

Assigned: 1/18/12

Due: 1/25/12

### Intro and Image Capture/Display

This project will familiarize you with the basics of MATLAB for image processing and will stimulate you to think about some issues concerning image capture.

*NOTE: This document contains hyperlinks that are highlighted with a light blue box. These links lead to online help as well as image files you will need for each project.*

### Getting Started

1. To start MATLAB on a PC, simply go to **Start->All Programs** and start MATLAB from the menu.
2. To become familiar with some of the “gee-whiz” capabilities of MATLAB, try running `echodemo xfourier`. The text shows the MATLAB commands that were used to generate the examples. You may also wish to explore some of the other examples by running `demo` and exploring the options.
3. Run `echodemo intro` to get an idea of the basic capabilities of MATLAB.
4. You can type `doc` at any time to get a hypertext version of the MATLAB Reference Guide or `help <cmd>` to get help on specific commands (assuming this is installed on the machine where you are).
5. If you need help on a MATLAB function and the hyperlink doesn't work, simply type `help <function>` at the MATLAB prompt.
6. Read “MATLAB for DSP” and “MATLAB for Image Processing”. The techniques you learn in these short overviews will be very useful throughout the semester.

### Exercises

1. Type “`help images`” to see a list of all functions in the Image Processing Toolbox or see the “Image Processing Toolbox User's Guide”. You will note under “Image file I/O” the function `imread`. Note that MATLAB allows you to read in a number of different image types. This function can be called so that it returns two arguments — a `colormap` matrix and an image matrix.
  - (a) Read in the image `chapel.tif`. Display the image using `image`. (Be sure to set the colormap to the one that is read in with the image.)
  - (b) Examine the colormap and determine how colormaps work to produce what you see on the screen.
2. Set the colormap to `gray(64)`.
  - (a) What happens if the index values are displayed directly using this colormap?
  - (b) Why does the wrong colormap make it look so bad in this case?
3. Create a ramp image:

- (a) Create a 256x256 image whose index is 1 in the first column and ramps to 256 in the last column. If possible, create this image without using any for loops. Display this image using a `gray(256)` colormap.
  - (b) Experiment with other colormaps.
4. Create a tinted image:
- (a) Determine how to convert the image of the chapel to a “hot” colormap so that the scene appears to have been viewed through a tinted filter. You may need to use `ind2gray` and `gray2ind`. (If it looks unusually noisy compared to the original color image, you did it wrong.)
  - (b) Figure out how to save the image as a PNG image using `imwrite`.
5. The files `paper1.tif` and `paper2.tif` are two scanned images of the same piece of paper taken a few seconds apart without moving the paper. (You may read them in as grayscale.)
- (a) Are the images solid white? How can you tell? Is this what you expect?
  - (b) Are the two images the same? How can you tell? If there are differences, can you describe them and speculate as to what accounts for the difference?

Write a **one-page** memo that summarizes your findings. You will have to be selective in your discussion to meet the space requirements. (That means you will need to leave some things out that you did in the exercise.) Include at least one image or image comparison and one code snippet. The memo should be written so that it makes sense without reference to the project instructions.

NOTE: All out-of-class work is to be done **independently** and should represent your work alone. Sharing of programming tips and discussing general concepts is ok. Collaborating on experiments or code-writing is not. **Any** such collaboration on these assignments will be considered an act of dishonesty and will be treated accordingly. Memos will be checked using Turnitin (TM) for excessive similarity to one another and to documents available online.

For further help:

- MATLAB Primer
- MATLAB Help Desk