Introduction to MBSim

The presentation gives an overview of the simulation tool MBSim (http://mbsim.berlios.de) which is freely licenced under the GNU Lesser General Public License. Exemplary the capabilities and application areas are demonstrated for motivating the use of the program.

The Institute of Applied Mechanics is doing research in the area of multibody simulation and power train engineering for years. With [1] the first version of MBSim for rigid bodies has been developed. The dissertation [2] extends the existing program with flexible bodies. The incorporation of hydraulic components and the validation with industrial applications [3], as well as a module for linear and nonlinear signal processing, electronics and power train simulation result in a domain independent tool. Co-simulation and parallelisation show that MBSim is a unique and efficient basis for the analysis of dynamical questions.

Point of departure of the presentation is the formulation of the mathematical equations of oscillatory dynamical systems with uni- and bilateral frictional constraints and impacts. The algorithmic treatment with event-detecting and timestepping integration is the basis for an efficient solution strategy. Advantages and disadvantages of modelling and integrator selection are discussed with respect to efficiency and robust behaviour.

The components and the connections in-between are modules in C++. The object-oriented architecture and the corresponding modelling possibilities with XML-input schemes as well as the external visualisation tool OpenMBV (http://openmbv.berlios.de) show a modular architecture for universal usage.

The simulation program and the computable results allow the detailed analysis of complex dynamical systems. Examples of academic and industrial research show, that the representation of contact forces and efficiency are essential for various load cases and the reduction of expensive experiments. This is most important for the economic optimisation of actual dynamical systems.

References

