---ROBOTS: A Lecture Series---

Lets Talk About Material Properties

Characterizing the Heterogeneous Material Properties of Solids Non-Destructively

Who: Dr. Sevan Goenezen
What: Distinguished Speaker
When: Wednesday May 4th
Time: 12:00 pm to 1:00pm
Where: Engineering 2901

Abstract

Dr. Goenezen presents a novel approach to solve the inverse problem in finite elasticity for the non-homogeneous shear modulus distribution solely from known surface deformation fields. The inverse problem is posed as a constrained optimization problem under regularization and solved utilizing the adjoint equations. Hypothetical "measured" surface displacement fields are created, by inducing indentations on the exterior of the specimen. These surface displacement fields are used to test the inverse strategy on a problem domain consisting of a stiff circular inclusion in a softer homogeneous background. We observe that the shear modulus reconstruction as well as the shape of the circular inclusion improves with an increasing number of surface displacement fields. Furthermore, with increasing noise level in the surface displacement field, the contrast of the reconstructions decreases.

Biography

Dr. Sevan Goenezen received his BS/MS degree (called Diplom in Germany) in Aeronautical Engineering from the "Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH)" in Germany in December 2006. He started his Ph.D. program in spring 2007 at Rensselaer Polytechnic Institute (RPI) and graduated in May 2011. His Ph.D. work involved the development and implementation of efficient algorithms to solve inverse problems in finite elasticity. Its application to nonlinear elasticity imaging of breast tumors has shown great potential to diagnose breast cancer non-invasively. He became a finalist for the $30,000 Lemelson-MIT-RPI Prize with his findings on breast cancer diagnosis using nonlinear elasticity imaging. After his PhD, Sevan Goenezen became a postdoctoral researcher in the Biomedical Engineering Department at Oregon Health & Science University, where he studied congenital heart defects of the embryonic chicken heart and risk of rupture of abdominal aortic aneurysms using fluid-structure-interaction computations. He joined the Department of Mechanical Engineering at Texas A&M University as an Assistant Professor in September 2013. His research interests are in computational (bio-)mechanics, growth and remodeling of tissues, non-destructive material characterization, inverse problems, fluid-structure-interactions, and multi-scale modeling. During his time at Texas A&M University, he was awarded the ASME Research Initiation Grant for young faculty sponsored by the Haythornthwaite Foundation and the Southeastern Conference (SEC) Visiting Faculty Travel Grant.

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