

NGMV Control Toolbox for Matlab: Installation and Release Notes

version 1.0 (2019-06-27) – original release

Introduction

This document contains basic information about the NGMV Control Toolbox for Matlab, which accompanies the book “Nonlinear Industrial Control Systems: Design and Applications”, to be published by Springer later this year. The NGMV Control Toolbox is a collection of Matlab files and Simulink model templates that can be used to design a family of optimal nonlinear controllers and filters that are fundamentally based on the minimum variance control principles, and which are described in detail in the book. Simulation files are provided for every example used in the book, so that the user can reproduce the results, explore the examples further, and use the models as a starting point for their own applications.

The software was produced using Matlab R2010bSP1 and then upgraded to R2015b, but it should run without major issues in later versions. Any compatibility problems, as well as general issues and bugs, can be reported to Pawel Majecki (pawel@isc-ltd.com).

Software Structure

The software is delivered in a single zip file, which unpacks into the following folder structure:

- **ngmv_toolbox_june_2019** (main toolbox routines)
 - **auxiliary** (library of auxiliary routines)
 - **examples** (basic toolbox demos)
 - **help** (online help accessible in Matlab Help Browser)
 - **rscon** (additional restricted-structure control routines)
 - **simulink** (Simulink model templates)
- **Book_Examples** (contains all examples used in the book)
 - **chapter 01**
 - ...
 - **chapter 15**
- **ngmv_control_software_readme.pdf** (this document)

The toolbox can be used as a stand-alone, but it is needed to run the book examples. Since relative paths are used during initialization of examples, the above folder structure should be maintained.

Installation

To install the toolbox it is sufficient to include it in the Matlab path – simply right-click on the `ngmv_toolbox_june_2019` folder in Matlab Current Folder window and select Add to Path -> Selected Folders and Subfolders. The online documentation should become available under Supplemental Software in Matlab Help Browser – take a look at it to get started. The NGMV Control blockset should also appear in the Simulink Library Browser.

Software Requirements

Apart from the basic Matlab and Simulink modules, the NGMV Control Toolbox makes extensive use of the Control Systems Toolbox. In addition, a large part of the polynomial systems routines and examples (particularly involving multivariable systems) require the Polynomial Toolbox for Matlab that can be obtained from www.polyx.com.

Example 15.4 that involves dynamic ship positioning uses Marine Systems Simulator that can be obtained from www.marinecontrol.org.

Book Examples

In each of the example folders there is a script `main.m` that can be run to produce the results and figures presented in the book (usually there is a list of options to choose from). Note that it is not necessary to initialize the toolbox first as this is done automatically at the start of `main.m`. In most cases a plotting script `book_plots.m` was provided that can be used to produce the exact book figures from the raw simulation data.

***Disclaimer:** The Toolbox has evolved from many years of implementing and testing the control algorithms described in the book. While all reasonable effort was made to ensure the Toolbox is functional, and to make the examples as useful as possible for the user, it needs to be emphasized that it is not commercial software and there will surely be errors and bugs remaining. We apologize in advance for those, and at the same time invite all users to feed back any problems or questions, which will be greatly appreciated and valuable when working on Toolbox future releases.*