Introduction to Matlab and Octave

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1 What is Matlab?

Quoting from the 1981 Matlab Users' Guide:[1]

> *MATLAB* is an interactive computer program that serves as a convenient "laboratory" for computations involving matrices. It provides easy access to matrix software developed by the LINPACK and EISPACK projects. The program is written in Fortran and is designed to be readily installed under any operating system which permits interactive execution of Fortran programs.

In the past couple of decades, the matlab language has become the de facto standard high-level language in digital signal processing. It is used extensively for analysis and rapid prototyping.[2]

The matlab language was created by Prof. Cleve B. Moler, Professor of Computer Science (a specialist in numerical analysis) at the University of New Mexico. It has since spawned several commercial and open-source derivatives of the original matlab language. Today, the premier commercial version is MATLAB (R) by The Mathworks, Inc.[3], and the best free, open-source version appears to be Octave.[4]

MATLAB by The Mathworks, Inc., is far and away the richest implementation of the matlab language. However, it is very expensive for non-students, costing thousands of dollars for an individual user (at the time of this writing). As a result, individuals may prefer the free, open-source Octave. I use the term "matlab" (not all-uppercase) to refer to either MATLAB or Octave (or any other reasonably compatible implementation of the matlab language).[5] Capitalized, "MATLAB" refers (in my documents) to the version sold by The Mathworks.

MATLAB and Octave are highly compatible with respect to purely mathematical computations. They may diverge, however, when generating plots. Octave's plotting capabilities are based on

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[1] http://ccrma.stanford.edu/~jos/matdoc/

[2] For final systems implementation, assembly language is still the most commonly used, followed by the C/C++ programming language.

[3] http://www.mathworks.com

[4] http://www.octave.org

[5] Unfortunately, there is not a standard definition of the matlab language, and so MATLAB and Octave are not 100% compatible, partly by choice. It is not hard to write for both, using only the compatible subset of the language.

`gnuplot`[6]. Octave 3.0[7] (released December 2007) was a large step forward in compatiblity, especially with respect to basic plots that are used most often. While I continue to encounter differences here and there, I find that almost all code I write (or receive from others) will run in either Octave or MATLAB.

2   Signal Processing in MATLAB and Octave

In MATLAB, the *Signal Processing Tool Box* contains many functions which are useful in the field of signal processing. It is naturally a rather expensive in addition to the base MATLAB product. Other useful tool boxes include those for *Filter Design*, *Control Systems*, *System Identification*, *Optimization*, *Symbolic Math*, and so on.

In the Octave world, *Octave Forge* is an add-on utility collection that includes many functions compatible with the MATLAB Signal Processing Tool Box and others. In Red Hat Fedora Linux , one can `yum install octave` and `octave-forge`.

In the next section, Web pointers are given to these and other resources.

3   On-Line Resources for MATLAB and Octave

- **Mathworks home page**: `http://www.mathworks.com`

- **Octave home page**: `http://www.octave.org`

- **Octave-Forge (GNU Octave Repository)**:
  `http://octave.sf.net/`

- **MATLAB Central (hundreds of user-contributed MATLAB functions)**:
  `http://www.mathworks.com/matlabcentral/`

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[6]`http://www.gnuplot.info/`
[7]`http://www.gnu.org/software/octave/NEWS-3.html`