Computer Aided Design (CAD)

Lecture 2 Matlab Environment

Dr.Eng. Basem ElHalawany

	Course Info
Title	Computer Aided Design (CAD)
Lecturer:	Dr. Basem ElHalawany
Lecturer Webpage:	http://www.bu.edu.eg/staff/basem.mamdoh
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Teaching Assistant (TA)	Eng. Shimaa Sayed
Course Webpage	http://www.bu.edu.eg/staff/basem.mamdoh-courses/
References	Multiple references will be used
Software Packages	Matlab/Simulink
Assessment 100/50	 Final Term Exam (100) Mid Term Exam Assignment Project
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Schedule (Draft)

Topics	Estimated Duration (# Lectures)
Introduction	1
Introduction to Matlab Environment	1
Matlab Programing (m-files)	5
Modeling using Matlab Simulink Tool	4
Communication Systems Simulation (Applications)	3
Midterm	8 th Week
Introduction to FPGA + Review on Digital Logic/Circuits	2
VHDL Modeling Language	4
VHDL Application	2
Introduction to OPNET Network Simulator	3
Course Closeout / Feedback/ project (s) Delivery	1

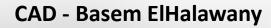


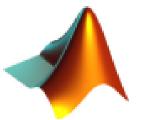
introducing MATLAB



The Lecture is based on :

A. Matlab by Example: Programming Basics, Munther Gdeisat





MATLAB

Connection Settings

R2011b

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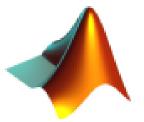
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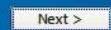
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🥠 Installation Type



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📣 MathWorks

Help

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Product Configuration Notes



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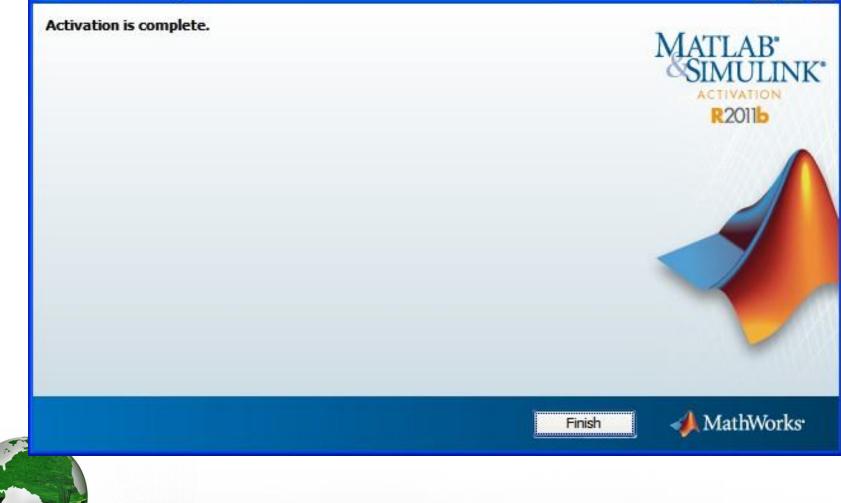


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Activation Complete



- Matrix Laboratory
- Created in late 1970's
- Intended for used in courses of matrix theory, linear algebra and numerical analysis
- Currently has grown into an interactive system and high level programming language for general scientific and technical computation



Common Uses for Matlab in Research

- Data Acquisition
- Multi-platform, Multi Format data importing
- Analysis Tools (Existing,Custom)
- Statistics
- Graphing
- Modeling



Data Acquisition

 A framework for bringing live, measured data into MATLAB using PC-compatible, plug-in data acquisition hardware





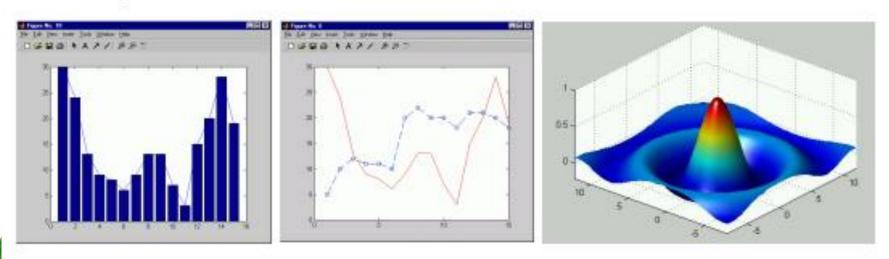
Statistical Analysis

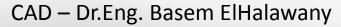
- A considerable variety of statistical tests available including:
 - TTEST
 - Mann-Whitney Test
 - Rank Sum Test
 - ANOVAs
 - Linear Regressions
 - Curve Fitting



