
Preface

As a researcher and instructor in control engineering and owner of scilab.ninja website, I have been using Scilab in my classes as well as research projects since its beginning era. While a Ph.D student at UMASS Amherst, I recalled reading Prof. Alex Megretski 's website at MIT, who introduced it as an alternative to proprietary software. During that period of time this open-source software was not so user-friendly. With not much community around I had to learn most things from scratch. Nowadays, Scilab matures dramatically, thanks to the creators, and contribution from developers, and users around the world, so that we do not have to rely only on expensive products. This path is more challenging, of course, especially at first. But once you understand the basics, further learning flows naturally.

In this digital era, the learning process could not be complete without implementing our design on some microcontroller platform. For a serious engineering application I prefer to design my own hardware, but that approach is rather too complex for a book supplement, especially for a beginner. Since Arduino products are popular low-cost, open-source prototyping platform used around the world, I choose to implement control algorithms in this book on an Arduino UNO board, which can be acquired easily for most people.

So, the purpose of this e-book is to guide the audience from basic usage of Scilab and its simulation engine Xcos, to prototyping on Arduino hardware. Since my research interests are in control systems area, the focus is on control analysis, design, simulation, and then implementation on a target board. Some materials are already scattered around my website scilab.ninja, while others, such as most topics on Arduino, are entirely new. To be readable as a book, all contents have to be wrapped to a cohesive story that can serve as classroom supplement. I actually use this book to accompany my teaching at Kasetsart university.

At the time of this writing, there is some Arduino toolbox for Xcos available, with limited applications such as data acquisition or simple hardware-in-the-loop. The toolbox does not help, for example, in case you want to implement a PID controller on the board. So in this book we choose to learn it the hard way to understand the underlying mechanisms that make things work. Throughout the book, the sketch is built up from basic to advanced. Eventually, the reader will have a workable structure of Arduino firmware to develop a controller for his/her application.

Feedback is essential. Kindly email your comments and suggestions, or participate in the scilab.ninja facebook page. The webpage for this book is at <http://fcsabook.dew.ninja>, where you can find extra stuff such as files used in the book, useful online articles and links, and additional exercises.

*Varodom Toochinda
September 2016*