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Section : C

Lab # 11

An Introduction To Matlab

MATLAB Environment

1. MATLAB stand for Matrix laboratory.
2. MATLAB was originally written to provide easy access to matrix software.
3. MATLAB is a high performance language for
    a. Technical computing integrator computations.
    b. Visualization and programming.
    c. Easy to use environment where problem and solution are expressed in mathematical rotation.
4. MATLAB usage
    a. In Universities.
    b. In Industry.
5. MATLAB features a family of add-on application specific solution called tool box.
6. Tool boxes are comprehensive collection of MATLAB (M-files) that extends the MATLAB environment to solve particular classes of problems.
7. Add on tool boxes for
    a. Signal processing
    b. Control system
    c. Neural networks

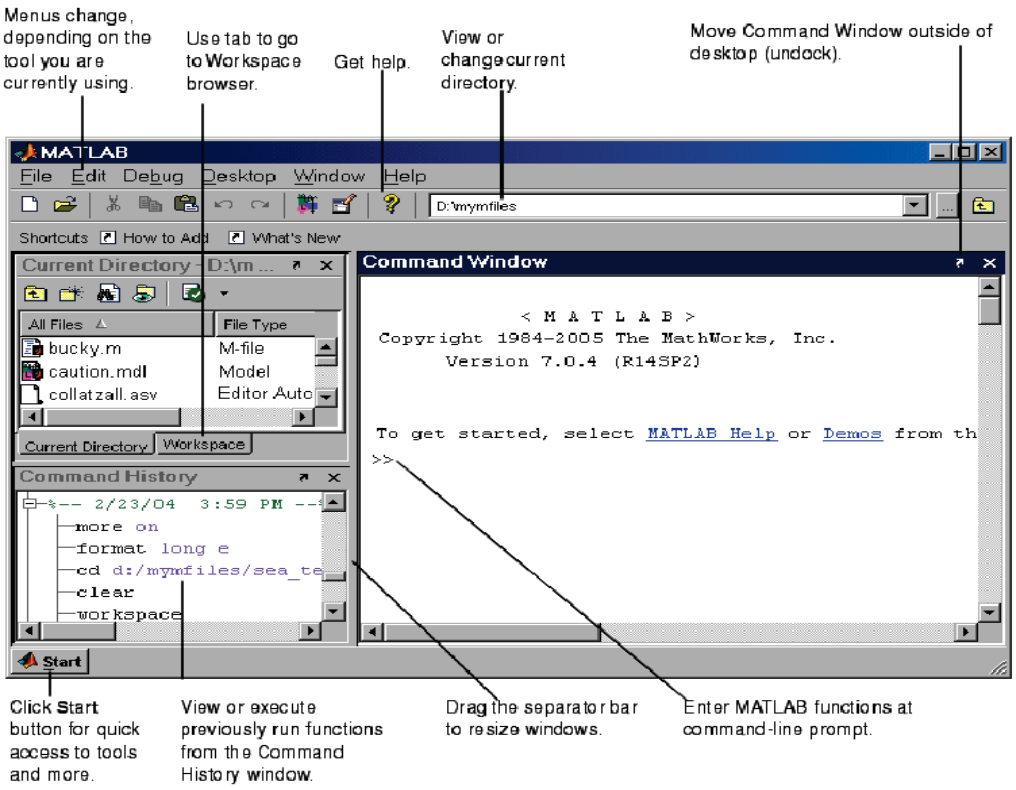
MATLAB System

It includes:

9.1 Desktop Tools and Development Environment:

It includes:

- MATLAB desktop and command window
- An editor and debugger
- A code analyzer
- Browsers for viewing help
- The work space files and folder



9.2 Mathematical Function Library:

Collection of computational algorithm ranging from elementary functions like sum, sine, cosine etc.

`cos(x)`	Cosine	`abs(x)`	Absolute value
`sin(x)`	Sine	`sign(x)`	Signum function
`tan(x)`	Tangent	`max(x)`	Maximum value
`acos(x)`	Arc cosine	`min(x)`	Minimum value
`asin(x)`	Arc sine	`ceil(x)`	Round towards $+\infty$
`atan(x)`	Arc tangent	`floor(x)`	Round towards $-\infty$
`exp(x)`	Exponential	`round(x)`	Round to nearest integer
`sqrt(x)`	Square root	`rem(x)`	Remainder after division
`log(x)`	Natural logarithm	`angle(x)`	Phase angle
`log10(x)`	Common logarithm	`conj(x)`	Complex conjugate

More Sophisticated functions like

- Matrix
- Inverse Matrix
- Z and Z' transform
- Fourier transform
- DTFT, IDTFT, FFT, DFT, etc

9.3 The Language:

- MATLAB language is a high level matrix/array language with control flow statements function, data structure and object oriented programming language.

9.4 Graphics:

- MATLAB has an extensive facility for displaying vector and matrices as graph.
- It include high level functions for two dimensional and three dimensional data visualization, image processing animation and presentation graphics.

9.5 External Interface:

- The external interface library allows you to write C and FORTRAN program that interact with MATLAB.

Basic Operation:

Operators	Symbols	Example
Addition	+	3+2
Subtraction	-	2.4-16.5
Multiplication	*	3.14*6
Division	\ or /	15.4/7 or 7\19.4
Exponentiation	^	2^8

Precedence:

Precedence is the order of performing arithmetic operators.