Graphing

- A Comprehensive array of plotting options available from 2 to 4 dimensions
- Full control of formatting, axes, and other visual representational elements



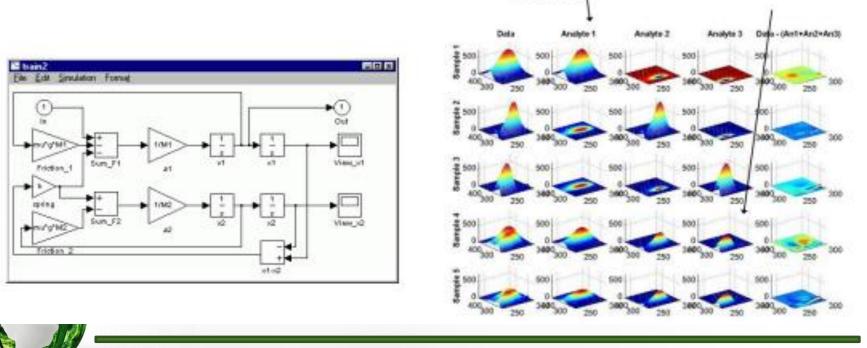


Modeling

 Models of complex dynamic system interactions can be designed to test experimental data

A(1,1)*B(:,1)*C(:,1)*

(a,,b,c,')



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A(4,3)*B(:,3)*C(:,3)*

(a,,b,c,T)

1 Matlab Integrated Development Environment

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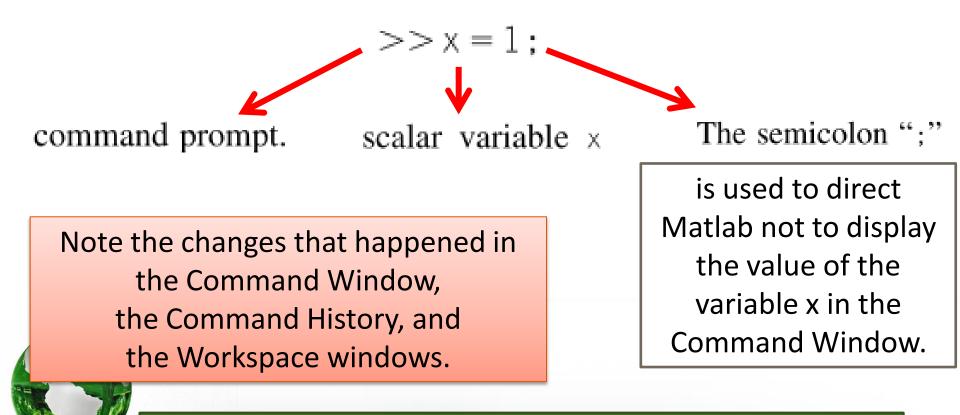
1 Matlab Integrated Development Environment

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	CAD – Dr.Eng. Basem ElHalawany	, 24

1.1.2 Creating Scalar Variables

- > Matlab is a short name for Matrix laboratory.
- As the name indicates, Matlab is a matrix-based software package, which, in fact, considers the scalar variable to be a 1X1 matrix.
- A scalar here means a number such as "2" or " 100"



1.1.2 Creating Scalar Variables

Note the changes that happened in the Command Window, the Command History, and the Workspace windows.

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The Variable Editor

Double-click the variable x in the Workspace. The Variable Editor pops up and shows the value of the variable.

