

Tutorial: Control-System Design with the CRONE toolbox

Organizer:

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Abstract: This tutorial is intended to Researchers, Ph.D. and Master students, Engineers, who wish to utilize a user-friendly CRONE toolbox under Matlab for the design of robust control-systems.

Tutorial identification code:

Abstract of the tutorial and general schedule:

Fractional (or non-integer) differentiation has played an important role in various fields notably in signal and image processing and control theory.

In control theory, fractional order differentiation provides very high powerful degrees of freedom which simplify the design of high performance feedback controllers.

very powerful degrees of freedom that simplify the design of high-performance feedback controllers. The CRONE Control System Design (CSD) methodology proposes to design robust controllers using real or complex fractional order operators. A toolbox fully compatible with the latest versions of Matlab® has been developed based on this methodology and is available free of charge to the international scientific and industrial communities. For systems with uncertain/perturbed models, with 3 generations of the CRONE CSD methodology, this toolbox allows the design in the frequency domain of continuous-time or discrete-time SISO controllers but also of decentralized MIMO controllers.

This tutorial prepares the audience with:

1. defining the uncertain model of plants and their control requirements
2. the choice of CRONE CSD methodology generation to use
3. robust controller design
4. CRONE controller evaluation with Simulink toolbox

Description of the intended audience and the expected learning outcomes:

Graduate students, postdocs, engineers, and faculty members dealing with modeling of complex systems, health monitoring, system identification, prediction and predictive maintenance tasks.

Program (one full day):

Tuesday 9th July 2019

09h00-12h00 **Principles of the CRONE CSD methodology**
14h00-17h00 **CRONE toolbox: presentation & practical work**



Expected learning outcomes:

1. Basic knowledge of fractional order control systems
2. Know-how on designing robust CRONE controllers

Desired prerequisite knowledge of the audience:

1. Basic knowledge of signals and systems, automatic control, Laplace transform
2. Basic knowledge about PID controller design
3. Basic knowledge of MATLAB and Simulink

Brief biography:

Patrick Lanusse was born in Bordeaux, France, on January 12, 1966. Since 1990 he has been with the CRONE team of the IMS laboratory where he has been working on Robust Control-System Design, Fractional Order Controllers and more particularly on CRONE Control. He received its PhD in 1994 by proposing to use the complex order fractional operator to design robust control-systems. Since 1995 he has been Associate-Professor of Control Engineering at the Bordeaux Institute of Technology. Focused on CRONE control and industrial applications, his research is mainly to increase performance without decreasing robustness. He developed the control-system design CRONE Toolbox for Matlab which can be downloaded freely since 2010. Complementary to feedback control, he is currently working on robust anticipative control for preview systems. Patrick Lanusse is member of the IFAC Technical Committee 2.1: Control Design.

