Lab 7: Different Plotting Commands

7.1 Introduction

Lab this week is aimed at *further* exploring MATLAB's ability to present information graphically. *Remember:* anywhere the lab manual or the book says to use `mesh` or `surf`, use `meshc` or `surfc` instead. Also, save any mesh, surface, or contour plots using the `print -depsc` command instead of just `print -deps`.

7.2 Resources

The additional resources required for this assignment include:

- Books: Palm
- Pratt Pundit Pages: `MATLAB:Plotting` specifically the part on Putting Text on a Plot, `MATLAB:Flexible Programming` specifically using `sprintf` to create dynamic titles

7.3 Getting Started

1. Log into one of the PCs in the lab using your NET ID. Be sure it is set to log on to acpub.
2. Start X-Win 32 on the PC. Roll the mouse over the X to make sure it is set to Display 0. If not, quit all instances of X-Win 32 and re-open X-Win 32.
3. Start PuTTY on the PC. Load a session, make sure X11 Tunneling is set in the SSH category and connect.
4. Once connected to a machine, switch into your `EGR53` directory and create a `lab7` directory inside it:
```
cd EGR53
mkdir lab7
```
5. Switch to your ~`/EGR53/lab7` directory:
```
cd lab7
```
6. Copy all relevant files from Dr. G's public `lab7` directory:
```
cp -i ~mrg/public/EGR53/lab7/* .
```
Do not forget the "." at the end.
7. Open MATLAB by typing `matlab &` at the prompt that appears in your terminal window. It will take MATLAB a few seconds to start up.

7.4 Assignment

For the most part, the assignment for this lab includes creating different graphs. You will only need to write text in the lab report for the final three problems.

7.4.1 Based on Palm Figure 5.5-1, p. 301

Using the `text` command above, write a script that will replicate Figure 5.5-1 on p. 301 of the Palm book. You may need to adjust the x and y coordinates for your text. Note that in MATLAB text commands (and in commands such as `title`), you can obtain italics in the same way as with LaTeX, by surround the items you want in italics with {\it ITEM}. You should also put your NET ID in the title of this plot, even though it is not in the example.

7.4.2 Palm Problem 5.15, p. 343

This problem examines parametric plots in 2-D. Use a `subplot` structure to break the figure up into a left half and a right half. In the left half, make a plot of both $x(t)$ and $y(t)$ as a function of time. Make your time value go from 0 to 2π sec and use 1000 points. Then, in the right half, make a plot of $y(t)$ as a function of $x(t)$. Be sure to use proper labels and a proper title for each subplot. In each case, assume that x and y are location measurements in meters.

7.4.3 Based on Palm Problem 5.21, pp. 344-345

Use the *data* from Problem 5.21 but perform the *tasks* given in Problem 5.22. Do *not* perform the task specifically mentioned in 5.21 itself. Use `subplot` to put the stem plot in the top of the figure window, the bar plot in the middle, and the stairs plot in the bottom. Be sure to properly label each plot, but only put a title on the stem plot. Use the `axis` command to make sure data points and lines do not sit on the edges and also that each of the three graphs have the same axis limits. Which of the three plots do you prefer, and why?

7.4.4 Based on Palm Problem 5.40, p. 350

Use the *data* given in the problem, but instead of *solving* an equation for the number of twists, write a script that will generate and label a `meshc` plot of the `twists` data where the percentage of x_1 is given in the x direction and the percentage of x_2 is given in the y direction. The number of twists should be in the z direction. Recall that the x, y, and z coordinates for a surface need to be given in a particular order. From this plot, how do you think x_1 changes the rod's resistance to breakage? How does x_2 change it?

7.4.5 Based on Palm Problem 5.49, pp. 354-355

This problem examines parametric plots in 3-D. In addition to the problem described, you will also be using three different values for a. Use a `subplot` structure to put nine graphs in a 3x3 array. The values of the parameters used for each graph should be:

$a = -1$ $b = -0.1$	$a = -1$ $b = 0.1$	$a = -1$ $b = 0.2$
$a = 1$ $b = -0.1$	$a = 1$ $b = 0.1$	$a = 1$ $b = 0.2$
$a = 2$ $b = -0.1$	$a = 2$ $b = 0.1$	$a = 2$ $b = 0.2$

Use the `axis` command so that all nine plots have the same axis limits. Plot using a solid black line and add a grid to each graph. *Do not put axis labels on these graphs*, but be sure to have a proper title for each subplot, which should include the values of a and b. Try to make your code efficient by plotting using a loop - see the Pundit page on `MATLAB:Flexible Programming` for how you might dynamically title your subplots. In the lab report, describe what a and b do to the graphs.