

Optimal Control of Dynamic Contact and Application to Knee Joint Prostheses

G. A. Müller¹ and A. Schiela²

Abstract: This talk will focus on optimization problems where the constraints involve dynamic contact problems, specifically in application to the design of knee joint replacements. The materials are modelled as linearly visco-elastic, since the involved materials in knee joint prostheses are bone, metals and polyethylene, which deform only slightly in the present load cases. The non-penetration constraint for multiple bodies is treated in a linearized form as well, but the problem remains inherently nonlinear and nonsmooth.

We address basic penalization of the contact constraint and derivation of adjoint equations as well as (adjoint-) time integration schemes as a possible basis for future application of bundle-method based optimization algorithms.

^{1,2} Chair of Applied Mathematics
Department of Mathematics, University of Bayreuth
Universitätsstraße 30, 95447 Bayreuth, Germany
georg.mueller@uni-bayreuth.de, anton.schiela@uni-bayreuth.de