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MATLAB
Unit 1-Lecture 9

BTech (CSBS) -Semester VII

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*few figures/content have been prepared/referred from internet source/books

Introduction to MATLAB

- History,
- basic features,
- strengths and weaknesses,
- good programming practices
- plan your code

History

- The first MATLAB was not a programming language; it was a simple interactive matrix calculator.
- In 1970, a group of researchers developed EISPACK (Matrix Eigensystem Package) and LINPACK (Linear Equation Package) in FORTRAN
- The development of the MATLAB started in the late 1970s by Cleve Moler, the chairman of the Computer Science department at the University of New Mexico. Cleve wanted to make his students able to use LINPACK & EISPACK (software libraries for numerical computing, written in FORTRAN), and without learning FORTRAN.
- In 1984, Cleve Moler with Jack Little & Steve Bangert rewrote MATLAB in C and founded MathWorks. These libraries were known as JACKPAC at that time, later these were revised in 2000 for matrix manipulation and named as LAPACK (Linear Algebra Package)

Features of MATLAB

1. MATLAB is high-level language

   This is a high-level programming language with data structures, control flow statements, functions, output/input, and object-oriented programming. It permits both, rapidly creating speedy throw-away programs, and creating complete, complex and large application programs.

2. Interactive Environment

   MATLAB provides an interactive environment that allows iterative exploration, design, and problem-solving. It is a bunch of tools that a programmer can use. It includes abilities for handling the variables in the workspace & importing/exporting data. It also contains tools for development, handling, debugging, and profiling MATLAB files.

Features of MATLAB

3. Handling Graphics

It offers built-in graphics useful for data visualization, and tools for generating custom plots. MATLAB holds high-level instructions specially for creating two and three-dimensional data visualizations, animations, image processing, and graphical presentation. It allows users to modify graphics through GUI

4. Accessing data

MATLAB can natively support the sensor, video, image, telemetry, binary, and various real-time data from JDBC/ODBC databases. Reading data from different databases, CSV, audio, images, and video is super simple from an integrated environment.

Features of MATLAB

3. Application Program Interface (API)

MATLAB APIs allow users to write C / C++ and Fortran programs that directly interact with MATLAB. These include options for calling programs from MATLAB (dynamic linking), reading and writing MAT-files and using MATLAB as an interface to run applications.

6. Toolboxes

A ” Toolbox” is a set of functions designed for a specific purpose and compiled as a package. These Toolboxes include MATLAB code, apps, data, examples and the documentation which helps users to utilize each Toolbox. There are separate Toolboxes available from Mathworks, to be used for specific purposes, for example, text analytics, image processing, signal processing, deep learning, statistic & machine learning, and many more.

Features of MATLAB

7. A large library of Mathematical functions

MATLAB has a huge inbuilt library of functions required for mathematical analysis of any data. It has common math functions like sqrt. factorial etc. It has functions required for statistical analysis like median, mode and std (to find standard deviation), and much more. MATLAB also has functions for signal processing like filter, butter(Butterworth filter design) audio read, Conv, xcorr, fft, fftshift etc. It also supports image processing and some common functions required for image processing in MATLAB are rgb2gray, rgb2hsv, adaptthresh etc.

Features of MATLAB

8. MATLAB and Simulink:

MATLAB has an inbuilt feature of Simulink wherein we can model the control systems and see their real-time behavior. We can design any system either using code or building blocks and see their real-time working through various inbuilt tools. It has lucid examples of basic control systems and their working.

9. Interface with other languages:

We can write a set of codes (libraries) in languages like PERL and JAVA, and we can call those libraries from within the MATLAB itself. MATLAB also supports ActiveX and .NET libraries.

Schematic of MATLAB