

Challenges in Human Health: Problem Solving and Design with Computer Science

Broad Learning Goals

1. Students will consider computer science as a potential problem solving approach to include when facing engineering design problems.
2. Students will value using computational approaches to contribute to solutions for challenges in human health.
3. Students will have increased interest in taking an introductory computer science class that includes programming.
4. Students will have increased confidence in their ability to succeed in an introductory computer science class that includes programming.

Day 1 Tuesday, November 11, 2014

Specific performance goals

1. Students will be able to open a computer programming interface (MatLab) and start a new programming file.
2. Students will be able to run a computer programming file.
3. Students will be able to write a simple computer program and then run it.
4. Students will be able to write a computer program that takes user entered input and stores it.
5. Students will be able to write a computer program that creates an output for a user to read.

Students will be able to open a computer programming interface (MatLab) and start a new programming file.

Log in to the Bass 103 computer. To open MatLab:

In Windows, go to:

Start -> All Programs -> Licensed Software -> MATLAB -> R2014b -> MATLAB R2014b .

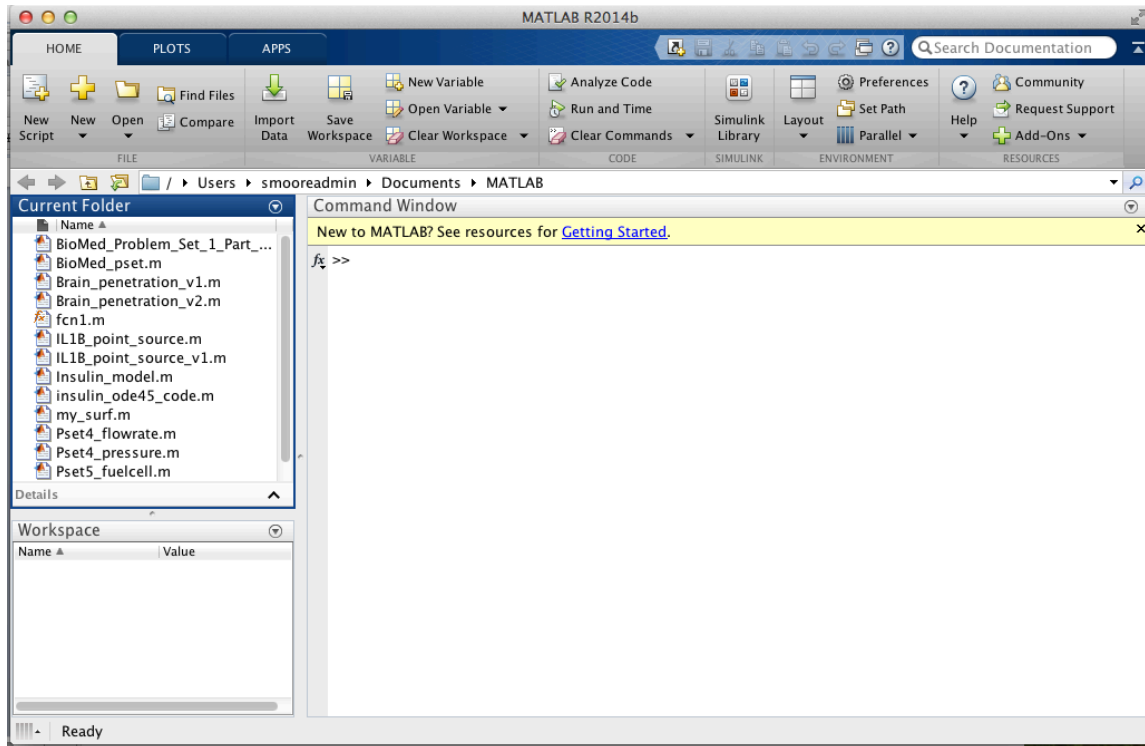
This should launch the MATLAB application.

Find the three main areas in the screen shot below.

Command Window – (Center, toward the top.) You can type directly into the Command Window to do computations or write short pieces of code.

Current Folder – (Left, toward the top.) This is where computer programs that you write in MATLAB are stored. It is also where you generally store files that are inputs to your computer programs, or outputs from your computer programs. It is possible to change the default “Current Folder” to wherever you want to store your programs and input and output files.

Workspace – (Left, toward the bottom.) Computer programming variables that you create appear here with their current values. This helps you to keep track of the variables.



Play around with the Command Window and Workspace.

In the Command Window, type “x = 4” (without the quotes) and hit the enter key on your keyboard. What appears in the Workspace?

Now, in the Command Window, type, “y = x +1” and hit enter. What additionally just appeared in the workspace?

