Comparison of Hybrid Modelling Approaches: ARGESIM-Comparison BCP - Bouncing Ball, Circuit with Diodes, Rotating Pendulum

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Modelling and simulation of hybrid systems is getting more and more important in advanced modelling theory and application. Therefore, the requirements regarding flexibility on modern simulators are getting higher and higher. The necessity of fast and stable algorithms is increasing considering more complex systems of interest. In the last ten years, physical modelling started to support simulation experts in building their complex structures. Thereby the needs for simulators are going up a second time. To see how modelling and simulation environments deal with state events of different order, three classical examples are discussed. These parts offer a spectrum of questions for testing basic features and they represent minimum requirements to hybrid simulators regarding state events.

At first, the bouncing ball with some extensions is discussed. The following section deals with an electrical circuit - it can be used to compare the simulation results of different implementation techniques (e.g. physical modelling vs. classical DAE form) in one simulator. The third example is a definition of a pendulum on a rope with free flight phase, representing a simple system with changes in the state space dimension depending on the state variables. The main focus lies on different implementation techniques and the comparison of solution quality, calculation time and/or usability of the implementation strategy.