MR Elastography by nonlinear inversion: a subdomain decomposition approach.

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Abstract:

Elastography is a characterization method for the elastic properties of soft tissue based on data obtained by medical imaging techniques, typically MRI or ultrasound. The outcome of the elastographic characterization process is a map describing the heterogeneous distribution of properties describing the viscoelastic, poroelastic, rheologic and/or anisotropic behavior within the tissue of interest. The last 20 years have seen elastography progress from a completely novel medical imaging modality towards a regular clinical imaging tool. MR Elastography (MRE) in particular has become a gold standard for the staging of liver fibrosis and has integrated itself into several clinical studies covering a variety of diseases and target organs. Despite having fairly well-established imaging objectives, MRE still has a number of different imaging methodologies that are in use for the reconstruction of elastographic images. These methods vary from direct methods, based on the estimation of the length of the mechanical wave to more sophisticated methods based on the equations of continuum mechanics. This colloquium will present a non-linear approach for the reconstruction of elastography images as well it's application in several cases such as: poroelastic versus viscoelastic imaging; imaging by intrinsic activation; multi-frequency imaging; and imaging in the case of mechanical anisotropy.