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PREFACE

This book is written for students at bachelor and master programs and has four different purposes, which split the book into four parts:

1. To teach first or early year undergraduate engineering students basic knowledge in technical computations and programming using MATLAB. The first part starts from first principles and is therefore well suited both for readers with prior exposure to MATLAB but lacking a solid foundational knowledge of the capabilities of the system and readers not having any previous experience with MATLAB. The foundational knowledge gained from these interactive guided tours of the system will hopefully be sufficient for an effective utilization of MATLAB in the engineering profession, in education and in research.

2. To explain the foundations of more advanced use of MATLAB using the facilities added the last couple of years, such as extended data structures, object orientation and advanced graphics.

3. To give an introduction to the use of MATLAB in typical undergraduate courses in electrical engineering and mathematics, such as calculus, algebra, numerical analysis and statistics. This part also contains introductions and mini-manuals to the most used MATLAB toolboxes. Thus, some chapters require additional MATLAB toolboxes. The idea is to give a brief tutorial on each subject and show the possibilities for applying MATLAB to each application area. We have focused on basic concepts in the applications, without trying to explain all theory behind the examples.

4. The appendix is an extensive reference part to a selection of the most useful matlab functions. The tables summarize complete syntax organized according to theoretical relations, rather than the organization in the MATLAB system.

The book is a beginner's introduction to MATLAB rather than a complete reference to all the thousands of functions available in MATLAB. The goal is to teach a sufficient subset of

the functionality and give the reader practical experience on how to find more information.

The second part of the book contains advanced concepts of MATLAB, normally not required in any undergraduate course, but still important for larger projects and thesis work. Among the topics are how to optimize speed of computation, how to construct graphical user interfaces, general data structures and object orientation amongst other things.

The objective of this manuscript is to gradually teach you to use MATLAB. Each chapter starts with a brief description of the content and is followed by a list of MATLAB relevant functions, and some general aspects of the chapter.

A guided tour 1 (Preface)

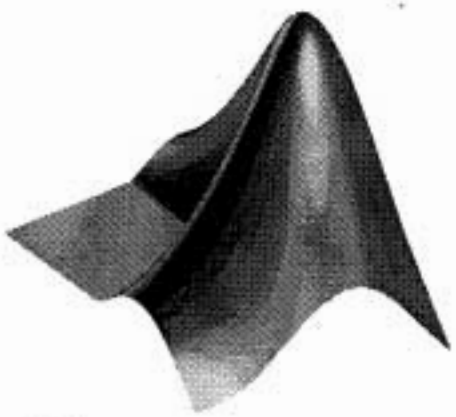
The core of each chapter consists of one or several guided tours. The idea is that the right column shows what you type in MATLAB and the left column what the purpose is. Consequently, these words explain what you see to the right. There are three different things that may appear to the right:

- files (contained in shadowed boxes),
- MATLAB window prompter and commands typed here (here the function `logo`),
- and all graphics that MATLAB produces from these, just as each plot appears when you copy the text into MATLAB.

File name: `preface.m`

```
% This is the content of
% the file preface.m
```

```
>> logo % This is typed in matlab
```



All chapters in the first part of this book are appended by a number of exercises, with solutions in Appendix A. Appendix B contains a reference listing of the presented MATLAB commands. Tables summarizing mathematical areas are found in Appendix C, while Appendix D provides mini-manuals to some common toolboxes. This bibliography contains a subset of English books with a similar scope as this one: an introduction for engineering students.

The most efficient way to learn to use the MATLAB system is to gradually work through each guided tour by copying the code and play around with the results. Curiosity is the mother of understanding, and you should therefore improvise and alter the input somewhat and try your own ideas of how to use the MATLAB system and its functions. Much complementary material and examples in the book are available to down-load from the book home page `http://www.control.isy.liu.se/books/matlab`, where also a self examination test is available, where you can compare your performance to other students!

Finally, we gratefully acknowledge all kind of valuable feedback, positive as negative, we have got from the 2326 students at Linköping University who have passed the course so far! We also thank all teachers involved in teaching the course, colleagues helping us with Latex, HTML and Perl programming, students and teachers from Lund Institute of Technology, Chalmers and the Royal Institute of Technology.