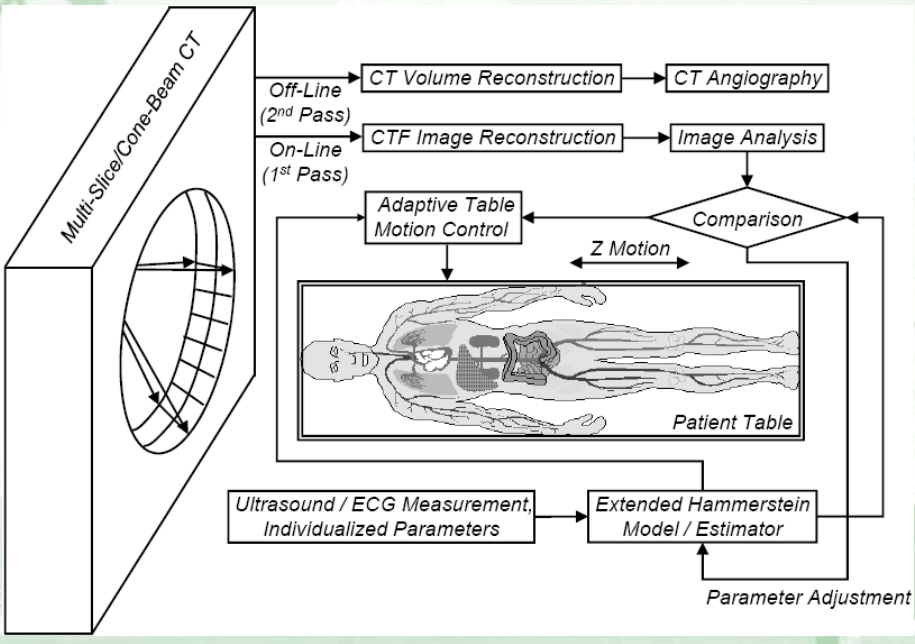
Bolus-chasing CT Angiography — Catch the Contrast via Control



Intravenous injection of contrast media is required to enhance conspicuity of the vasculature, organs and tumors in CT angiography (CTA) for diagnosis of cardiovascular structures, peripheral vessels and solid organs. The overall goal of this project is to develop bolus-chasing CTA for a wide class of diagnostic applications. This will be achieved by instantaneously reconstructing CT images, dynamically predicting bolus propagation, and adaptively varying scanning pitch from the aortic arch to the feet to allow real-time correction of any significant deviation from the prediction.

Papers by Our Team

Wang G, Vannier MW: Bolus-chasing angiography with adaptive real-time computed tomography. US Patent 6,535,821, 2003

Bai EW, Wang G, Vannier MW: System and method for adaptive bolus chasing computed tomography (CT) angiography. US patent publication 20060178836, Aug. 10, 2006

Ye Y, Wang G: A filtered backprojection formula for exact image reconstruction from cone-beam data along a general scanning curve. Med. Phys. 32:42-48, 2005

Lu DH, Bai EW, Liu J, Yu HY, Wei YC, Cai ZJ, Sharafuddin MJ, Golzarian J, Stolpen A, Saba O, Vannier MW, Wang G: Projection-based bolus detection for CT angiography. Journal of Computer Aided Tomography 30:846-849, 2006

Bai EW, Bennett JR, McCabe R, Sharafuddin MJ, Bai H, Halloran J, Vannier MW, Liu Y, Wang CL, Wang G: Study of an adaptive bolus chasing CT angiography. Journal of X-Ray Science and Technology 14: 27-38, 2006

Cai ZJ, Stolpen A, Sharafuddin MJ, McCabe R, Bai H, Potts T, Vannier M, Li DB, Bi XM, Bennett J, Golzarian J, Sun SL, Wang G, Bai EW: Bolus characteristics based on magnetic resonance angiography. Biomedical Engineering OnLine 5:53 doi:10.1186/1475-925X-5-53, 2006

Zhao J, Lu Y, Jin YN, Bai EW, Wang G: Feldkamp-type reconstruction algorithms for spiral cone-beam CT with variable pitch. To appear in Journal of X-ray Science and Technology 15:1-20, 2007

Cai Z, McCabe R, Wang G, Bai EW: Bolus chasing computed tomography angiography using local maximum tracking method. Internal Journal of Modeling, Identification and Control 2:305-312, 2007

Bai EW, Cai ZJ, McCabe R, Wang G: An adaptive optimal control design for bolus chasing computed tomography angiography. IEEE Transactions on Control Systems Technology 16(1):60-69, 2007

Bai H, Zeng K, Bai EW, Wang G: Adaptive manual control of the patient table for bolus-chasing CT angiography. To appear in Journal of X-ray Science and Technology, 2007

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

Cai ZJ, Wang G, Bai EW: Adaptive bolus chasing computed tomography angiography: Control scheme and experimental result. To appear in Biomedical Signal Processing and Control, 2008