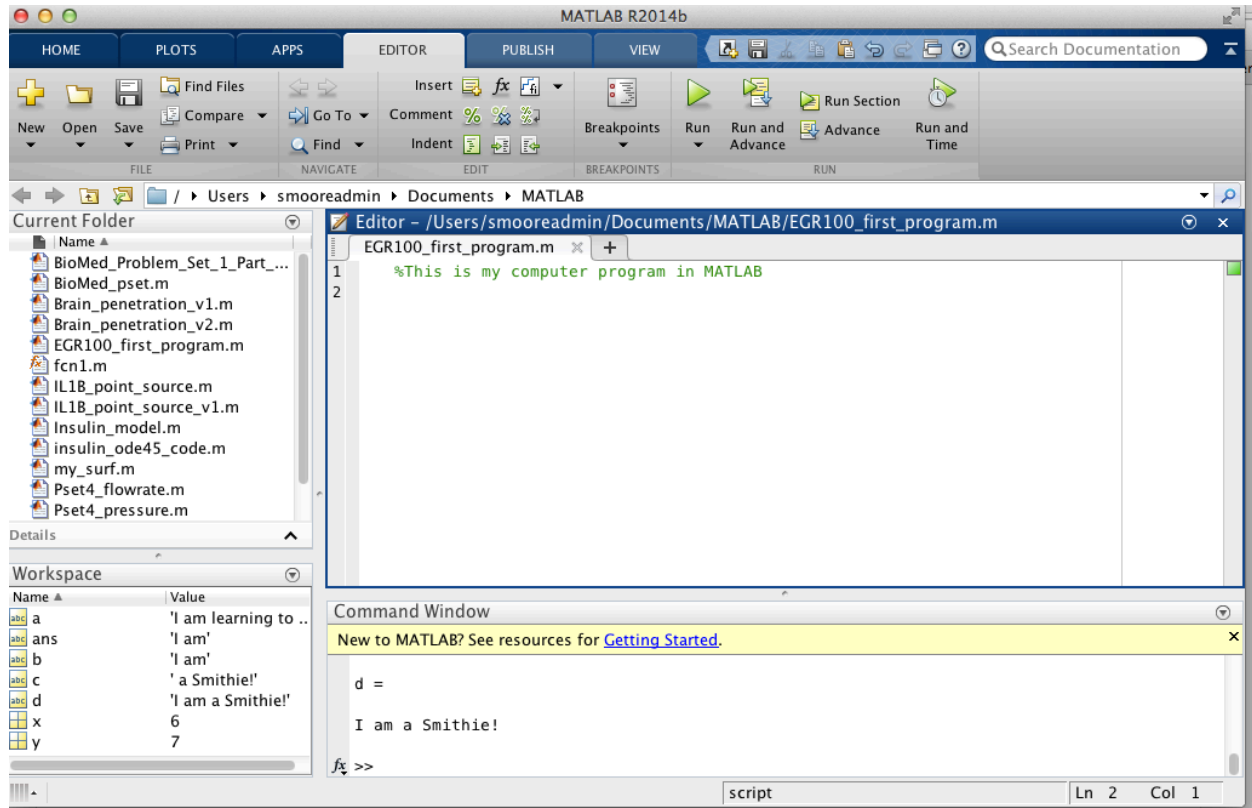
You just created two variables, x and y, and they each now have specific numerical values assigned to them. You can also store data other than numbers in computer programs.

In the Command Window, type “a = ‘I am learning to program.’ “ (this time, include the single quotes, and as before omit the double quotes) and hit enter. You just created a variable, a, that stores text. The text is referred to as a string of characters. The single quotes mark the beginning and end of the text you want to store in a.

In MatLab, you can access the individual characters stored in the variable a. In the Command Window, type “a(1)”. What is the output? Now type, “a(4)”. What is this output? Now type, “a(1:4)”. You are accessing subsets of the data stored in the variable a. You can store these subsets in a new variable, such a by typing, “b = a(1:4)” .

Create a new MatLab computer program file

Once you close the MatLab application, the lines of commands you are typing into the Command Window will not be saved. For a computer program, you want a permanent record of the commands you write, so you can implement that series of commands over and over as needed by running your computer program file. Start a MatLab computer programming file by clicking on the “New Script” button towards the top left of the MatLab window. Your screen will now look a little different, as the program file is now layered into the screen.



Click “Save” also on the upper left of the screen. Give the file the name “EGR100program” using no spaces. The extension will be .m, as compared to a .docx for a Word document, or .pdf for a PDF file.

You are now going to write a computer program in Matlab, this time in the program file that has the “EGR100program.m” label at the top.

First, type what we call comments at the top of the file to provide a description of the program and your name. Comments are lines of code that provide information but are not executed as commands when running the code. To tell MatLab that what you are typing is a comment, start with the percentage sign %.

Type the following comments:

% This is my computer program in MATLAB.

% Written by ____ (where you insert your name here)

Note that these comments appear green in the screen.

Next, code in a few variables. After each line in your code, you need to end with a semicolon ; to indicate that line of code is done. Type in the following:

```
x = 4;  
y = x +4;  
disp(y);
```

Now, save your program.

To run the program, go to the Command Window, and enter “EGR100program” (without the quotes) and hit enter.

What do you see?

disp is short for display – in this case, you are telling the code to display the value stored in the variable y to the Command Window.

Finally, we will add to this program to have the program take input from the user via the Command Window.

In your “EGR100program.m” file editing window, add the following lines of code after the last current line:

```
name = input('What is your name? ','s');  
disp(['Hello ' name]);
```

Save your file, and run your code by typing in “EGR100program” into the Command Window. As you can see, here, you are taking in input from a user, storing that information in the variable “name,” and then using that information to display it. Next class, we will also do calculations or other manipulations with inputs from the user.

In this last example, the ‘s’ is a format that tells MatLab that the input they should expect from the user is text, rather than numerical data. We call the specific ways that information must be communicated with a computer language “syntax.” We will continue to learn about syntax related to MatLab. When trying to figure out the specific syntax that is needed for a specific computer language, it is often helpful to search online for information.

If you have time left, play around with MatLab. You can also start to develop ideas for needs in human health where you see computer science being able to have an important role to developing solutions.