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Titel des Beitrags:
A high order fictitious domain method for patient specific surgery planning

Abstract:
Fast and reliable methods for predicting and monitoring in-vivo bone strength are of major importance in clinical applications such as fracture fixation or endoprostheses for joint replacement. Furthermore, the development of implants calls for highly efficient and robust analysis tools which allow during a design loop to match the mechanical properties of implants with those of the individual bone in order to avoid adaptive remodelling with cortical thinning and increased porosity of the bone. The main objective of this paper is to describe a prototype of such an analysis tool. The newly developed Finite Cell Method, which is a high order fictitious domain technique, is extended to be able to automatically derive and analyse a numerical model based on quantitative computed tomography angiography (QCT) scans. The method is validated on experimental data. It is shown that it provides reliable results and sufficient accuracy, delivers inherent error control and has significant advantages over traditional approaches, especially concerning the engineering effort to set up or modify a computational model.

Stichworte:
Finite Cell Method, computational biomechanics, high order finite elements, p-FEM, fictitious domain method

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