Integrating Highly-Oscillatory Mechanical Systems with Solution-Dependent Frequencies

Daniel Weiß (Mathematisches Institut, Universität Tübingen)

This talk is about the application of several integrators to highly-oscillatory mechanical systems with solution-dependent frequencies. As an example we use the stiff spring double pendulum: two mass points are attached serially by stiff springs to one another. The numerical behaviour of several integrators such as Flavor, the impulse method, the mollified impulse method, and a integrator based on the framework of Heterogeneous Multiscale Methods is studied. It is explained that a correct approximation of the actual motion relies on an almost-invariance property of the actions in the system. Whereas consistent initializations lying on the manifold given by the effective system are sometimes treated properly, one has to take into account the actions in case of inconsistent initial values.