AbstractID: 2562 Title: New Development of Imaging Theory and Algorithms in Computed Tomography

New Development of Imaging Theory and Algorithms in Computed Tomography

Computed tomography (CT), one of the most widely used imaging modality in medicine and other areas, is currently in a period of renaissance largely due to the advent of the helical cone-beam data acquisition technology. This new development has opened up tremendous opportunities for the design and applications of CT imaging protocols in medicine and other areas that would otherwise be impossible. On the other hand, the cone-beam CT also poses numerous theoretical and numerical challenges on the algorithm development. One of such challenges is to the need of new theory for obtaining accurate images from helical cone-beam data to which the conventional CT theory is no longer applicable.

In this talk, following the introduction of the basic principle of CT imaging, the recent advances of CT technology and imaging theory/algorithms will be discussed. Emphasis will be placed on the description of the new concepts, theory, and algorithms that we have recently developed for image reconstruction from cone-beam data acquired with a wide variety of scanning configurations, including the helical scanning configuration. We also believe that one of the important trends in CT imaging is the so-called targeted imaging of a region of interest (ROI) within the subject from truncated data. Such a targeted imaging strategy would substantially reduce the radiation dose delivered to the subject, scanning effort, and/or data contamination from motion and other artifacts. Therefore, I will describe our approaches to and algorithms for exactly reconstructing ROI images from truncated or reduced data in cone-beam CT.