

Eastern Mediterranean University

Department of Computer Engineering

CMPE/CMSE 424 Introduction to Image Processing

Laboratory Work #1

INTRODUCTION TO MATLAB AND IMAGE PROCESSING TOOLBOX

The objective of this experiment is to be familiar with MATLAB (MATrix LABoratory) environment by writing commands and programs to find solutions for simple mathematical problems using selection ("if…else...end" statement) and loop structures ("for...end" and "while...end" statements). The Image Processing Toolbox of MATLAB is also introduced to perform basic operations related to digital images and some fundamental functions are presented for the solution of digital image processing problems.

Starting MATLAB: After logging into your account, you can enter MATLAB by double-clicking on the MATLAB shortcut *icon* on your Windows desktop. When you start MATLAB, a special window called the MATLAB desktop appears. The desktop is a window that contains *other* windows. The major tools within or accessible from the desktop are:

- The Command Window
- The Command History
- The Workspace
- The Current Directory
- The Help Browser
- The Start button

In this experiment, you will learn basic MATLAB commands and syntax, including the `help` system. Then, you will have the chance to write and edit your own script files (M-files) in MATLAB, and run them as commands. The graphical interface to the MATLAB workspace is shown in Figure 1.

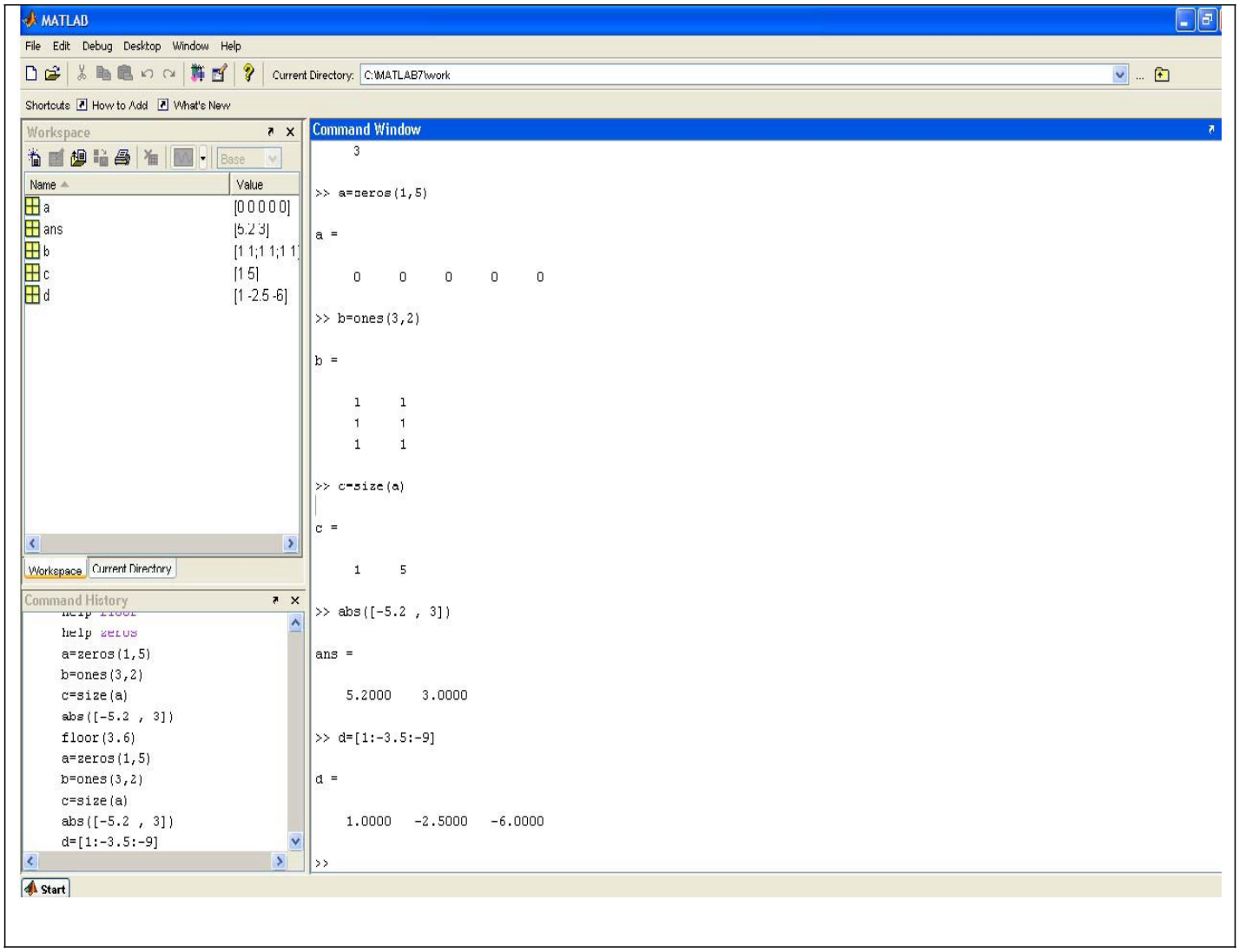


Figure 1. The graphical interface to the MATLAB workspace

The M-file: is a MATLAB document the user creates to store the code they write for their specific application. The advantage of using an M-file is that the users, after modifying their code, must only tell MATLAB to run the M-file, rather than reenter each line of code individually. An M-file is created by selecting **File** Æ **New** Æ **M-file**. The code is written inside the M-file, it can be saved by pressing **Save** button and can be run whenever the user presses **Run** button.

