Results in the Past

By Ge Wang (wangg@vt.edu)

**Spiral Cone-beam CT**

We published the first paper on spiral/helical cone-beam CT in a 1991 SPIE conference. The subsequent 1993 IEEE paper on spiral cone-beam CT has been the most cited in this area. We also made recent contributions to exact cone-beam reconstruction methods, partially in collaboration with Dr. Katsevich. The modern CT scanners use spiral cone-beam scanning and perform >100-million scans annually in the USA.

**Interior Tomography**

Conventional tomography allows exact reconstruction of an object from complete projections.

The long-standing interior problem is to reconstruct an interior ROI accurately only from local projection data. Interior tomography solves the interior problem with knowledge such as known sub-region or compressive sensing.

Interior tomography can handle large objects, reduce radiation dose, and improve temporal resolution, which is a new research direction. We have extended interior tomography to SPECT, MRI and other imaging modalities.

**SBES Advanced Multiscale (SAM) CT**

SAM-CT is an x-ray imaging facility for basic and applied research in diversified fields, including the only 500nm resolution micro-CT system on the East Coast and the only 50nm nano-CT system with the interior tomography capability in the world. These micro-/nano-CT scanners cost $3M and were made possible by funding from NIH, NSF, and SBES.

**Bioluminescence Tomography**

A mouse with an embedded bioluminescent source is imaged in a bioluminescent mode to capture external views, in a tomographic mode (CT or MR) to reconstruct an anatomical volume, and in an optical mode to estimate optical parameters. An imaging model is then built linking the bioluminescence measurement and the source distribution, and inverted for 3D analysis of the underlying molecular/cellular activities. This scheme can be simplified with various approximations.

http://imaging.sbes.vt.edu

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Bioluminescence Tomography