Computed Tomography and Fourier Analysis

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Call for Papers

X-ray CT (computed tomography) has been the leading technique for medical imaging and a most important research field for the past four decades. Fourier analysis is the theoretical foundation of computed tomography, including formulism, algorithms, and programs. Historically most people considered Radon formula as the starting point of CT theory and, recently some researchers treated Tuy formula as an alternative mother formula. These dialect formulas make CT an isolated research field and CT research is limited within a small group. In fact, Radon formula and Tuy formula are two representations of inverse Fourier transform in the spherical (or polar) coordinate system. Fourier analysis provides us a straightforward, complete and unified scheme for 2D and 3D, parallel beam and divergent beam computed tomography.

The aim of this Special Issue is to invite more mathematicians, physicists, engineers, and programmers with expertise in Fourier analysis to participate in CT research and advance this technology. Its focus is the relationship between computed tomography and Fourier analysis, such as the applications of Fourier analysis in CT, and the contribution of recent CT results to Fourier analysis. Both intuitive review papers from various viewpoints and original research papers of high quality are welcome. Potential topics include, but are not limited to:

- Fourier transform, Fourier series, discrete Fourier transform in CT
- Theoretical foundation, scheme, and central formula of CT
- 2D and 3D, parallel and divergent beam reconstruction and their relationships
- The influence of recent CT results on classical Fourier analysis
- Radon theory, Tuy-related framework, Orlov theorem, Gel'fand inversion formula
- Data consistent condition, identity, Fourier slice theorem, odd-even extension, etc.
- Generalized function, filtering theory, weight function, and motion of the frequency plane
- Compressive sensing, wavelets, common waveform analysis, advance in Fourier analysis
- Integral geometry, differential geometry, topology, number theory, group theory, etc.
- None X-ray CT, new ideas and methodology for medical imaging

Here are some examples of possible titles for intuitive review papers

Computed tomography based on X-rays and others
100 years of Radon Transform (1917-2017)
Integral geometry and computed tomography
Compressed sensing: a new idea and promising method
Generalizations of Fourier analysis: sine functions, common waveforms and wavelets

Lead Guest Editor Yuchuan Wei**,** ywei.ijbi@gmail.com
Guest Editors A. Katsevich, G. Zeng, V. Palamodov, Y. Boursier, H. Feichtinger

Manuscript Due	March 29, 2013
First Round of Reviews	June 21, 2013
Publication Date	August 16, 2013