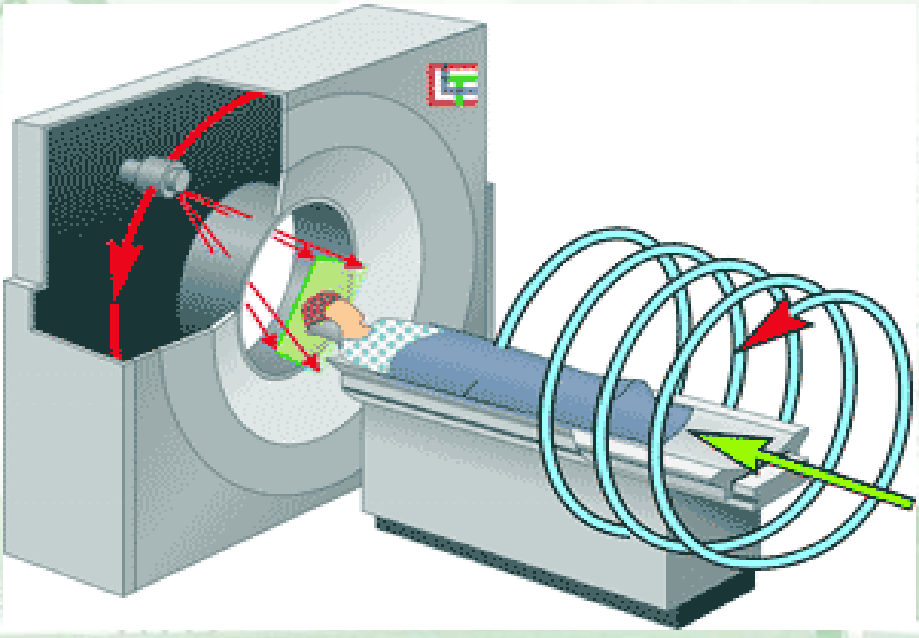
Spiral Cone-beam CT — Successes with Spiral Scans



X-ray computed tomography (CT) is instrumental in medicine, industry and homeland security, which depicts internal structures of an object from its shadows projected in a fan-beam or cone-beam from an x-ray source along a appropriate trajectory. ***We published the first paper on spiral cone-beam CT in 1991 to solve the long object problem****. Now, spiral cone-beam scanning has been widely used in modern CT scanners, in which cone-beam rotation and table translation are simultaneously performed, and spiral cone-beam CT remains a major area in CT research and development.*

Quotations from Distinguished Peers

To solve the long-object problem, a first level of improvement with respect to the 2D FBP algorithms was obtained by backprojecting the data in 3D, along the actual measurement rays. The prototype of this approach is the algorithm of Wang et al (1993).

Defrise, Noo, Kudo: A solution to the long-object problem in helical cone-beam tomography. Phys. Med. Biol. 45:623-643, 2000

Many advances in CB reconstruction have been made recently thanks to the quest for an attractive reconstruction method in helical CB tomography.

Pack, Noo, Clackdoyle: Cone-beam reconstruction using the backprojection of locally filtered projections. IEEE Trans. Medical Imaging 24:1-16, 2005

Papers by Our Team

Wang G, Lin TH, Cheng PC, Shinozaki DM, Kim HG: Scanning cone-beam reconstruction algorithms for x-ray microtomography. Proc. SPIE 1556, p. 99-112, July 1991 (Scanning Microscopy Instrumentation, Gordon S. Kino; Ed.) (First paper on spiral cone-beam CT, posed the long object problem, introduced the spiral/spiral-like cone-beam scanning mode, and developed approximate algorithms)

Wang G, Lin TH, Cheng PC, Shinozaki DM: A general cone-beam reconstruction algorithm. IEEE Trans. on Med. Imaging 12:486-496, 1993 (TMI version of the above paper, the mostly cited (>100 SCI citations) in the area of spiral cone-beam CT from 1991 until now)

Wang G, Ye Y, Yu HY: Approximate and exact cone-beam reconstruction with standard and non-standard spiral scanning. Phys. Bio. & Med. 52:R1-R13, 2007 (Overview of spiral cone-beam CT methods)

Wang G, Yu HY, DeMan B: An outlook on x-ray CT research and development. Med. Phys. 35:1051-1064, 2008 (Invited outlook of the CT field, defined 12 topics for CT R&D in the next decade; the Chinese version to appear in "Chinese Journal of Medical Instrumentation", translated by Tiange Zhuang and Jun Zhao, June 2008)