Modeling the mechanics of nonlinear biological tissue with finite element and domain decomposition methods

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In this talk the focus will be on the structural model for the nonlinear elastic behavior of biological tissues, in particular arterial walls. Arteries are treated as an anisotropic material consisting of several layers. I present the governing equations of an arterial wall model and outline the main steps to the finite element model.

Matters of existence and uniqueness of a solution are discussed as well as difficulties in the numerical simulation.

A way to treat the very complex algorithms resulting from the nonlinear models is the strategy of parallel computing. One possibility to achieve such a parallelization is to apply domain decomposition methods, which are also motivated by the composition in layers of most biological tissues. I outline the main ideas of one particular approach, the finite element tearing and interconnecting (FETI) method and its application to the artery model.

Finally numerical examples are included.

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