Introduction to Use of MATLAB

By Kuo-Yang Tu

MATLAB Function Reference

- Development Environment
- Mathematics
  - Arrays and matrices, linear algebra, data analysis, other areas of mathematics
- Programming and Data Types
- File I/O
- Graphics
  - Line plots, specialized plots, images, printing
- 3-D Visualization
  - Surface and mesh plots, view control, lighting and transparency, volume visualization.
- Creating Graphical User Interface
  - GUIDE, programming graphical user interfaces.
- External Interfaces Java, COM, Serial Port functions.

Development Environment

- Starting and Quitting
  - Startup and shutdown options
- Command Window
  - Controlling Command Window
- Getting Help
  - Finding information
- Workspace, File, and Search Path
  - File, search path, variable management
- Programming Tools
  - Editing and debugging, source control, Notebook
- System
  - Identifying current computer, license, product version, and more
- Performance Improvement Tools and Techniques
  - Improving and assessing performance, e.g., profiling and memory use

Mathematics

- Arrays and Matrices
  - Basic array operators and operations, creation of elementary and specialized arrays and matrices
- Linear Algebra
  - Matrix analysis, linear equations, eigenvalues, singular values, logarithms, exponentials, factorization

Mathematics …

- Elementary Math
  - Trigonometry, exponentials and logarithms, complex values, rounding, remainders, discrete math
- Data Analysis and Fourier Transforms
  - Descriptive statistics, finite differences, correlation, filtering and convolution, fourier transforms

Mathematics …

- Polynomials
  - Multiplication, division, evaluation, roots, derivatives, integration, eigenvalue problem, curve fitting, partial fraction expansion
- Interpolation and Computational Geometry
  - Interpolation, Delaunay triangulation and tessellation, convex hulls, Voronoi diagrams, domain generation

Mathematics …

- Coordinate System Conversion
  - Conversions between Cartesian and polar or spherical coordinates
- Nonlinear Numerical Methods
  - Differential equations, optimization, integration
- Specialized Math
  - Airy, Bessel, Jacobi, Legendre, beta, elliptic, error, exponential integral, gamma functions

Mathematics …

- Sparse Matrices
  - Elementary sparse matrices, operations, reordering algorithms, linear algebra, iterative methods, tree operations
- Math Constants
  - Pi, imaginary unit, infinity, Not-a-Number, largest and smallest positive floating point numbers, floating point relative accuracy

Programming and Data Types

- Data Types
  - Numeric, character, structures, cell arrays, and data type conversion
- Array
  - Basic array operations and manipulation
- Operator and operations
  - Special characters and arithmetic, bit-wise, relational, logical, set, date and time operations

Programming and Data Types

- Programming in MATLAB
  - M-files, function/expression evaluation, program control, function handles, object oriented programming, error handling
  - Control Flow
  - break
  - switch case
  - continue
  - If else elseif end
  - for end
  - Error
  - return
  - While end

Graphics

- Basic Plots and Graphs
  - Linear line plots, log and semilog plots
- Annotating Plots
  - Titles, axes labels, legends, mathematical symbols
- Specialized Plotting
  - Bar graphs, histograms, pie charts, contour plots, function plotters
- Bit-Mapped Images
  - Display image object, read and write graphics file, convert to movie frames

Graphics

- Printing
  - Printing and exporting figures to standard formats
- Handle Graphics
  - Creating graphics objects, setting properties, finding handles

3-D Visualization

- Surface and Mesh Plots
  - Plot matrices, visualize functions of two variables, specify colormap
- View Control
  - Control the camera viewpoint, zooming, rotation, aspect ratio, set axis limits
- Lighting
  - Add and control scene lighting

3-D Visualization

- Transparency
  - Specify and control object transparency
- Volume Visualization
  - Visualize gridded volume data