STRESS - DISPLACEMENT FORMULATIONS FOR HYPERELASTIC MATERIALS: LEAST-SQUARES FINITE ELEMENT METHOD AND GAUSS-NEWTON ITERATION

Benjamin Müller
Leibniz Universität Hannover, Hannover, Germany
e-mail: benjamin1985.mueller@t-online.de

Joint work with Gerhard Starke

Abstract

Elastic deformation processes with hyperelastic material laws play an important role in solid mechanics. The main objective is to compute the displacement and the stresses, that occur in a given body due to external forces. In this talk we present a least squares finite element method to solve such problems, which are in general nonlinear. Thereby our solution method is based on Gauss - Newton iterations.

At the end of the talk we will demonstrate our solution method for a special material law on some numerical examples. Here we use quadratic Raviart - Thomas elements for the first Piola - Kirchhoff stress tensor $\mathbf{P}$ and continuous quadratic elements for the displacement $\mathbf{u}$. In our numerical simulations adaptive refinement strategies are used.