Image Reconstruction in Diffraction Tomography

Xiaochuan Pan
Department of Radiology
University of Chicago

Abstract

Diffraction tomography (DT) is an imaging modality that can be viewed as a generalization of X-ray computed tomography for use with diffracting wavefields. In DT, a probing wavefield such as an ultrasound or coherent x-ray wavefield, illuminates an object, and the scattered wavefield is measured. From the measured wavefield data, one seeks to reconstruct an image that depicts the spatial distribution of the object?s complex-valued refractive index. In this talk, the imaging models of DT will be described under different physical conditions. Based-upon the imaging models, examples of DT-image reconstruction will be discussed. In particular, the discussion will focus on how to develop (numerically) stable algorithms, how to exploit data redundancy for controlling image noise, and how to reconstruct images from reduced-scan data. It is not uncommon that only sparsely sampled DT data are available in practice. Therefore, it is of practical merit to investigate accurate image reconstruction from sparse DT data. This talk will also briefly cover some recent results on image reconstruction from highly sparse DT data.