

Title: Ultrasound tomography: inverse problem and regularization

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Abstract:

Ultrasound tomography is a promising modality for cancer screening. The speed of sound propagation and its attenuation could help detect cancer and differentiate benign from cancer masses. Unlike the x-rays, ultrasound is deviated by refraction and distorted by inhomogeneities in tissue. For a long time, the propagation of ultrasound and the non-linear inverse problem that had to be solved were difficult tasks. Today, with enhanced computing power and advances in transducers technologies, the future of ultrasound tomography is bright and the prospects are showing great promise.

The ultimate goal of this research is to improve the quality of ultrasound imaging in terms of its accuracy and image resolution aimed at creating an easy, safe, non-ionizing, reliable, operator independent and inexpensive method for breast cancer screening.

In this presentation I will examine the inverse problem behind the ultrasound tomography. The subjects related to the signal acquisition (time delay estimation) and image reconstruction (inversion) will be addressed in details. In addition it will be presented how one can improve upon the state of the art methods by using sophisticated signal processing tools, such as: beamforming, compressed sensing, and dictionary learning.