



Introduction to MATLAB

By

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Objectives

- What is MATLAB?
- Advantages & Disadvantages
- MATLAB Architecture
- MATLAB System
- Typical Uses of The MATLAB
- Application Areas

What is MATLAB?

- MATLAB is a high performance computing language and stands for **MATrix LABoratory**, which is developed by The MathWorks, Inc.
- Mathworks offers more than 80 products for technical computing and Model-based Design.
- These products are accelerating the pace of discovery, innovation, development and learning in engineering and science.
- It provides an interactive environment with thousands of in-built functions for technical computation, visualization, animation, graphics, GUI, analysis and simulation.
- It provides excellent tools for signal processing, image processing, neural computing, statistical optimization, financial, geometric modeling, virtual reality modeling, Bio-informatics, embedded system, application programming and many other types of scientific computations.

Advantages

- MATLAB is easy to use because it is an interpreted language like Turbo Basic, Visual Basic etc, and also supports for editor, command run, online help and Browser.
- It is platform independent; that means its program can create on one platform and run on any another platform like Windows NT, Windows 2000, Linux, and Macintosh.
- MATLAB has its predefined functions called MATLAB built-in functions library.
- MATLAB supports for device independent plotting. This facility is useful for technical data and results on any graphical output device.
- For data analysis interactive interface is provided through Graphical User Interface (GUI).

Disadvantages

- The first is that execution of MATLAB is slower than any another programming language because it is an interpreted language.
- The second disadvantage of MATLAB is the cost; it is more expensive than any another conventional programming languages.

MATLAB Architecture

- MATLAB Features:

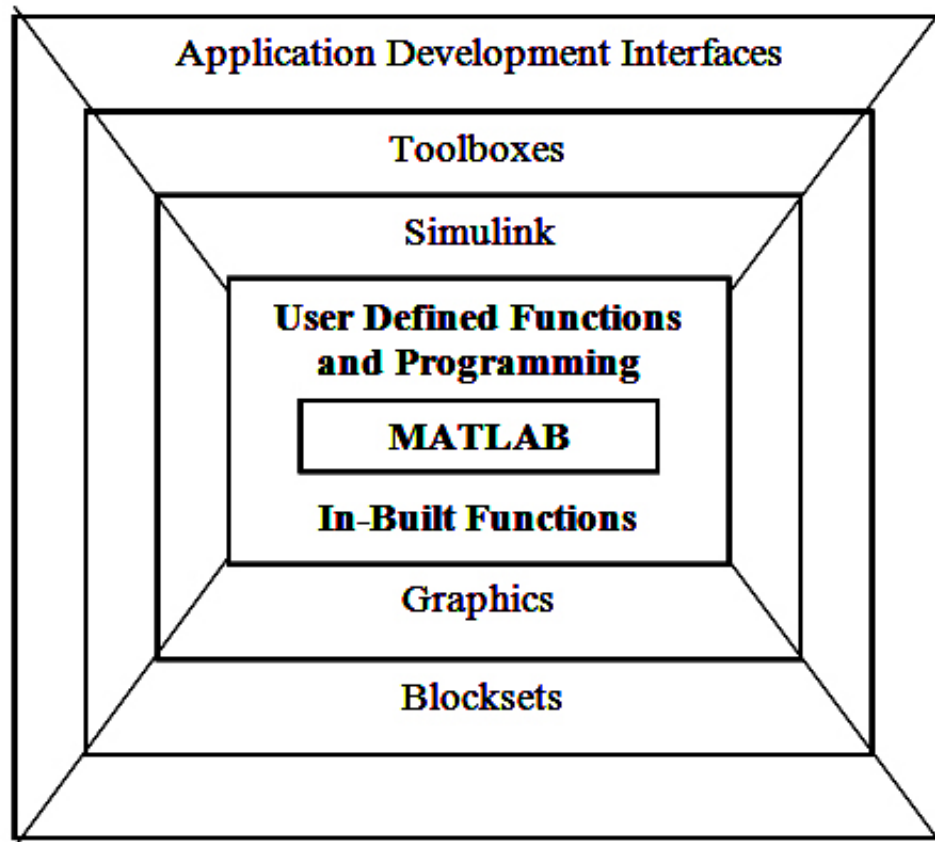


Fig 1: MATLAB Features
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- **MATLAB:**

Matlab is specially designed for matrix computations: solving systems of linear equations, computing eigenvalues and eigenvectors, factoring matrices, and so forth.

- **In-built functions:**

This feature advances the capability of MATLAB. It gives ready developed, checked routines to evaluate the task. The user can use these in-built routines directly in the applications. Use of such capability of programming increases reliability of the user's program. There are thousands of in-built functions present in MATLAB.

