

Speaker: Yiming Deng

Qualitative to Quantitative: Model-based Image Processing for Noninvasive Imaging Techniques

Abstract:

Noninvasive imaging techniques are used in both engineering and clinical fields to determine the state or internal conditions of structures and human body on the basis of information contained in measured images without the use of invasive approaches. Development of the sophisticated mathematical models and model-based image processing methods for noninvasive imaging techniques not only helps to understand the physics and biological processes better, but also enables development of efficient, low-cost and accurate instruments, sensors and algorithms for early detection and diagnosis of anomalies.

Recent qualitative and quantitative development of three noninvasive imaging applications, Magneto Optical (MO) Imaging, Giant Magneto Resistive (GMR) Imaging in Electromagnetic field and Positron Emission Tomography (PET) Imaging in Biomedical field are covered in this talk. For MO and GMR Imaging, the Element Free forward model in contrast to the conventional Finite Element Method as well as the fast image reconstruction and automated image enhancement and classification approaches are presented. On the biomedical side, PET imaging modality will be described and in particular the major challenge, degradation of PET images due to the patients' thoracic (including cardiac and respiratory) motion will be addressed. In contrast to the other approaches for correcting motion artifacts in the image space, an innovative image processing framework for motion correction in the raw projection space is introduced based on the forward Monte Carlo model. This talk clearly demonstrates the merits of model-based image processing approaches.

Biography:

Yiming Deng received his B.Sc. with honors in Electrical Engineering from Tsinghua University, Beijing in 2003. He is getting his Ph.D. degree in the Electrical and Computer Engineering Department of Michigan State University this May, 2009. His research interests include: Image Processing; Biomedical Imaging and Medical Physics, Applied Electromagnetics and Electromagnetic Imaging; Pattern Recognition; Mathematical Modeling/Analysis and Inverse Problems. Over the past five years, he has been doing highly interdisciplinary research and collaborated with faculty members and students not only from the Department of Electrical and Computer Engineering but also from Biomedical Engineering, Radiology in Medical School, Psychology and Statistics. He has also collaborated with numerous industries and government agencies, including GE Health Care, Air Force Research Laboratory, Federal Aviation Administration, Applied Physics at Boeing Company, etc.

He is the author of 15 peer-reviewed journals and more than 25 conference

proceedings/presentations and full member of Sigma Xi and IEEE. He is the co-recipient of the FAA “Better Way” Award awarded nationally in 2005 and the First Prize Winners of Chinese National Mathematics and Chemistry Olympics at the age of 18 and 15, respectively.