

Harman Outline 1 CENG 5131 PDF

August 25, 2014I. **Review of Chapter 1 for MATLAB basic operation.**

Read Chapters 1 and 2 in the text.

A. Introduction to the Course

Why the Math and Applications - DSP, Control, Communications, etc.

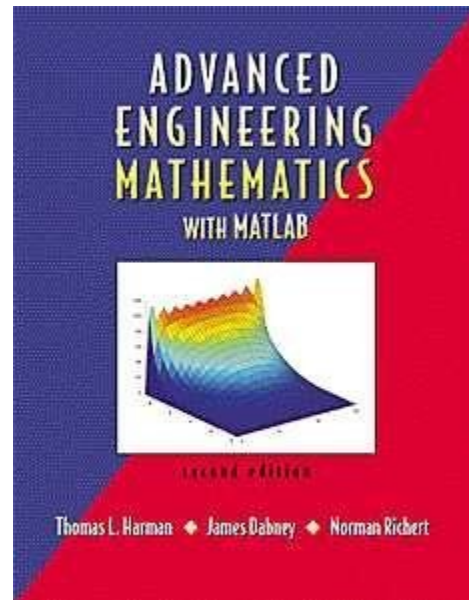
Syllabus handout and homework rules and HONESTY- Go over in Detail

Handout SURVEY

Get the book and the m-files from the WEB site of the publisher.

