

B.ENG. MERLIN BARSCHKE

DEVELOPMENT OF A CONTROLLER DESIGN UNIT FOR MEWAS

MOTIVATION

To enable the software tool MEWAS [Mechatronic Development Tool for the Design of Spacecrafts] to support domain specific tools such as SIMULINK® in the simulation of dynamic processes, a controller design unit is required. In this work such a controller design unit which supports the MEWAS user in the controller design process was developed.

MODE OF OPERATION

Provided with simulation models or hardware-in-the-loop test series of the system to be controlled, the control unit design tool will lead the user through an automated but user monitored feedback controller design process. This design process starts with the **parameter identification** of the system using the least squares method (Figure 1). The **structure identification** will then analyse a step response to identify required process parameters and suggest a suitable tuning method.

Implemented **controller tuning methods** are:

- CHIEN, HRONES and RESWICK tuning method
- ZIEGLER & NICHOLS reaction curve method
- ZIEGLER & NICHOLS ultimate sensitive method
- Tuning of a dead-beat controller

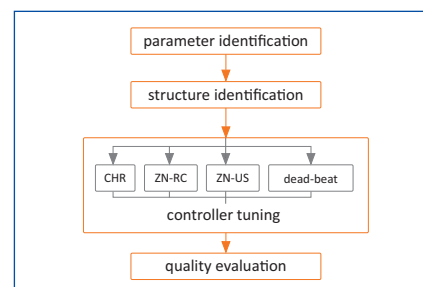


Figure 1: Workflow of the controller design tool

Software-in-the-loop- and/or hardware-in-the-loop-simulation tests of the closed loop system are used to evaluate the command response performance as well as the disturbance response controller performance in the **quality evaluation** module.

RESULTS

Due to the layout of the controller design unit it can be used as an integrated part of MEWAS but also as a standalone controller design tool.

All results of the different calculations and simulations are summed in well defined result structures. These structures are created in such a manner that the unit can also be run from external software tools using MATLAB® and SIMULINK® as background engines.

Various experiments have been performed to demonstrate the capabilities as well as to analyse the limitations of the developed controller design tool.



KONTAKT

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