MS13: Inverse Problems and Imaging II

Illusory Shapes via Corner Fusion

Sung Ha Kang, *Georgia Institute of Technology*

We propose a method for constructing illusory shapes from convex corners. Corner bases are fused together by elastica energy to construct both foreground illusory shapes and background occluded shapes. Robust numerical schemes are developed, and several generic examples are presented.

A Fast Algorithm for Super-Resolution of Spectrally Sparse Signals

Jianfeng Cai, *University of Iowa*

We propose a fast algorithm to reconstruct a spectrally sparse signal from a small number of randomly observed time domain samples. Different from conventional compressed sensing where frequencies are discretized, we consider the super-resolution case where the frequencies can be any values in the normalized continuous frequency domain [0,1]. Our signal recovery problem can be converted into a low rank Hankel matrix completion problem, for which we propose an efficient feasible point algorithm named projected gradient algorithm(PGA). We give the convergence analysis of the algorithm. The algorithm can be further accelerated by the FISTA-like technique. Numerical experiments are provided to illustrate the effectiveness of our proposed algorithm.

Mathematical Modeling and Methods of Signal Separations

Yuanchang Sun, *Florida International University*

In this talk, the speaker shall consider three classes of signal separation problems depending on the available knowledge of the source signals (minimal, partial or full knowledge of a template of source signals). The problems are blind, partially blind and template assisted signal separation. Deterministic and statistic models and their numerical methods will be formulated . Numerical results on real world including NMR, DOAS, and Raman spectroscopy will be presented.

Numerical Methods for Hyperelastic Image Registration

Lars Ruthotto, *Emory University*

Image registration aims at finding geometrical correspondences between two or more images. Image registration is commonly phrased as a variational problem that is known to be ill-posed and thus regularization is of key importance.

This talk presents applications of and fast numerical methods for regularization functionals based on the theory of hyperelastic materials. These methods guarantee existence of solutions to the variational problem and ensure the invertibility of the computed transformation between the images.