

Matlab Tutorial
EN-74 ECE: Introduction to Image Processing
Tufts University
Fall 2007

Instructions

The goal of this assignment is to gain some experience with the basic use of Matlab. While Googling “matlab tutorial” would bring up a host of available resources, the first on the list, which has been written by the makers of Matlab, is the one you should use here. For other reference, you can go to Appendix A of the class textbook “Introduction to Digital Image Processing” by Alasdair M^cAndrew.

Now, the web address for the tutorial is

http://www.mathworks.com/academia/student_center/tutorials/prerequisites.html.

The tutorial itself is written as a sequence of modules each of which provides an overview of different elements of functionality of Matlab. The tutorial assumes that you are running Matlab concurrently so you can type in the commands as you proceed through the lessons. Unfortunately, there are no independent exercises to go along with the tutorial so, in addition to completing the tutorial on your own, please be sure to hand in a printout of your work. Instructions for saving the output of a Matlab session are provided in the module “Saving Variables and Sessions” under the heading “Saving the Text of MATLAB Sessions.” You may want to read this first.

Exercises

Creating variables

1. Create variables **a**, **b**, **c**, and **d** equal to 1, -2, -5.5, and 7.
2. Let the variables **s** = the sum of these variables and **p** = the product. Write Matlab commands to compute **s** and **p**. Verify that the calculations are correct
3. Clear **a**, **b**, and **s**. What is left in your workspace?

Performing calculations

4. Clear all variables. Create a variables
 - a. **sc** equal to -1.3
 - b. **vct** equal to a column vector holding 1, 2, and 3
 - c. **mtx1** which is a 3 x 3 matrix with 1, 2, 3 on the first row, 4, 5, 6 on the second, and 7, 8, 9 on the third.
 - d. **mtx2** which is a 3x3 matrix with all ones on the first column, all twos on the second and all threes on the third.
5. Compute the product of **sc** and **vct**
6. Compute the matrix-vector product of **mtx1** and **vct**
7. Compute the matrix-matrix product of **mtx1** and **mtx2**
8. Compute the element-wise product of **mtx1** and **mtx2**
9. Using “colon” operations, compute to extract the right piece of **mtx1** **col1.^vct** where **col1** is the first column of **mtx1**.

- Using the “colon” operator, create a vector **time** consisting of equally spaced points between -1 and 1 where the increment is 0.01. Why are there 201 points in this vector rather than 200?

Visualizing Data

- Provide a labeled plot of the function $y(t) = \sin(10t)\cos^2(20t)e^{-9t/10}$ for 2000 equally spaced values of t between -1 and 3.
- Provide a labeled surface plot of the function $f(x,y) = x^2(1-y)^3(1+|x|)^{-1}$ for x and y sampled on a grid of 50 points each between -1 and 1.
- Repeat but this time use `imagesc` to generate a “picture” of f .

Creating scripts with the MATLAB Editor/Debugger

- Repeat 11-14 but using a script rather than commands at the `>>` prompt