Analysis of Matlab

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***Abstract*- This paper gives us the knowledge of basic MATLAB and how to use it, actually it is an iterative program for numerical computation and data visualisation.**

***Index terms*- Numerical computation and data visualisation**

INTRODUCTION

MATLAB stands for MATRIX LABORATORY we can use this software in many of engineering and science field; it's an iterative program for numerical computation and data visualisation. It is run on UNIX, Macintosh and Windows environment.
It integrates mathematical computing visualisation and a powerful language to provide flexible environment for technical computing.
MATLAB provide an iterative language for solving problems mathematically and visually.
Typically include Numerical computation and algorithm development

- Symbolic computation
- Modelling, simulation & prototyping
- Data analysis
- Engineering graphics

OBJECTIVE OF INVENTION

In a 1970, MATLAB invented by Cleve Molar University of New Mexico. It is first adopted by researcher and practitioner in control engineering.
How to operate

- Frist we Starting and quitting MATLAB
- Then click on MATLAB icon
- Display window
- Then command window (used to enter command)
- A graphics window (this are used to display plot)
- An edit window (used to create and files)
- Entering commands (name of file without extension, example- Unnayan_Satyam_Parth)
- MATLAB Expo (shows some different type of expo)
- Abort (this are used to abort command in MATLAB, hold down the control key and press C to create a local abort with matlab)
- Semicolon (;)
- Typing % (designated as a comment)
- CLC command (this command used to cleaning the window)
- Help (if you need any help then click on help icon)
- Statement and variable (>> variable=expression)

1. ARITHMETIC OPERATION

- Addition (+) 5+5=10
- Subtraction (-) 5-3=2
- Multiplication (*) 2*3=6
- Right division (/) 20/2=10
- Left division (\) 10\2=2/10=1/5
- Exponential (^) 3^4=81

A. Elementary maths built in function

For performing a computation, MATLAB contains a number of functions along with trigonometry functions

- Some common functions are
- abs(x) : computes the value of x
- sqrt(x) : computes the value of square root of x
- round(x) : round x to nearest number
- fix(x) : round x to nearest towards '0
- floor(x) : round x nearest to -∞
- ceil(x) : round x nearest to ∞
- sign(x) : x>0 value =-1, x=1value = 1
- rem(x,y) :modulus function
- exp(x) : computes e^x
- log(x) : computes lnx

- $\log_{10} x$: log of base 10

A. Arrays

- Those no. arranged in rows or columns
- 1D array is a row or a column of no.
- 2D array has a set of no. arranged in rows and columns
- Operation is performed by element by element.

B. Row Vector

- We use space or comma between the elements inside the square bracket
  x = [7,-1,2,-5,-8]
  y = [7, 1, 2, 5, 8]

B. Column vector

- We use semicolon between the elements.
  x = [1 ; -2 ; 3 ;

B.Polynomials

- Function of a single variable
  $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots + a_{n-1}x^1 + a_n$
  where x is a variable
  a_0 , a_1 , are coefficient
  Degree of polynomials equals largest of exponent
  Represented by vector in Polynomials.

2. How to enter the polynomials

$5s^4 + 7s^3 + 2s^2 - 6s + 2$

Enter in matlab

>> x[5 7 0 2 -6 2]

- Its needed to enter the coefficient of the terms
- Contains function that performs polynomials multiplication and division

3.

- Conv(a,b)
- Deconv(n,d)
- Root(a)
- Poly(r)

Output of the program is a row vector which contains the polynomial coefficient.

Examples:

4. Determine the value of x, y, z for the following set of linear algebraic equation.

$X_2 - 3x_3 = -5$

$2x_1 + 3x_0 - x_3 = 7$

$4x_1 + 5x_2 - 2x_3 = 10$

$$A=\begin{bmatrix} 0 & 1 & -3 \\ 2 & 3 & -1 \\ 4 & 5 & -2 \end{bmatrix} \quad B=\begin{bmatrix} 5 \\ 7 \\ 10 \end{bmatrix}$$

and $X=\begin{bmatrix} x1 \\ x2 \\ x3 \end{bmatrix}$

AX=B

A'AX=A'B

IX =A'B

X=A'B

>>A = [0 1 -3; 2 3 -1; 4 5 -2]

>>B = [-5; 7; 10]

>>X = inv(A) * B

X=-1.0000

4.0000

3.0000

Check = A* X

>>Check =

-5

7

10

% alt method

>> X = A/B

X= -1

4

3

Control Structures

- For the designing of control systems MATLAB has an extensive sets of function.
- They use matrix, root determination model conversion and plotting of computer function
- Found in MATLAB's control system toolbox
- Uses models in the form of transfer function or state-space equation.

Transfer Function

Expressed as a ratio of two polynomials in linear time invariant system

$$H(s) \quad \frac{b_0s^n + b_1s^{n-1} + \ldots + b_{n-1}s + b_n}{A_0s^m + a_1s^{m-1} + \ldots + a_{m-1}s + a_m}$$

Numerator and denominator of a transfer function are factored into the zero-pole-gain form.

$$H(s) = \frac{k\,(s-z1)\,(s-z2)\,\dots\,(s-zn)}{(s-p_1)\,(s-p_2)(\,\dots\,(S-p_n)}$$

State space model is represented in linear control system(s).

X=Ax + Bu

Y =Cx + Du

The Laplace transform used to find the transform of time function

6. Used to obtain the partial-fraction expansion of the ratio of two polynomials B(s)/A(s) as following:

$$\frac{B(s)}{A(s)} = \frac{num}{den} = \frac{b\,(1)\,s^{n}+b\,(2)\,s^{(n-1)}+\dots+b\,(n)}{a\,(1)\,s^{n}+a\,(2)\,^{(sn-1)}+\dots+a\,(n)}$$

Where a (1) ≠ 0

Num and dem are row vectors

Num= [b (1) b (2) … b (n)]

Den = [a (1) a (2) … a (n)]

CONCLUSION

In the last we can say that with the help of basic Matlab we can solve too many complicated trigonometric functions. With the help of array we can solve a complicated function.

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