SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

AUXILIARY SINOGRAM ALTERNATING MINIMIZATION (ASAM) FOR X-RAY CT WITH INCOMPLETE DATA

PhD Preliminary Research Examination

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Abstract: X-ray computed tomography (CT) reconstruction has evolved over 40 years for medical, security and industrial applications. Reconstructing X-ray CT images from incomplete measurement data is not an uncommon situation. One of the examples of incomplete data is the existence of metal objects in clinical X-ray CT scan. Due to the high linear attenuation coefficients of metals, we get low photon counts on the detectors and this photon starvation will result in streaking artifacts and noisy reconstructions. To deal with this problem, we developed a new algorithm, called Auxiliary Sinogram Alternating Minimization (ASAM), to reduce metal-artifacts in X-ray CT imaging. The ASAM introduces an auxiliary sinogram domain that synchronizes pre-processing methods and iterative algorithms, which both are effective in reducing metal-artifacts, into a dual domain optimization problem. The pre-processing operator is expressed as a constrained optimization problem and we can quantitatively control its performance. Compared with the traditional iterative algorithms, we do not introduce extra computations, such that we still maintain good speed performance. With different designs of constraints on the auxiliary sinogram domain and the image domain, the ASAM can involve different pre-processing methods and prior knowledge to reduce metal-artifacts, which is more flexible than traditional iterative algorithms. By phantom study and real patient study, we show our algorithm outperforms other metal-artifact reduction methods in image quality with relatively fast convergence.

DATE: Wednesday, August 9, 2017
TIME: 9:00 a.m.
PLACE: Green Hall, Room 0120

Dissertation advisor:
Dr. Joseph O'Sullivan

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

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