

Tutorial proposal for 8th Modelica Conference 2011

Title

“Dynamic Optimization of Modelica Models with JModelica.org and Optimica”

Organizer

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Duration

JModelica.org tutorials have been given in four different versions ranging from 3h to 16h. A 3h tutorial would provide the participants with an overview of the platform as well as hands-on experience from solving optimization problems using JModelica.org.

Goal

To give an overview of how Modelica models can be used to solve engineering optimization problem using the open source platform JModelica.org (www.jmodelica.org).

Abstract

Model-based simulation, optimization, and verification are essential tools in many industrial branches today. Optimization is increasingly used as a standard tool to improve operation, both in on-line and off-line applications. Examples in manufacturing industry are calculation of operating points and transition plans that maximize production while minimizing utilization of raw material, energy, and other resources.

A wealth of numerical optimization methods is available, both commercially and as open source. Commonly, such algorithms are written in C or Fortran and require substantial effort in terms of model encoding and/or interfacing of modeling and simulation software. Also, commercial are often restricted to proprietary modeling format and particular algorithms.

The Modelica-based open source project JModelica.org (www.jmodelica.org) targets dynamic optimization of Modelica (www.modelica.org) models. To meet this end, a language extension of Modelica, Optimica, has been defined. Optimica enables the user to encode dynamic optimization problems in a high-level description format on par with that of Modelica. The JModelica platform.org is intended to provide a flexible and extensible Modelica environment, with the ambition of bridging the gap between the details of numerical algorithms and the engineering need for high-level description formats. JModelica.org also features a convenient scripting environment built on Python.

The tutorial will give an introduction to the JModelica.org platform and provide hands on examples of how to use JModelica.org, Modelica and Optimica to solve optimal control problems and parameter estimation problems.

Topics

- Introduction to Modelica
- A brief introduction to direct collocation algorithms for solving dynamic optimization problems

- Overview of the Optimica extension
- Introduction to scripting and visualization with Python
- Solving optimal control problems
- Solving parameter estimation problems