Appendix A. Shared knowledge of Maple and Matlab

A.1 Introduction

The traditional role of information technology for solving problems in scientific computing has been in effective programming of appropriate and efficient algorithms which were applied to compute mathematical models. The current development of information and communication technology and especially the web technology enables us to easily share acquired common knowledge in solving problems in scientific computing. Furthermore we can built user friendly interfaces to programs and perform on-line computation via the Internet.

New releases of MAPLE (see `http://www.maplesoft.com`) and MATLAB (see `http://www.mathworks.com`) combine efficient mathematical solvers with advanced information and communication technology. The standard process of solving problems in scientific computing using MAPLE and MATLAB usually consists of several steps: the problem identification; a development of its mathematical model; solving this model using MAPLE or MATLAB and visualizing its solutions; and analyzing them. If necessary the mathematical model is modified and then the above process will be repeated.

To support such problem solving processes, MAPLE and MATLAB web sites have been set up to disseminate the acquired knowledge of users and to distribute software among the community in all scientific, educational and technical disciplines. It is therefore a good idea to check these sites when working on a problem. The chances are good that somebody else has already solved it and it will save us from reinventing the wheel. Moreover, new functions e.g. in MAPLE allow us to collect data on-line directly from the Internet or let us use MAPLE applications via any web browser remotely.

Shared knowledge for solving problems in scientific computing is furthermore available on the Web through discussion boards. There are newsgroups for MAPLE (`comp.soft-sys.math.maple`) and MATLAB (`comp.soft-sys.matlab`). The MATLAB discussion group can also be reached on `http://mathforum.org/epigone/comp.soft-sys.matlab` and on `groups.yahoo.com/group/matlab`, or directly on MATLAB Central

`www.mathworks.com/matlabcentral/newsreader.shtml`.

A.2 Application Centers

The main source for shared knowledge for solving problems in scientific computing can be found in the application centers of MAPLE `www.mapleapps.com` and MATLAB `www.mathworks.com/matlabcentral/fileexchange/`. These are web pages where people can contribute their solutions of problems and other scientists can download and use them for their own research.

A.2.1 MAPLE Applications Center

The MAPLE Application Center `www.mapleapps.com` consists of several parts: Research and Education Application PowerTools; Tutorials (with 3 tutorials – Maple Essential, Intro to Maple for Physics Students and Maple Programming); and 12 application areas (Mathematics, Education, Science, Engineering, Computer Science, Statistics&Data Analysis, Finance, Communications, Education Power Tools, Research Power Tools, Graphics and Language Applications). Each of the 12 application areas contains a different number of sub areas with many free down-loadable worksheets in standardized form. All together there are over 1000 down-loadable MAPLE applications and classroom demos for free.

Research Application PowerTools contains 11 MAPLE packages, which were developed by experts in their fields to help MAPLE users in research of specific application areas. The *Education Application PowerTools* consist of Math, Science and MAPLE Education PowerTools. The *Math and Science Education PowerTools* contains 22 and 6 academic courses developed by university professors to help teachers and students use MAPLE in their mathematical classes. The MAPLE *Education PowerTools* contains 4 tutorials developed by MAPLE experts to help users to learn the MAPLE programming language.

The collected applications consist of solutions of problems in some specific fields, Maplet applications, classroom demonstrations, aesthetic graphics or animations, extensions of MAPLE's functionality, or a whole MAPLE package providing any of the above features.

When developing MAPLE worksheets for the Application Center, contributors have to prepare a document in a consistent format, which is described in the downloadable "Style Guide for Developing Application Center Worksheets", see `www.mapleapps.com/authors/styleguide.shtml`.

A.2.2 MAPLE Student Center

The MAPLE Student Center `www.maple4students.com` offers MAPLE worksheets to help students in courses such as mathematics, physics, computer science and engineering. Furthermore one can find MAPLE tutorials, cool MAPLE graphics, the best rated applications of MAPLE developed by students, and much more.

For example, the MAPLE *Essential Tutorial* gives a complete self-placed hands-on introduction to the basic commands needed to use MAPLE effectively.

The MAPLE Programming Tutorial provides an introduction to Maple's programming capabilities and shows how MAPLE programming concepts can enable students understand ideas from mathematics for solving problems in scientific computing. There is also the tutorial *Intro to* MAPLE *for Physics Students*, with the focus of using MAPLE in physics.

A.2.3 MATLAB Student Center

The MATLAB Student Center located at

`www.mathworks.com/products/education/student_cntr.shtml`

contains MATLAB learning tutorials, toolboxes for many specific areas of study - communications, financials, databases, differential equations, statistics, image processing etc. The important part of this page is Homework Helper, where we can find complete solutions for some mathematical problems as the physics of bungee jumping or baseball, Using toolboxes we can use also control system models, signal processing models or biomedical applications.

A.2.4 MATLAB Faculty Center

For more experienced users, at the webpage `www.mathworks.com/products/education/prof_cntr.shtml` we can get chapters from important books, courses and links to many other books, which are structured according to the topics: Aerospace engineering, Biomedical engineering, Chemical engineering, Computer science, Electrical engineering, Earth science, Economics and Finance, Mathematics, Mechanical Engineering, Natural Sciences.

A.2.5 MATLAB Central

The main knowledge sharing portal for solving problems in scientific computing using MATLAB is `www.mathworks.com/matlabcentral/`. It offers mainly source codes for download. These programs are arranged in categories and several subcategories.

There are the following categories: Aerospace; Games; Automotive; Biotech, Pharmaceutical, Medical; Image Processing; Chemistry and Physics; Mathematics; Communications; Optimization; Comparison Software for Books; Signal Processing; Controls and Systems Modeling; Statistics and Probability; Earth Sciences; Test and Measurements; Financial Modeling and Analysis; Utilities; Gallery and White Papers.

Each free down-loadable file from the above categories (or subcategories) is marked by a grade (5=best), by its title, the date, when it was submitted and the number of downloads. This provides a simple judgment of the quality. There is also a keyword search for the MATLAB Download Center, which looks up the file descriptions.

Moreover, MATLAB Central offers MATLAB Usenet newsgroup access to enhance the possibility of sharing knowledge.

A.3 Conclusions

For sure we have not been able to give you here a complete list of all available shared knowledge about MAPLE and MATLAB on the web. We will try to update this information on the webpage of the book `www.SolvingProblems.inf.ethz.ch`. Of course we appreciate to hear from you if you can help us in this effort.