.531	1494.67	1569.98		1415.31
			1	1265.25	87.412		1569.62	1546.8	1415.31
			-	1268.25	87.016		1569.98	1547.6	1415.31
				1266	86.323		1569.89	1548.25	1415.62
				1268.25	86.422		1570.07	1548.33	1415.62
	0	800	1000	1263.75	86.026		1569.62		1415.31
	IL	- In In N		1264.5	85.333		1569.98	1548.25	1415.31
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EXAMPLES 7

- 7.1 Using table G2010.XLS import into the MATLAB environment the power consumption (the 3rd column) and channel temperature in the glass furnace (the 6th column), plot these variables and evaluate their mean values
- 7.2 Using table G2010.XLS import into the MATLAB environment the matrix of measured values from the second up to the seventh column, save them into the *.MAT file and plot these variables in chosen limits



8. GRAPHICAL USER INTERPHASE

8.1 Steps of GUI Construction

- 1. Opening of the environment \Longrightarrow File / New / GUI
- 2. Either opening of a new environment or existing figure
- 3. Opening of the PROPERTY INSPECTOR for each object and property
- 4. Opening EDITOR and modification of commands

%% Example 8.1: Plot of a selected function

%%% Example 8.2: Plot of a harmonic function with its frequency
%%% modified by a slider

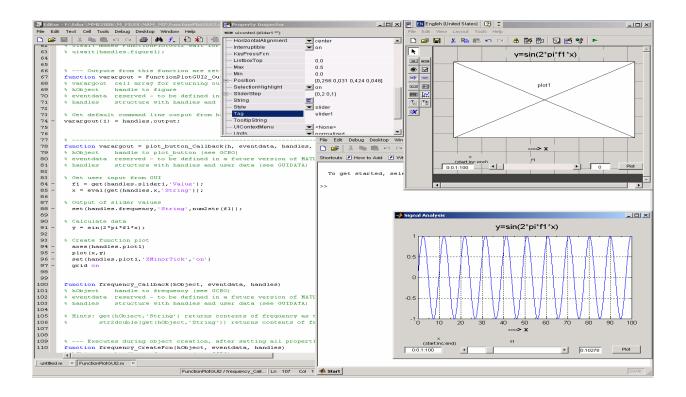
8.2 Menu Creation

- 1. Opening of the environment \implies Tools / MenuEditor
- 2. Creation of the menu structure
- 3. Modification of related functions in the EDITOR environment

8.3 Hidden Functions Use

1. Modification of callback functions for specific object in the EDITOR environment

Note: Object handles are available for all functions



EXAMPLES 8

- 8.1 Modification of slider limit values
- 8.2 Modification of plotted function

OBJECTS PUSH BUT SLIDER RADIO BUT CHECK BOX EDIT TEXT STATIC TEXT MENU AXES