Image Processing Toolbox: is a collection of MATLAB functions (called M-functions or M-files) that extend the capability of the MATLAB environment for the solution of digital image processing problems.

Digital Image Representation: A digital image is composed of a 2 or 3 dimensional matrix of pixels. Individual pixels contain a number or numbers representing what grayscale or color value is assigned to it.

Reading Images: Images are read into the MATLAB environment using **imread** function.(Type "help imread" in MATLAB to see the syntax of the imread function). If color is not an important aspect, then **rgb2gray** function can be used to change a color image into a grayscale image.

Displaying Images: Images are displayed on the MATLAB desktop using function **imshow**. The function **figure** tells MATLAB which figure window the image should appear in.

Writing Images: Images are written to a graphics file of any format supported by MATLAB using **imwrite** function so that they can be transferred to a disk or opened with another program.

EXPERIMENTAL WORK:

E1. Try to perform the following steps that will introduce you to MATLAB:

(a) View the MATLAB introduction by typing **intro** at the MATLAB prompt. This short introduction will demonstrate some of the basics of using MATLAB.

(b) Run the MATLAB help desk by typing **helpdesk**. The help desk provides a hypertext interface to the MATLAB documentation. Two links of interest are **Getting Help** (at the bottom of the right-hand frame), and **Getting Started** which is under MATLAB in the left-hand frame.

(c) Explore the MATLAB help capability available at the command line. Try the following:

help	help zeros
help disp	help ones
help input	lookfor mean % <--- keyword search – you will wait...
help floor	

(d) Run the MATLAB demos: type **demo** and explore a variety of basic MATLAB commands and plots.

(e) Use MATLAB as a calculator. Try the following:

pi*pi - 10

sin(pi/4)

ans ^ 2 %<--- "ans" holds the last result

(f) Do variable name assignment in MATLAB. Try the following:

x = sin(pi/5);

cos(pi/5) %<--- assigned to what?

y = sqrt(1 - x*x)

(g)Write down the following commands in MATLAB and obtain the outputs:

a=zeros(1,5) b=ones(3,2) c=size(a) abs([-5.2 , 3]) floor(3.6) help floor	d=[1:-3.5:-9] f=d(2) g=sin(pi/2) h=exp(1.0) K=[1.4, 2.3; 5.1, 7.8] m=K(1,2)	n=K(:,2) disp('MATLAB is useful… ') 3^2 4==4 2==8 3~=5

(h) Write down the following commands in MATLAB and then use the syntax of selection ("if…else...end" statement) and repetition structures ("for...end" and "while...end" statements) to write a program to find the average of odd numbers between 123 and 455, and then display a message if the average is odd or even value.

help if

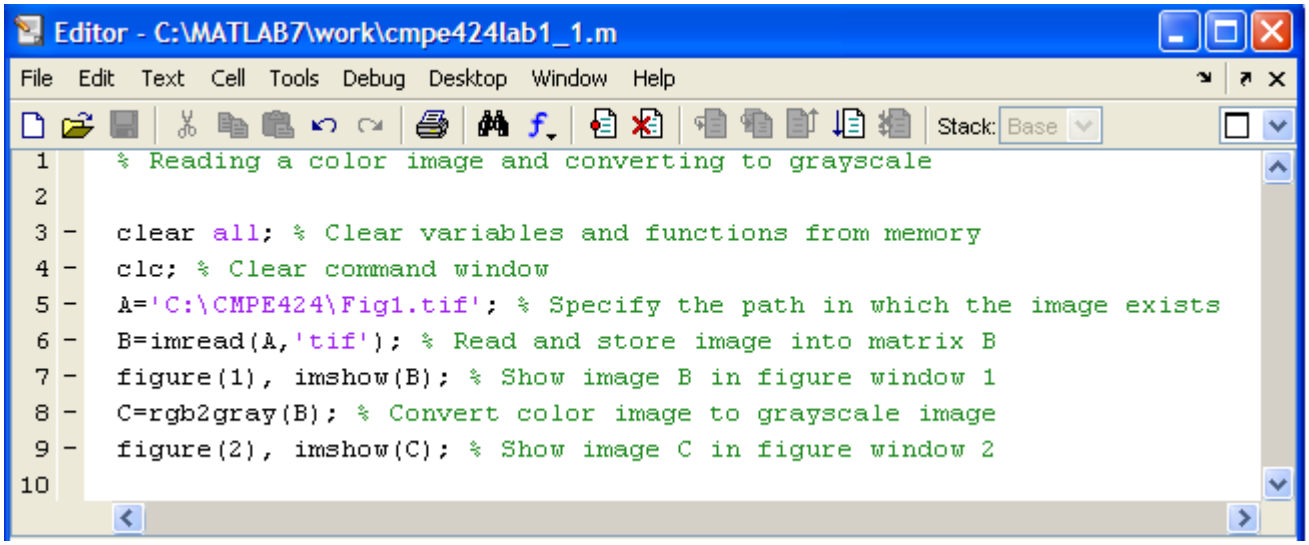
help for

help while

E2. Write down the following MATLAB codes in separate M-files and then save and run the programs to obtain the outputs.

(a) Reading images

(Save the four image files (Fig1.tif, ..., Fig4.tif) and try to see the output for each of them)



(b) Writing images

(Save the four image files (Fig1.tif, ..., Fig4.tif) and try to see the output for each of them)

