

SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

DUAL ENERGY X-RAY CT IMAGE RECONSTRUCTION

PhD Preliminary Research Examination

Yaqi Chen
PhD Candidate

Preston M. Green Department of Electrical and Systems Engineering
Washington University in St. Louis

Abstract: This research is motivated by application in radiation oncology including dose prediction in proton therapy.

Dual energy X-Ray CT is a technique used for diagnostic imaging purposes which uses two different X-ray tubes with different energy levels. With the additional tube comes the advantage of exposing the patient with two different energy spectrums.

Ever since Lange and Carson's fundamental work in 1984, a lot of modifications of the EM algorithm for transmission tomography have emerged. We would like to address one of the novel methods called alternating minimization (AM) algorithm for transmission tomography, proposed by O'Sullivan and Benac in 2007. This AM algorithm can be easily extended to the dual energy X-ray CT image reconstruction problem.

Relative to filtered backprojection (FBP), the AM algorithm produces images with lower variance and higher contrast, and can produce equivalent images with lower dose. However, similar to other EM based algorithms, it has been observed that as iterations continue, the reconstructed image tends to become noisier. This motivates researchers to incorporate neighboring pixel interactions in the algorithm to explicitly trade off image smoothness and data fitting.

In this talk, I will explore the regularization behavior in the AM algorithm for dual energy X-ray CT imaging by using an edge-preserving potential function, which has also been used by several researchers. Simulated axial data based on Siemens Somatom plus 4 scanner geometry was used for image reconstruction. Real axial and helical data from Philips Brilliance scanner was also used for reconstruction.

DATE: Monday, February 11, 2013
TIME: 3:00 p.m.
PLACE: Green Hall, Room 0120

Thesis advisor:
Dr. Joseph O'Sullivan

This seminar is in partial fulfillment
of the Doctor of Philosophy degree