Evaluation and Adaptation of Techniques for Higher Index DAE with Respect to Real-Time Simulation

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In this paper we will evaluate approaches to the simulation of DAE of higher order under real-time conditions. Some of these approaches are new variants of well-known methods. For the purpose of evaluation we used, for example, explicit multistep methods with and without subsequent inexact projection, and BDF approaches under real-time termination conditions.

The Hardware in the loop (HIL) Simulation requires plant models which can be simulated under hard real-time conditions. Thus the combination of DAE and real-time simulation is very interesting for model-based generation of plant models because the so-called hybrid differential algebraic equations (HDAE) are the mathematical foundation of modeling languages such as Modelica and Simscape.

So beyond the numerical properties of a technique we will watch out wherever they are suitable for model-based code generation.