

# SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

## **Optimization of GPU-Accelerated Iterative CT Reconstruction Algorithm for Clinical Use**

MS Dissertation Defense

By

**Tao Ge**

MS Candidate

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

**Abstract:** In order to transition the GPU-accelerated CT reconstruction algorithm to a more clinical environment, a graphic user interface is implemented. Some optimization methods on the implementation are presented. We describe the alternating minimization algorithm as the updating algorithm, and the branchless distance driven method for the system forward operator. We introduce a version of Feldkamp-Davis-Kress algorithm to generate the initial image for our alternating minimization algorithm and compare it to a choice of a constant initial image. For the sake of better rate of convergence, we introduce the ordered subsets method, find the optimal number of ordered subsets, and discuss the possibility of using hybrid ordered subsets method. According to the runtime analysis, we implement a GPU-accelerated combination and accumulation process using Hillis-Steele Scan and shared memory. We then analyze some code-related problems, which indicate that our implementation of the AM algorithm may reach the limit of single precision after approximately 3,500 iterations. The Hotelling observer, as an estimation of the human observer, is introduced to assess the image quality of reconstructed images. The estimation of human observer may enable us to optimize algorithm parameters with respect to clinical use.

DATE: Monday, April 23, 2018

TIME: 3:00 p.m.

PLACE: Whitaker Hall, Room 218

**Research Advisor:**

Dr. Joseph A. O'Sullivan

This seminar is in partial fulfillment  
of the Masters Degree