WARNING: USING MY M-FILES, MAKE THEM LOWER CASE

A BRIEF DISCUSSION OF MATLAB AND ITS CAPABILITIES



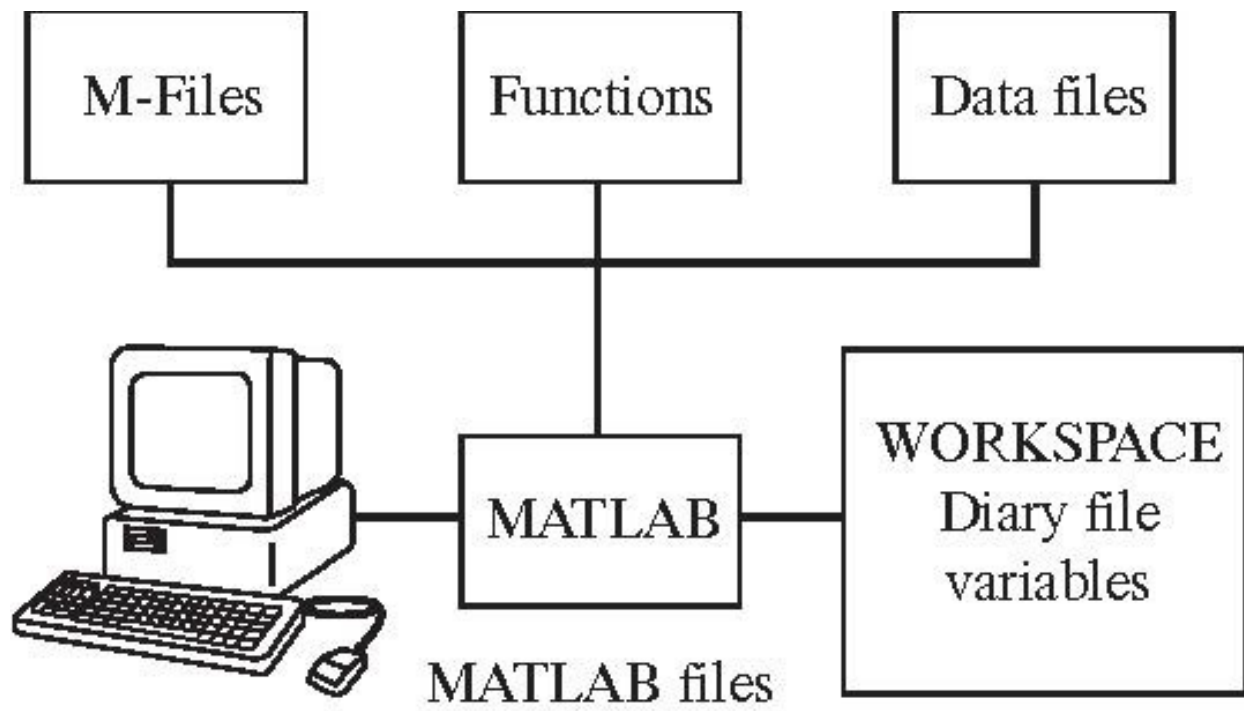


Figure 1: MATLAB Structure Harman P4

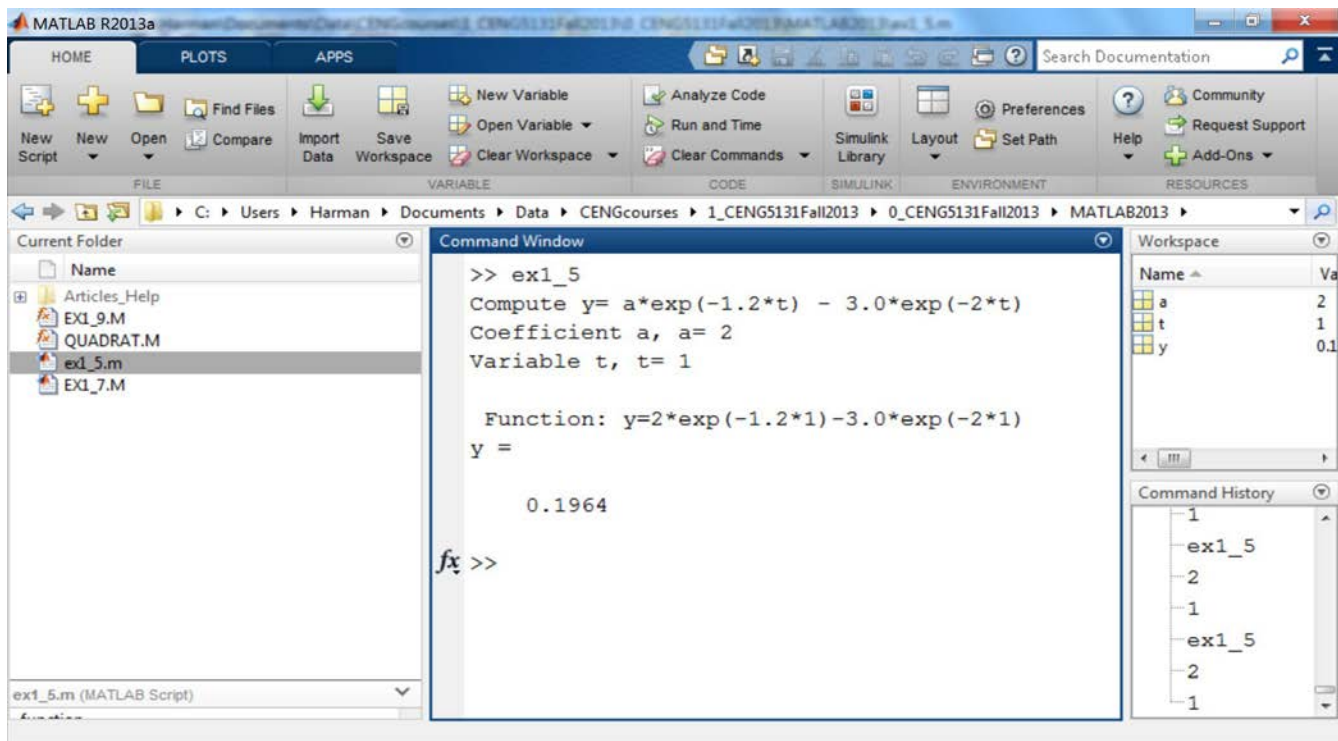


Figure 2: MATLABScreen

Notice on the MATLAB screen, the Ribbon, Current Directory, Command Window and Workspace.

