Einladung zum Vortrag

Computational Simulation of Bone Remodeling using Topology Optimization

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Internal bone architecture, with its unique complex material matrix, has long been studied to determine the underlying principles of its adaptation and “remodeling”. Wolff proposed that trabecular bone in the proximal femur functionally adapts to external mechanical loading stimuli, orientating to align with the principal stress trajectories. The “self-optimizing” property of bone was observed, and it was theorized that bone achieves maximum mechanical efficiency with minimal mass: a naturally optimum structure. Recently, computational techniques have been developed that utilize the finite element (FE) method to simulate this “bone remodeling” process.

This seminar will present the first micro-level three-dimensional FE bone remodeling simulation of the proximal femur using the design space topology optimization to address Wolff’s hypothesis of self optimization using proven mathematical theory. In this work, all loading and geometric simplifications used in previous studies are addressed by utilizing accurate three-dimensional loads and an accurate femur model based on clinical and CT scan data. The numerical results are compared to natural bone qualitatively and quantitatively via cross-sectional imagery and simulated radiographs. Key limitations and future areas of improvement will be identified and discussed.

Dienstag, 19. Oktober 2010
11:00 Uhr **MW 0250**

Für weitere Informationen: http://www.lnm.mw.tum.de/events
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