Ch. Weidemann, L. Mauer, M. Arnold

Abstract. The calculation effort for numerical integration of the equations of motion depends mainly on the degree of complexity of the multibody system model. This paper looks at the effects of different modelling approaches on the simulation effort required. Considering railway vehicles the critical modelling components are the wheel-rail contact and some other strongly non-linear components like bumpers and Coulomb friction elements.

It is shown that, by choosing an appropriate integration method and reasonable assumptions for the modelling of the wheel-rail contact and other non-linear force elements, it is possible to reduce the calculation effort by the factor 50 and more. On the other hand, in certain situations this can lead to a severe reduction in the accuracy of the results. The paper analyses some critical situations, considering the requirements of several typical simulation scenarios such as curving forces or derailment analysis. It points out the potential and the limitations of different integration methods in regard to reducing the calculation effort whilst preserving a reasonable result quality. Particular attention is paid to the quality of the results in comparison to the calculation effort.

Contact: `christoph.weidemann@simpack.de, martin.arnold@mathematik.uni-halle.de`