



MATLAB for Finance

7

More on Graphics



01/03/2017

Graphics and 3-D Visualization



Meshgrid

- ✚ Drawing a two-dimension (2D) graphic we need a vector of values of the independent variable x , compute $y=f(x)$, then draw the points (x,y) .
- ✚ Drawing a three-dimension (3D) graphic we need a **matrix** of points along the two independent variables x and y as follows:

$$[X \ Y] = \text{meshgrid}(x, y)$$

- ✚ or, in some case:

$$[X \ Y] = \text{meshgrid}(x)$$

- ✚ where $Y=X'$

Mesh or Surf?

- Given the matrix of independent variables we can compute the dependent one, e.g.:

$$Z = -(X.^2) - (Y.^2)$$

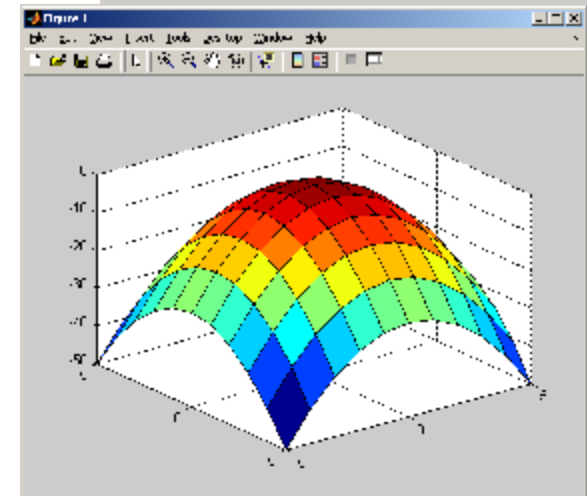
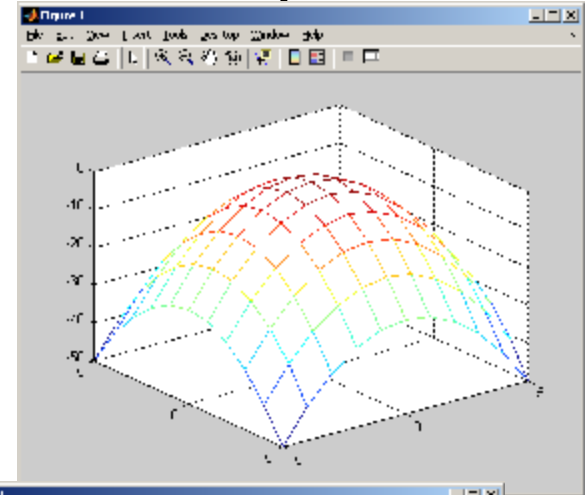
- And draw the graphics with:

```
mesh(X, Y, Z)
```

- or

```
surf(X, Y, Z)
```

- depending on the needs





In-classroom Exercise

- ✚ Describe the following sequence of commands:

```
[X Y] = meshgrid(-8:.5:8);
```

```
R = sqrt(X.^2 + Y.^2) + eps;
```

```
Z = sin(R) ./ R;
```

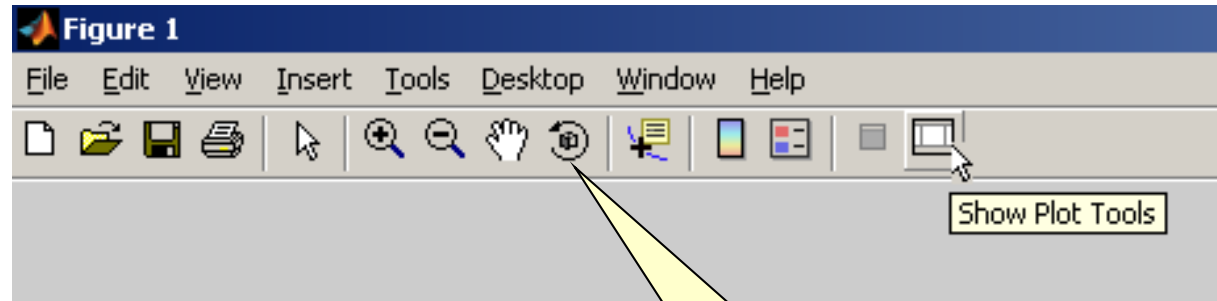
```
mesh(X, Y, Z)
```



Other Controls

✚ View / Property editor

or



✚ Edit / Properties

✚ and More Properties...



