Lecture 3

Lecture 3: MATLAB Programming

➢ MATLAB Scripts

- A script is a sequence of MATLAB instructions (statements) that is stored in a file

- To create a script, click New Script. A new window will appear called the Editor. By default, scripts will be saved in the work directory.

- To edit an existing file, there are several methods to open it. The easiest are:

  ✓ Click File, then Open, then click the name of the file

  ✓ Click the Current Directory tab, then double-click the name of the file

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➢ **MATLAB Scripts**

- The contents of a script can be ==displayed in the Command Window== with *type* command.

- The script can ==be executed or run==, by simply ==entering the name of the file (without the .m extension).== The script file can also be viewed by opening the Editor Window

- Example: write a script to calculate the area of a circle with a radius of 5.

  script1.m

  > radius = 5
  > area = pi * (radius^2)

  >> type script1

  radius = 5

  *area = pi * (radius^2)*

  >> script1

  radius =

  *   5*

  area =

  *   78.5398*

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➢ **Documentation**

- One way of documenting a script is to put comments in it. In MATLAB, a comment is anything from a " % " to the end of that line.

- When typing help scriptname in command window, the first block (contiguous lines) of comments will be displayed.

script1b.m

```
% This program calculates the area of a circle


% First the radius is assigned

radius = 5

% The area is calculated based on the radius

area = pi * (radius^2)
```

>> help script1b

This program calculates the area of a circle

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➢**Input and Output**

 ▪ Input function is used to <mark>initialize variables with the keyboard</mark>.

 ▪ The syntax is variablename = input('prompt string')

> Example: >> rad = input('Enter the radius: ')
>
> Enter the radius: 5
>
> rad =
>
>   5

How to enter a vector or a matrix?

When writing a script, we generally use the input function to read values from the keyboard.

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➢ **Input and Output**

  ▪ If we want to enter a character or a string, <mark>'s' should be added after the prompt</mark>,

   Example: >> letter = input('Enter a char: ', 's')

                   Enter a char: g

                   letter = | **Both 's' and 'S' are ok.** |

                    'g'

  ▪ It is also possible for the user to <mark>type quotation marks around the string</mark> rather than including the second argument 's' in the call to the input function.

   Example: >> name = input('Enter yourname: ')

                   Enter your name: 'Stormy'

                   name = | **What if we do not use the quotation marks here?** |

                        'Stormy'

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- ➢ **Output Statements: disp and fprintf**

  - ▪ Output statements <mark>display strings and the results of expressions</mark> in command window, and can allow for <mark>formatting, or customizing</mark> how they are displayed.

  - ▪ disp <mark>does not allow formatting</mark>

    Example: >> disp('Hello')

    Hello

    >> disp(4^3)

    64

    | What if we do not use the quotation marks here? |

    >> radius = 5

    >> display(radius)

    radius =

    5

  - ▪ <mark>Formatted output</mark> can be printed to the screen using the fprintf function,

    Example: >> fprintf('The value is %d, for sure!\n', 4^3)

    The value is 64, for sure!

  - ▪ The %d is called a <mark>placeholder</mark>. \n is the <mark>newline character</mark>. Without the newline character, it would print in a row but the <mark>next promp >></mark> would appear on the same line.

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➤ **Output Statements: disp and fprintf (Cont)**

▪ Some simple placeholders.

%d   integers

%f   float numbers

%e   exponential notation

%g   values are either floating point or scientific notation depending on which is shorter.

%c   single character

%s   strings

What will we get when typing >> fprintf(' %c \n','abcd')

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➢ **Output Statements: disp and fprintf (Cont)**

- <mark>A field width</mark> can be included in the placeholder in fprintf.

- For example, %5d indicates a <mark>field width of 5</mark> for printing an <mark>integer.</mark> %6.2f means a <mark>field width of 6</mark> (including the decimal point and the decimal places) with <mark>2 decimal places</mark>

  Example (<mark>multiple place holders and variables</mark>):

  >> fprintf('The int is %3d and the float is %6.2f\n', 5, 4.9)

  The int is   5 and the float is   4.90

  > **What will we get when typing**
  > >> fprintf('The int is %3d and the float is %6.2f\n', 4.9,5)

- The value being printed can be <mark>left-justified</mark> within the field width using a <mark>minus sign</mark>.

  >> fprintf('The integer is xx%5dxx and xx%-5dxx\n', 3, 3)

  The integer is xx   3xx and xx3   xx

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➢ **Output Statements: disp and fprintf (Cont)**
- Printing <mark>Vectors and Matrices</mark>
  - ✓ For a vector, if a place holder and the newline character are in the format string, it will print in a column regardless of whether the vector itself is a row vector or a column vector:

    Example: >> vec = 2:5;

    >> fprintf('%d\n', vec)

    2

    3

    4

    5

  - ✓ Without the newline character, it would print in a row but the next prompt would appear on the same line:

    Example: >> fprintf('%d', vec)

    2345>>

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➢ **Output Statements: disp and fprintf (Cont)**

■ Printing Vectors and Matrices (Cont)

✓ If the number of elements in a vector is known, that the place holder can be specified and then the newline:

Example: >> fprintf('%d %d %d %d\n', vec)

2 3 4 5

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➢ **Output Statements: disp and fprintf (Cont)**

    ✓ For matrices, MATLAB unwinds the matrix column by column:

       Example: >> mat = randi([1,10],2, 3)

                   mat =

                      5 9 8

                      4 1 10

>> fprintf('%d\n', mat)	>> fprintf('%d %d %d\n', mat)
5	5 4 9
4	1 8 10
9	
1	**How to print the matrices as**
8	**they appear when created?**
10	

12

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➢ **Output Statements: disp and fprintf (Cont)**

- Printing Vectors and Matrices (Cont)

  ✓ For vectors and matrices, even though formatting cannot be specified, the disp function may be easier to use in general than fprintf because it displays the result in a straightforward manner.

  Example: >> mat = randi([5,15],2, 3)

  mat =

      15   11   14

      7   10   13

  >> disp(mat)

      15   11   14

      7   10   13

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➢ **Summary**

- MATLAB scripts

- Input statements

- Output statements: disp and fprintf

➢ **Homework (on Canvas)**

- Due next Tuesday