Universität Stuttgart

Institut für Nichtlineare Mechanik

Masterarbeit

Time Finite Element Methods for Mechanical Systems in Minimal Coordinates

Since the introduction of finite element procedures in the early 1960s and thanks to ongoing research in this field together with the increase of computational power over the years, these methods became indispensable for engineering development. The finite element procedures are employed extensively in the analysis of solids and structures, of heat transfer, and partially even in fluid mechanics. The algorithms used for the nonlinear finite element analysis of solids and structures are known to be very performing in terms of accuracy and robustness. These properties follow from the fact that the finite element description is derived from a variational formulation in the space dimension, e.g. the weak variational form of the principle of virtual work.

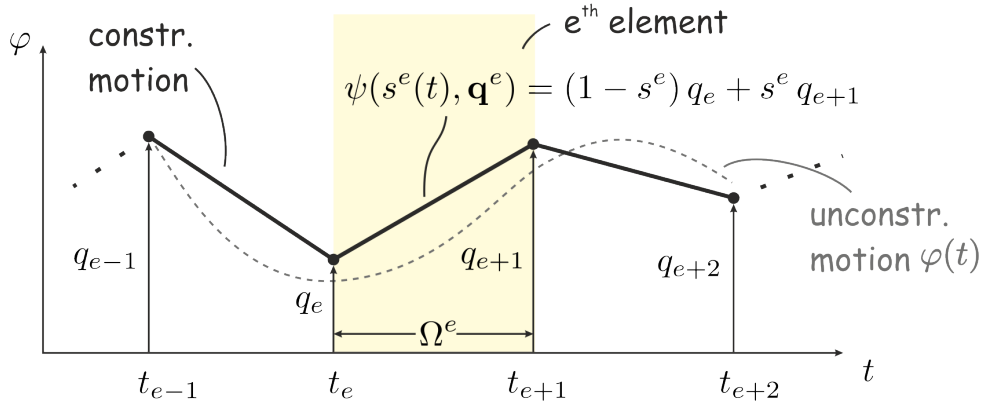

Abbildung 1: Time discretization with linear shape functions.

In this thesis time finite element methods for multibody systems described with minimal coordinates have to be developed. Mechanical principles as e.g. the principle of virtual action and multi-field formulations have to be discussed in the infinite dimensional and in the discretized, finite dimensional, case. The finite element methods are derived by the discretization of an appropriate variational formulation of the dynamics merely by the choice of shape functions.

Themengebiete:	Analytical Dynamics, Variational Integrators, Finite Element Methods
Betreuer:	Simon Eugster, eugster@inm.uni-stuttgart.de
Verantwortlicher Professor:	Prof. Dr. R. I. Leine
Vorkenntnisse:	Dynamik mechanischer Systeme, Technische Mechanik, FEM, Matlab