01/03/2017

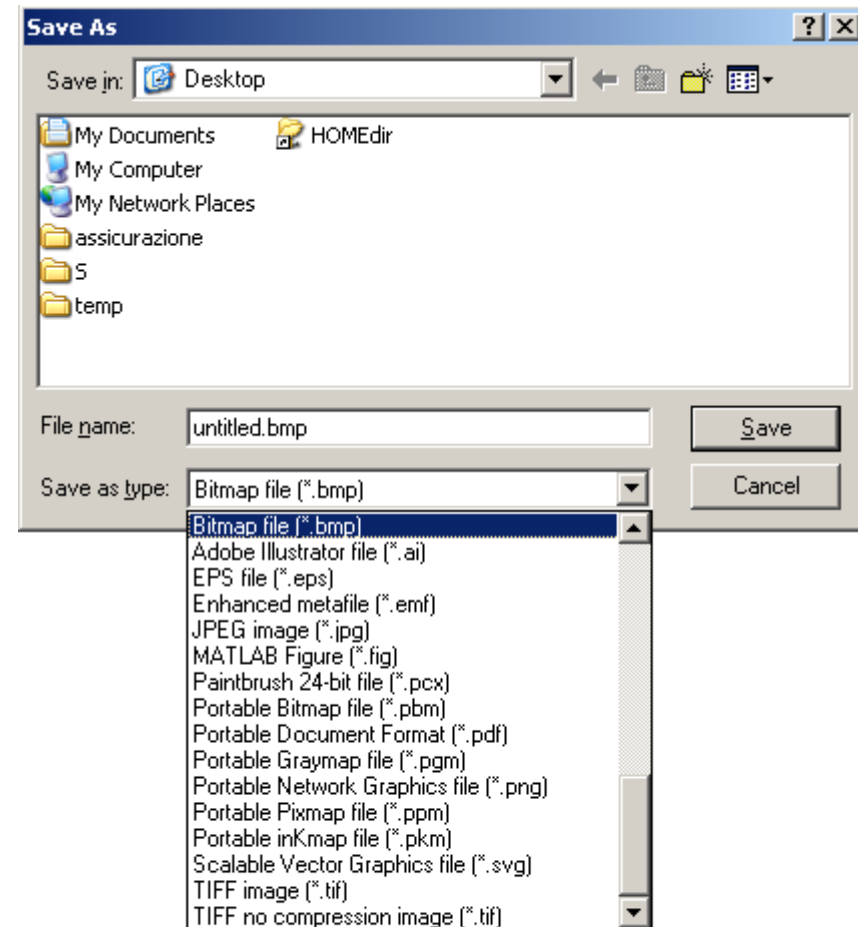
Exporting Graphics



Save and Export

File / Save

- .fig
- .eps
- .jpg
- .pcx
- .pdf
- .png
- .tif
- .emf
- ...





Save and Export

⊕ File / Generate M-file... → Editor

```
function createfigure(x1, y1)
%CREATEFIGURE(X1,Y1)
%   X1:   vector of x data
%   Y1:   vector of y data

%   Auto-generated by MATLAB on 01-Apr-2009 09:19:38

% Create figure
figure1 = figure;

% Create axes
axes1 = axes('Parent',figure1);
box('on');
hold('all');

% Create plot
plot1 = plot(x1,y1);
```



01/03/2017

Images



Imagine Matrix

✚ Example:

```
load durer  
image(X)  
colormap(map)
```

✚ Other maps available:

```
colormap(hot)
```

✚ Saving an image:

```
print -depsc2 miafigura.eps
```



imread

```
X = imread('figura.bmp', 'bmp');  
[X map] = imread('exhibit3.gif', 'gif');
```

✚ Formats available:

Format	Description
✚ 'bmp'	Windows Bitmap (BMP) 1-bit, 4-bit, 8-bit, 16-bit, 24-bit, and 32-bit uncompressed images and 4-bit and 8-bit run-length encoded (RLE) images
✚ 'cur'	Windows Cursor resources (CUR) 1-bit, 4-bit, and 8-bit uncompressed images
✚ 'gif'	Graphics Interchange Format (GIF) 1-bit to 8-bit images
✚ 'hdf' or	Hierarchical Data Format (HDF4) 8-bit raster image data sets, with or without an associated colormap, and 24-bit raster image data sets
✚ 'ico'	Windows Icon resources (ICO) 1-bit, 4-bit, and 8-bit uncompressed images



Format

- ❏ 'jpg' or 'jpeg'

Description

Joint Photographic Experts Group (JPEG). Any baseline JPEG image or JPEG image with some commonly used extensions, including

Image Type

Bitdepth

Compression

- grayscale 8- or 12-bit lossy
- grayscale 8-, 12-, or 16-bit lossless
- RGB 24- and 36-bit lossy or lossless

- ❏ 'pbm'

Portable Bitmap (PBM) 1-bit images using either raw (binary) or ASCII (plain) encoding

- ❏ 'pcx'

Windows Paintbrush (PCX) 1-bit, 8-bit, and 24-bit images

- ❏ 'pgm'

Portable Graymap (PGM) ASCII (plain) encoding with arbitrary color depth, or raw (binary) encoding with up to 16 bits per gray value

- ❏ 'png'

Portable Network Graphics (PNG) 1-bit, 2-bit, 4-bit, 8-bit, and 16-bit grayscale images; 8-bit and 16-bit indexed images; and 24-bit and 48-bit RGB images



Format	Description
❏ 'pnm'	Portable Anymap (PNM)PNM is not a file format itself. It is a common name for any of the other three members of the Portable Bitmap family of image formats: Portable Bitmap (PBM), Portable Graymap (PGM) and Portable Pixel Map (PPM).
❏ 'ppm'	Portable Pixmap (PPM)ASCII (plain) encoding with arbitrary color depth or raw (binary) encoding with up to 16 bits per color component
❏ 'ras'	Sun Raster (RAS) 1-bit bitmap, 8-bit indexed, 24-bit truecolor and 32-bit truecolor with alpha data
❏ 'tif' or 'tiff'	Tagged Image File Format (TIFF)Any baseline image, including 1-bit, 8-bit, and 24-bit uncompressed images; 1-bit, 8-bit, and 24-bit images with packbits compression; 1-bit images with CCITT compression; and 16-bit grayscale, 16-bit indexed, and 48-bit RGB images
❏ 'xwd'	X Windows Dump (XWD)1-bit and 8-bit ZPixmap, XYBitmaps, and 1-bit XYPixmap