Creating Simple plots in MATLAB   EAS 199B
Review of screencast

Introduction

This screencast provides an introduction to the creation and annotation of simple plots of the form $y = f(x)$. A brief introduction to creating histograms is also included.

MATLAB produces high quality plots in many formats. Getting these plots into a word processor like Microsoft Word requires a little care. The screencast demonstrates ways of exporting your graph into MS Word.

Plot a small data set

Suppose you want to plot data from measurements of pressure versus depth of water in a tank. The water is stationary, so it should obey the theoretical model

$$p = \rho g h$$

where ρ is the density of water (998 kg/m^3), g is the acceleration of gravity, and h is the depth of the water in m. Suppose that you have a set of measurements given in the following table.

h (cm)	5	10	15	20	25	30
p (Pa)	560	950	1560	1910	2530	2870

On a single set of axes, plot the measured data as open circles and the theoretical model as a dashed red line. Use a legend to identify the two sets of data.

Plot a histogram of a large set of samples

Raw readings from a sensor are stored in plain text files. Before using the data in a calibration, we want to know whether the data is reliable. Histograms allow us to visually inspect the distribution of a large set of samples of a random variable.

1. Creating plot from a small data set

Manually enter the measured pressure data into vectors h and p. Vectors are delineated by square brackets, and vector elements are separated by commas.

```
h = [5, 10, 15, 20, 25, 30 ]/100;        %  depth (m)
p = [560, 950, 1560, 1910, 2530, 2870 ];  %  pressure (Pa)
```

Note that the *h* data is converted from cm to m by dividing by 100 in the assignment statement.

Evaluate the theoretical model over the range $0 \le h \le 30$ cm

```
rho = 998;              %  density of water (kg/m^3)
g = 9.8;                %  acceleration of gravity (m^2/s)
htheory = [0, 30]/100;
ptheory = rho*g*htheory;
```

Since the theoretical model is a straight line, we only need to specify the end points. Thus, htheory has only two elements. ptheory will have the same number of elements as htheory.

Plot both the measured data and the theoretical model on the same axes.

```
plot(h,p,'o',htheory,ptheory,'r--')
Add axis labels and a legend
xlabel('Water depth (m)')
ylabel('Pressure (Pa)')
legend('Measured data','Theory','Location','northwest')
```
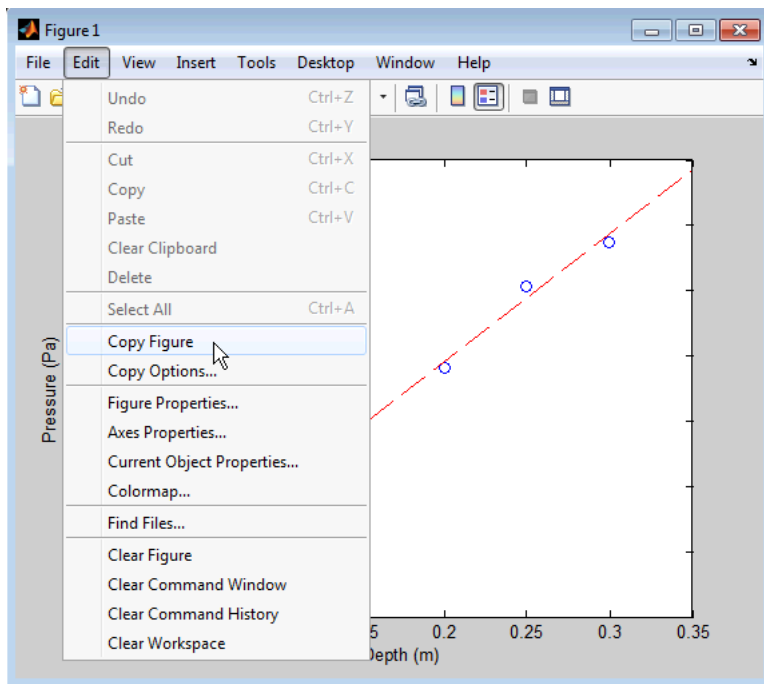
3. Copy the graph into MS Word

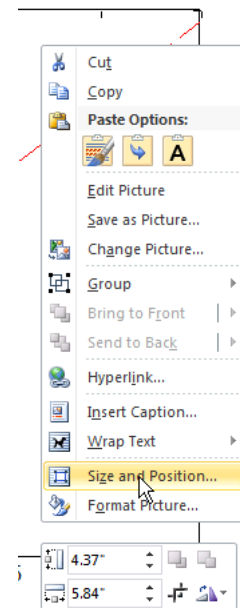In the MATLAB Figure window, select *Copy Figure* from the *Edit* menu.

In MS Word, select paste.

In MS Word, resize the plot by right-clicking on the plot and selecting *Size and Position*

Copy Figure in MATLAB

Resize figure in MS Word

4. Plot a histogram from a large data set in an external file

In anticipation of reusing this function, let the name of the data file be an input argument.

```
function salinity_stats(fname)
```

Use the load command to read the data into the variable `r`.

```
r = load('salinity05_data.txt');
```

Plot a histogram of the data with the built-in `hist` function

```
hist(r)
```

Compute and print the mean, standard deviation and median of the data

```
rmean = mean(s);
rstd = std(s);
rmedian = median(r);
```

Use the fprintf function to print the data.

```
fprintf('\n\tMean reading:       %8.1f\n',rmean)
fprintf(  '\tStd dev of reading: %8.1f\n',rstd)
fprintf('\n\tMedian reading:     %8.2f\n',rmean)
```

You could also change the function definition so that `rmean`, `rstd`, and `rmedian` are returned to the command window. That would be a *very good idea*, and is easily achieved by changing the function definition as follows.

```
function [rmean,rstd,rmedian] = salinity_stats(fname)
```

5. Save the graph in a file

In the MATLAB Figure window, select *Save As...* from the *File* menu.

Or use the print command like this

```
print –depsc –tiff salinity05_histogram.eps
```

In MS Word, use Insert … Photo

Further reading

How to Print or Export:

http://www.mathworks.com/help/matlab/creating_plots/how-to-print-or-export.html

Printing to a file with the Print GUI

http://www.mathworks.com/help/matlab/creating_plots/how-to-print-or-export.html#f3-138020

Problems exporting graphics to MS Word:

http://www.mathworks.com/help/matlab/creating_plots/troubleshooting.html#f3-81822