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1.1.3 Creating Vector Variables

To create a vector variable, type the Matlab command

>>y = [2,3,6,9,11,8,5,3,2,-1];

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In order to draw the vector variable y,

- Right Click on the y variable in the and plot(y).
- Or Left Click, then use "Plot" Tab to select

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1.1.4 Creating Array Variables

To create an array variable, type the following Matlab command

>> Z = [1,2;3,4];

This command creates an array variable with the following values:

 $Z = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

Right Click on the z variable in the and mesh(z).... Check the results



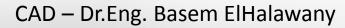
1.2.1 Creating a Script File

- An M-file is a text file that contains a collection of commands that Matlab executes in a sequential order.
- A script file has the following properties:
 - It has no arguments (input data) and it does not return any values (outputs).
 - The commands executed in the script file have the same effect as if these commands were executed in the Command Window.
 - The variables created by the script file are displayed in the Workspace window.
- Suppose that we would like to create a script file that contains the following Matlab commands:

$$x = 1;$$

 $y = 2;$

create the script file

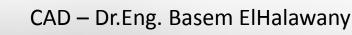


1.2.2 Naming a Script File

Stupid Error Source 😕

- The following restrictions must be taken into consideration when a script file is named:
- The file name must **not** contain spaces or hyphens (-).
- The file name must start with an alphabetical character (a-z or A-Z).
- The file name must contain only alphabetical characters (a-z or A-Z), numbers (1-9) or underscores (_).
- Punctuation characters such as commas (,) or apostrophes (') are not allowed, because many of them have special meanings in Matlab.
- · The file name must be neither a Matlab variable nor an existing Matlab function.

Remember: It can be very helpful to use meaningful and descriptive file names.



1.2.2 Naming a Script File

- The use of a Matlab reserved word as a file name is not allowed.
- A list of Matlab reserved words are given below:

'name' 'node' 'output' 'parameter' 'setup' 'signal' 'source' 'terminal' 'through_variab 'variable' 'across_variable' 'build' 'description' 'descriptor' 'element' 'input' 'interface_input'

- 'terminal' 'interface_node' 'through_variable' 'interface_output'
 - 'item_type' 'local_variable'

- The use of a Matlab keyword as a file name is not allowed.
- A list of Matlab keywords are given below.
 - 'break' 'case'
 - 'catch' 'classdef'
 - 'continue'
 - 'else'
 - 'elseif'
 - 'end'
 - 'for'
 - 'function'

- 'global'
- 'if'
- 'otherwise'
- 'parfor'
- 'persistent'
- 'return'
- 'spmd'
- 'switch'
- 'try'
- 'while'

1.2.2 Naming a Script File

To check that the file name you have chosen is not a Matlab keyword or a Matlab function, you can use Matlab help

>>help cat

Matlab responds and informs you that there is already a function called cat that concatenates arrays.

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1.2 Matlab Script Files 1.2.4 Executing a Script File

There are two methods available for executing the script file

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ethod 1	: •8 c8	- 1.0	+ +	1.1	× ***	0	Run cat1.m (F5)	
	1 -	x=1;						
	2 -	y=2;						

2. The second method is to type the name of the M-file at the Command Prompt without the file extension.

1.2.5 Matlab Code Readability

- It is good programming/engineering practice to produce Matlab programs that are tidy and well commented.
- > This makes the code easier to understand, both for you and for others.

price of ruler = 6: x = 6; price_of_rubber = 8: y = 8;price_of_book = 25; z = 25: No_of_rulers = 3; No_of_rubbers = 2; a = 3;No_of_books = 4; b = 2;Total_price_paid_by_Chris = ... c = 4:price_of_ruler * No_of_rulers +... price_of_rubber * No_of_rubbers +... r = x * a + y * b + z * cprice of book * No of books



Which version of the code do you think is easier to understand?

The continuation characters "..." at the end of the line makes the code continue onto the next line.

1.2.6 Commenting Matlab Code

You can add a comment to Matlab code by inserting a percentage sign "%" at the beginning of the line. For example:

% Chris bought three rulers, two rubbers, and four books.

% The price of a ruler is d6. The price of a rubber is d8.

% The price for a book is d25.

% This Matlab program calculates the total price paid by % Chris.

- A more elaborate method for commenting code is performed by using block commenting.
- In this method, add the textual characters "%{" before the first line of the comments and add the characters "%}" after the last line of the comments.

% {

Chris bought three rulers, two rubbers, and four books.

The price of a ruler is $\pounds 6$. The price of a rubber is $\pounds 8$.

The price for a book is $\pounds 25$. This Matlab program calculates the total price paid by Chris.