- **User-Defined functions and Programming:**

In addition to in-built functions, the user can write his own set of statements to solve a specific task. In user define functions; a set of statements may consist of in-built functions. Once the complete user defined function has been written and gives the correct result, it may be treated as an in-built function

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- **Simulink:**

Simulink is a platform for multidomain simulation and model-based design of dynamic system. Simulation is an interactive tool for modeling simulating and analyzing a dynamic multi domain system. You can build a block diagram, simulate system behavior, evaluate performance and refine the design.

- **Graphics:**

This utility of MATLAB allows a user to create various graphical objects including two- and three-dimensional graphs; graphical user interfaces (GUIs) movies etc.

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- **Blocksets:**

Blocksets provides reference models and utilities to accelerate the development and integration of system and subsystem model.

- **Toolboxes:**

The collection of M-files or functions for specific application solutions is called as the Toolbox.

- **Application Development Interfaces:**

To develop software according to the user's requirements, the user can use all the above features of MATLAB. All features collectively are used to develop dedicated software. This feature is on top level of MATLAB Architecture. It is an outer phase having direct interaction with the application user.

MATLAB System

- MATLAB System is categorized into six parts:
 - 1) Development environment
 - 2) The MATLAB mathematical function
 - 3) The MATLAB language
 - 4) Handle Graphics
 - 5) The MATLAB Application Program Interface (API)
 - 6) MATLAB file types

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1) Development environment :

Development environment is the set of tools (graphical user interfaces includes MATLAB desktop, command window, a command history and browsers for help, the workspace, files and the search path) and facilities that help you to assess the performance of your functions or M-files.

2) The MATLAB mathematical function:

This is a vast collection of computational algorithms ranging from elementary functions like sum, sin, and complex arithmetic to more sophisticated functions like matrix inverse, matrix eigenvalues, Bessel functions, and fast Fourier transforms and also supports the solution of delay differential equations, solution of singular boundary value, ordinary differential equation (ODE) problems, Integration over a volume etc

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3) The MATLAB language:

This language supports the 64-bit integer and 64-bit file handling. It also supports 24-bit and 32-bit recording and playback on 32-bit windows machines. You can also do the GUI (Graphical User Interface).

4) Handle Graphics:

MATLAB Graphics systems consist of high-level commands for two-dimensional and three-dimensional data visualization, image processing and animation and presentation graphics. It also includes low-level commands that allow you to fully customize appearance of graphics as well as to build complete graphical user interfaces on your MATLAB application.

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5) The MATLAB Application Program Interface (API):

MATLAB is a complete, self-contained environment for programming and manipulating data. It is often useful to interact with data and programs external to the MATLAB environment. MATLAB provides an interface to external programs written in the C language, Fortran language and Java.

6) MATLAB file types:

User's information is stored in different types of files in the MATLAB. The types of files are: M-file, MAT file, MEX file, Figure, GUI (fig), Model (mdl) etc.

Typical Uses of the MATLAB

- Application Development
- Algorithm Development
- Modeling
- Simulation and Prototyping
- Data analysis
- Visualization and Exploration
- Scientific and engineering Problems
- Graphics
- GUI Building
- Virtual reality and modeling etc.

Application Areas

- Math and Optimization
- Statistics and Data Analysis
- Application Development
- Database Connectivity and Reporting
- Signal Processing and Communication
- Image Processing
- Test and Measurement
- Financial Modeling and Analysis
- Computational Biology
- Control Design
- Embedded Target
- Verification, Validation and Testing
- PC-Based Rapid Prototyping and HIL
- Code Generation
- Physical Modeling
- Fixed Point Modeling

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- Event Based Modeling
- Simulation Graphics
- Technical Computing
 - A) Data Acquisition
 - B) Data Analysis
 - C) Mathematical Modeling
 - D) Algorithm Development
 - E) Parallel Computing
 - F) Desktop and Web Deployment
- Embedded system
- Control Systems
- Digital Signal Processing
- Communications Systems
- Image and Video Processing
- FPGA Design
- Mechatronics
- Test and Measurement
- Computational Biology
- Computational Finance

Summary

The Mathworks has developed a matrix laboratory use to handle array/matrix data called MATLAB. MATLAB architecture consists of the Basic MATLAB, Functions, simulink, Blocksets, Toolboxes, and application development and interface. The system of MATLAB is categorized into six parts to cover major areas of applications and typical dedicated uses. The various application areas that have used the platform of MATLAB are technical computing, signal processing and communication, image processing, test and measurement, financial modeling and analysis, bioinformatics control design, simulation and so on.



Thank You