International Journal of Biomedical Imaging
Volume 2007 (2007), Article ID 35830, 11 pages
doi:10.1155/2007/35830

Research Article

Model-Based Reconstructive Elasticity Imaging Using Ultrasound

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Received 28 September 2006; Revised 2 March 2007; Accepted 16 May 2007

Academic Editor: Tie Zhou

Abstract

Elasticity imaging is a reconstructive imaging technique where tissue motion in response to mechanical excitation is measured using modern imaging systems, and the estimated displacements are then used to reconstruct the spatial distribution of Young's modulus. Here we present an ultrasound elasticity imaging method that utilizes the model-based technique for Young's modulus reconstruction. Based on the geometry of the imaged object, only one axial component of the strain tensor is used. The numerical implementation of the method is highly efficient because the reconstruction is based on an analytic solution of the forward elastic problem. The model-based approach is illustrated using two potential clinical applications: differentiation of liver hemangioma and staging of deep venous thrombosis. Overall, these studies demonstrate that model-based reconstructive elasticity imaging can be used in applications where the geometry of the object and the surrounding tissue is somewhat known and certain assumptions about the pathology can be made.