

Chapter 1

MATLAB Programming for Engineers

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Abstract

This chapter of the book presents an introduction to programming with MATLAB® by means of examples from nonlinear dynamics. Section 1 is a brief introduction to MATLAB. Section 2 considers chemical kinetics and autocatalytic reactions. Section 3 introduces the Duffing equation used to model a periodically forced pendulum. Section 4 concentrates on the famous Chua's electronic circuit and Section 5 provides an example from nonlinear optics. Note that the emphasis is on the modelling using MATLAB and there is very little mathematical theory in this chapter.

1.1 Introduction

One of the many ventures in the UK National Higher Education Science, Technology, Engineering and Mathematics (HE STEM) programme is the Supporting MATLAB Automated assessment to Reinforce Teaching (SMART) project. Some staff involved include the author (Manchester Metropolitan University and the Open University), Professor Alan Irving (Liverpool University) and Dr Adam Crawford (Loughborough University). Some of the aims include developing students programming skills, engaging students in contextualised real world problems and developing a broader STEM community where academics can share expertise. Some of the objectives include developing an automated assessment system to give individual feedback to large cohorts of students in a short space of time, to disseminate findings through the Institute for Maths and its Applications (IMA) and Royal Academy of Engineers as HE STEM partners and to encourage input and feedback from international colleagues by means of an open educational resource channel. It is hoped that these resources will be freely available within the next few years.

It is assumed that the reader is familiar with either the Windows or *UNIX* platform. This chapter was prepared using MATLAB (R2010b) but most programs should work under earlier and later versions of the package.

A tutorial introduction to MATLAB can be downloaded from the MathWorks Central File Exchange. The commands and programs listed have been chosen to allow the reader to become

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