B. Show some of the MATLAB stuff on computer - HELP, some of MY examples

HANDOUTS ABOUT MATLAB AND MY BOOK - WEB SITES

Go over START > MATLAB > HELP > DEMOS

Go over Desktop with Commands of Example 1.5 Note Directory, Workspace, History

Execute ex1_5.m and discuss Desktop

```
%M-file (ex1_5.m) Harman Page 14 to evaluate the function
% y= a*exp(-1.2t) - 3.0*exp(-2t)
%INPUT: Coefficient a and time t
%OUTPUT: y(t) displayed
fprintf('Compute y= a*exp(-1.2*t) - 3.0*exp(-2*t) \n')
a=input('Coefficient a, a= ');
t=input('Variable t, t= ');
% Display results
fprintf('\n Function: y=%g*exp(-1.2*%g)-3.0*exp(-2*%g) ', a, t, t)
y=a*exp(-1.2*t) - 3.0*exp(-2*t)
% End M-file
```

As an example, solve the quadratic equation

$$ax^2 + bx + c = 0$$

with the solution

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

The function "quadrat1" yields the solution while checking for the various cases as defined in the function.

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```
Execute Example 1.10 (quadrat1) and Handout
function [x,Eflag] = quadrat(a,b,c)
% QUADRAT Function to solve the quadratic equation ax^2+bx+c=0
%
% CALL [x,Eflag]=quadrat(a,b,c)      %This will display x and Eflag also
%
% INPUTS: a, b, and c coefficients as real numbers
%
% OUTPUTS: x, a vector of the solutions as real or complex numbers
% Eflag, error condition
% if a=b=0, Eflag=1 since x is not defined
% otherwise Eflag=0
%
% ALGORITHM: The quadratic formula is used in the form
%(1) x = -b/2a +/- sqrt(b^2-4ac)/2a, if a not = 0;
%(2) x = -c/b, if a =0 and b not = 0.
%_____
%
Eflag=0; %Assume result is correct
%(Program statements start here)
%
if a ==0 & b==0      %Error?
Eflag=1;
elseif a==0          %Linear equation?
Eflag=0;
    x=-c/b;
else
    x1=sqrt(b^2-4*a*c);
    x(1)= (-b + x1)/(2*a);
    x(2)= (-b -x1)/(2*a);
end
```

Here is the diary file that was generated. Note the test cases.

```
TEST CASES for quadrat1.m
EQUATION      ANSWER      EFLAG
X^2-1=0       1,-1           0
X^2+3X+2=0    -1,-2          0
3X^2+2X+4=0   -.033 +-1.105i 0
2x+1=0        -0.5           0
1              Nan            1

>> diary quadrat1a.txt
>>[x,Eflag]=quadrat1(1,0,-1)
x =
     1     -1
Eflag =     0

>>[x,Eflag]=quadrat1(1,3,2)
x =
    -1    -2
Eflag =     0

>>[x,Eflag]=quadrat1(3,2,4)
x =
-0.3333 + 1.1055i -0.3333 - 1.1055i
Eflag =     0

>>[x,Eflag]=quadrat1(0,2,1)
x =
-0.5000
Eflag =     0

SYMBOLIC EXAMPLE
syms a b c
solve('a*x^2+b*x+c')

ans =

-(b + (b^2 - 4*a*c)^(1/2))/(2*a)
-(b - (b^2 - 4*a*c)^(1/2))/(2*a)%

Symbolic example
```

MATLAB program characteristics Harman P 25

Classification *Examples*

Data types	Scalars, vectors, matrices, strings, and special values
<i>Operators:</i>	
Arithmetic	+ - * / \ ^ =
Logical	& ~ all, any, find
Relational	< <= > >= ~= ==
Special	% ' . : ;
Functions	Mathematics, signal processing, and symbolic math
<i>Program statements:</i>	
Control flow	if, for, while, break
Debugging	echo on, pause, keyboard, dbtype
Evaluation	Timing commands such as clock, etime , and profile
I/O	Commands to input data, create graphics, and print

Table 1: MATLAB program characteristics