

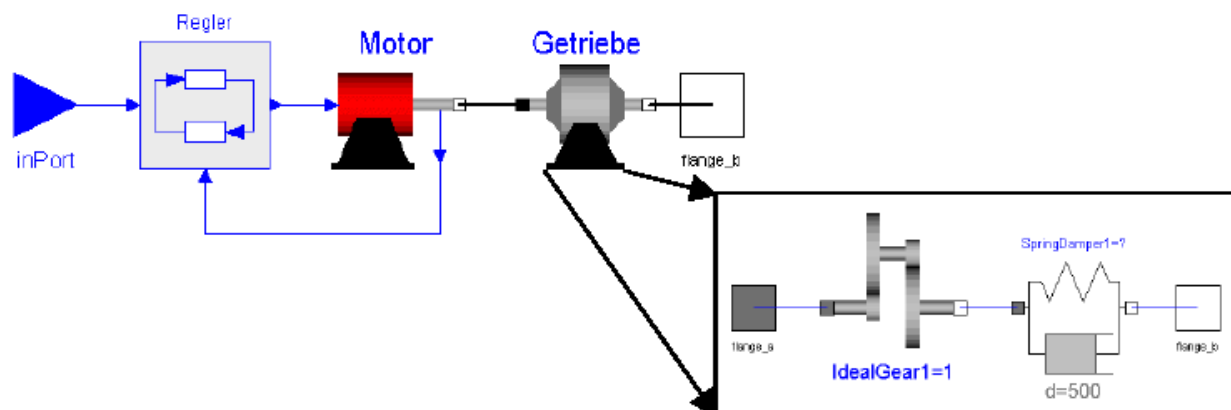


Modeling of multi-physics systems with Modelica™

The Modelica modeling language has been designed to allow convenient and efficient modeling and simulation of complex, multi-domain physical systems described by differential, algebraic and discrete equations, aiming at full system simulation. Since January 2002, version 2.0 of the Modelica language definition is available together with many free Modelica libraries, as well as commercial Modelica simulation environments. Convenient interfaces exist for Matlab and Simulink (with Dymola) and to Mathematica (with MathModelica). The language, libraries and tools are used by a growing number of people in industry and academia for advanced applications, such as detailed fuel cell simulations, power systems, full vehicle dynamics models, hardware-in-the-loop simulations, embedded control systems with nonlinear Modelica models.

Modeling complex multi-physics systems with Modelica is done by the following key-steps:

- The system is transformed to an component-diagram (see picture)
- The connections between components correspond to the actual physical interrelations.
- Each component is locally described using differential and algebraic equations and its interaction to extern objects.
- Special treatment is necessary in case of components that change the structure of the system or are non-continuous (i.e. discrete controller, friction).



The tutorial will give an introduction into the basics of Modelica with detailed discussions on the above mentioned working procedure. Exercises can be carried out on your own notebook; needed software is provided. During the exercises simple models will be generated from scratch. Furthermore, complex systems will be modeled and simulated by using components available in the Modelica-Standard library. For the practical exercises the participants can work in groups.

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Short Biography:

Prof. Dr. Bernhard Bachmann received his Ph.D. in Mathematics from the University of Zürich, Switzerland in 1994. After working several years in industry, he has been appointed in 1999 Professor of mathematics at the University of Applied Sciences in Bielefeld. His research areas are numerical analysis, scientific computation, object-oriented modeling and power systems simulation. Dr. Bachmann is a member of the Modelica Association.

