

Part Five:

Introduction to MATLAB

MATLAB is system that originally was designed to illustrate common linear algebra operations. As linear algebra is so useful, the original program has grown into a vast scientific software system. Visit <http://www.mathworks.com> to get an idea about the commercial success of MATLAB. MATLAB is the computing standard in almost all engineering disciplines.

The titles of the nine lectures are

1. Introduction to MATLAB
2. Plotting with MATLAB
3. Polynomials and Fitting
4. Programming in MATLAB
5. MATLAB as Drawing Tool
6. Images and Movies in MATLAB
7. Signal Processing in MATLAB
8. Special Matrices in MATLAB
9. Linear Programming in MATLAB

Through its symbolic toolbox, it is possible to extend the working precision of MATLAB. However, MATLAB remains primarily a numerical software system and is very good to deal with approximate data. In our lectures we will see three very different situations where we encounter approximate data. The first occasion is when we use polynomial fitting to remove errors. Secondly, we will use splines to make smooth drawings. A third case occurs when we consider filtering noise from signals.

GNU Octave (available via <http://www.octave.org/>) is freely distributed. Its language is mostly compatible with MATLAB. Since in this introduction we can only touch the basics of MATLAB, most common operations we will see are expected to work as well with GNU Octave. While Octave is included with the Debian GNU/Linux and SuSE Linux distributions, the Windows version is easy to install.

There are many good introductions to MATLAB, for example: [3], [4], [5], [6], [7], [8], and [10]. The author of [7] is the original author of MATLAB, and is currently the Chairman and Chief Scientist at The Mathworks, the company of MATLAB. In addition to the general purpose introductions to MATLAB, there are a fair number of problem solving books, e.g. [1], [2], [9], and [11].

References

- [1] J.M. Cooper. *Introduction to Partial Differential Equations with MATLAB*. Birkhäuser, 1998.
- [2] P.W. Davis. *Differential Equations. Modeling with MATLAB*. Prentice-Hall, 1999.
- [3] D. Hanselman and B. Littlefield. *Mastering MATLAB. A Comprehensive Tutorial and Reference*. Prentice-Hall, 1996.
- [4] D.J. Higham and N.J. Higham. *MATLAB Guide*. SIAM, 2000.
- [5] B.R. Hunt, R.L. Lipsman, and J.M. Rosenberg. *A Guide to MATLAB, for beginners and experienced users*. Cambridge University Press, 2001.
- [6] A. Knight. *Basics of MATLAB and beyond*. Chapman & Hall/CRC, 2000.
- [7] C. Moler. *Numerical Computing with MATLAB*. SIAM, 2004. See <http://www.mathworks.com/moler> for electronic version.
- [8] S. Nakamura. *Numerical Analysis and Graphic Visualization with MATLAB*. Prentice-Hall, 1996.
- [9] L.F. Shampine, I. Gladwell, and S. Thompson. *Solving ODEs with MATLAB*. Cambridge University Press, 2003.
- [10] D. Smith. *Engineering Computation with MATLAB*. Addison-Wesley, 2008.
- [11] S.D. Stearns and R.A. David. *Signal Processing Algorithms in MATLAB*. Prentice-Hall, 1996.