PRECEDENCE	MATHEMATICAL OPERATIONS
First	The contents of all parentheses are evaluated first, starting from the innermost parentheses and working outward.
Second	All exponentials are evaluated, working from left to right
Third	All multiplications and divisions are evaluated, working from left to right
Fourth	All additions and subtractions are evaluated, starting from left to right

Special Variable with Description:

- Ans Default variable name used for result.
- Pi Ration of the circumference of the circle.
- Eps smallest number that, when added to 1 creates a number.
- Inf infinity (eg 1/0).
- Nan or nan stands for not a number (eg 0/0).

- I or j stands for -1
- Nargin No. of function input argument
- Nargout No. of function output argument
- Real min smallest usable positive real no.
- Real max largest usable positive real no.

Exercise:

1. **4+12+144-36-10*18/12 =?**
   Output:
   ans =

   109

   Solution:
   Ans = 4+12+144-36-180/12 //Multiplication will held first
   =4+12+144-36-15 //Division will held at Second
   =4+12+144-36-15 //Then Addition
   =160-36-15 //Then Subtraction
   =109
2. **10*14+18-188*14/24 =?**
   Output:
   ans =

   48.333

   Solution:
   Ans = 140+18-2632/24 //Multiplication will held first
   = 140+18-109.666 //Division will held at Second
   = 158-109.666 //Then Addition
   = 48.333 //Then Subtraction
3. **2^10 =?**
   Output:
   ans =

   1024

4.

S. No.	Item	Quantity	Unit Cost
1.	Pen	40	10
2.	Stapler	20	40
3.	Eraser	45	2
4.	Paper rim	4	350
5.	Pencil	100	3

a. Find the total cost of all the items.
b. Also find the average of the total cost.
Source code:

```
>> pen=40*10;
>> stapler=20*40;
>> eraser=45*2;
>> paperrim=4*350;
>> pencil=100*3;
>> total_cost=pen+stapler+eraser+paperrim+pencil;
>> average=total_cost/5;
>> total_cost

total_cost =

      2990

>> average

average =

  598
```

5. Implement following in MATLAB

a. Fahrenheit to Celsius formula
Source code:

```
display('Farenhite to celcius Conversion…')
display('Enter the attributes ')
F= input('Enter degrees in farenhite')
C=(F - 32)*(5/9);
display('farenhite equals to')
display(C)
```

Output:

```
Lab11t5a
Farenhite to celcius Conversion…
Enter the attributes
Enter degrees in farenhite
64

F =
   64
Degrees in celsius will be
C =
  17.7778
```

b. Lens formula

Source code:

```
display('lens Formula…')
display('Calculation of Focal length')
display('Enter the attributes ')
P= input('Enter Object distance:');
Q= input('Enter Image distance:');
F=(P*Q)/(P+Q);
display('Focal lenth of Micro Scope is:')
display(F)
```

Output:

```
Lab11t5b
lens Formula…
Calculation of Focal length
Enter the attributes
Enter Object distance:

3
Enter Image distance:

6
Focal lenth of Micro Scope is:
F =
    2
```

c. 3-Equations of motion

Source code:

```
display('1st equation of motion')
display('Calculation of final Velocity ')
display('Enter the attributes ')
Vi= input('enter the initial velocity:  ');
a= input('enter the acceleration of body: ');
t= input('enter the time taken: ');
Vf=Vi+a*t;
display(Vf)
display('------------------------------')
display('2nd equation of motion')
display('Calculation of Displacement ')
display('Enter the attributes ')
Vi= input('enter the initial velocity:  ');
a= input('enter the acceleration of body: ');
t= input('enter the time taken: ');
S=Vi*t+a*t*t/2;
display(S)
display('------------------------------')
display('3rd equation of motion')
```

```
display('Calculation of Accerleration ')
display('Enter the attributes ')
Vf= input('enter the final velocity:  ');
Vi= input('enter the initial velocity:  ');
S= input('enter the displacement of body: ');
a=(Vf*Vf-Vi*Vi)/(2*S);
display(a)
```

Output:

```
Lab11t5c
1st equation of motion
Calculation of final Velocity
Enter the attributes
enter the initial velocity:  3

enter the acceleration of body: 2

enter the time taken: 4
Vf =
   11
------------------------------
2nd equation of motion
Calculation of Displacement
Enter the attributes
enter the initial velocity:  4

enter the acceleration of body: 2

enter the time taken: 3
S =
   21
------------------------------
3rd equation of motion
Calculation of Accerleration
Enter the attributes
enter the final velocity:  5

enter the initial velocity:  3

enter the displacement of body: 4
a =
    2
```

6. Create a Mark sheet of 3 subjects

Sample Program:

```
display('MARK SHEET OF THREE SUBJECTS…')
display('Enter your subject marks ')
CS= input('enter 1st subject marks out of 100:  ')
RDBMS= input('enter 1st subject marks out of 100: ')
BAC= input('enter 1st subject marks out of 100:  ')
Total= CS + RDBMS + BAC
TotalMark=Total/300
Percentage= TotalMark * 100
display('Your  Percentage Is')
Percentage
```

Program:

```
display('MARK SHEET OF THREE SUBJECTS…')
display('Enter your subject marks ')
Eng= input('enter 1st subject marks out of 100:  ');
Math= input('enter 2nd subject marks out of 100: ');
Phy= input('enter 3rd subject marks out of 100:  ');
Total= Eng + Math + Phy';
TotalMark=Total/300;
Percentage= TotalMark * 100;
display('Your  Percentage Is')
display(Percentage)
```

Output:

```
Lab11t6
MARK SHEET OF THREE SUBJECTS…
Enter your subject marks
enter 1st subject marks out of 100:
90
enter 2nd subject marks out of 100:
85
enter 3rd subject marks out of 100:
90
TotalMark =
    0.8833
Your  Percentage Is
Percentage =
   88.3333
```