Preface

This book gives an introduction to PID control of dynamic systems. The PID controller (PID = Proportional Integral Derivative) is the dominating (most frequently used) controller function in industry. This book can be used as a text-book in control courses in B.Sc. studies and in M.Sc. studies. It may also serve as a reference for engineers working in the industry.

The book describes the theory, but does not (except in a few cases) describe computer tools for analysis and design. However, lots of supplementary material are available from the homepage of the book on **http://techteach.no**. This material is in the form of documents which describes how analysis, simulation, and design of dynamic systems can be performed in MATLAB, Octave[1], SIMULINK, and LabVIEW. From this homepage there is also a link to KYBSIM (http://techteach.no/kybsim) which is a library of freely available simulators. Many of these simulators are used in this text book.

To benefit from all parts of the book, you must be familiar with systems theory of continuous-time dynamic systems – specifically basic mathematical modeling, differential equations, transfer functions, block diagrams, first and second order systems and frequency response.[2]

The theoretical tools for analysis and design described in this book is for continuous-time feedback control systems. The theoretical tools for analysis and design of discrete-time (sampled) feedback systems are quite similar to tools for continuous-time systems, and they are described in documents available for free on http://techteach.no.

[1] Octave is a free mathematical tool, quite similar to MATLAB, with lots of in-built function categories, like the toolboxes in MATLAB. Octave is available from http://www.octave.org.

[2] These topics are included in the textbook **Dynamic systems – modelling, analysis and simulation** by F. Haugen, Tapir Academic Publisher, 2004. (Information on http://techteach.no.)

A textbook covering advanced control topics building on the present book will be available during 2004. (Information is given on http://techteach.no.)

The book focuses on topics which I have found practically important. I have tried to describe the material in a simple and understandable way. I will appreciate suggestions and comments about both the presentation in the book and the choice of topics (e-mail to finn@techteach.no).

A comment about mathematical notation used in the book: Given a function of time, say $f(t)$. Taking the Laplace transform of $f(t)$ yields, say $F(s)$. Different symbols are used since they are different functions. However, because it is very convenient to do it, I have chosen to use the same symbol for both the time function and the corresponding Laplace transform in this book. So I write $f(s)$ for the Laplace transform of $f(t)$. It is my experience that this style of notation does not cause problems or misunderstandings.

The book is written with the text formatting program Scientific Word. LabVIEW, MATLAB, and SIMULINK are used as computer-based tools for analysis and simulation. Most simulations are performed with LabVIEW.

An exercise book with solutions is available during 2004 (information will be given on http://techteach.no).

A few words about my background: I have a M.Sc. degree (1985) in Engineering cybernetics from the Norwegian Institute of Technology. I have been doing teaching, writing, programming, and consulting since then. I have now a teaching position at the Telemark University College. I also work in my one-man company TechTeach.

I want to thank my family for giving me good working conditions while writing this book.

FinnHaugen

Skien, Norway, August 2004