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香港浸會大學
HONG KONG BAPTIST UNIVERSITY

Centre for Mathematical Imaging and Vision & Institute for Computational Mathematics

Workshop on Image Processing

18 November 2008 (Tuesday)

Programme:

10:00-11:00	Speaker	:	Dr. XiaoLong LI (Peking University) *Information Hiding - An Introduction*
11:15-12:00	Speaker	:	Dr. Tieyong ZENG (Hong Kong Baptist University) *On the Matching Pursuit Shrinkage Algorithm*
14:00-14:45	Speaker	:	Dr. XiaoLong LI (Peking University) *Increasing the Embedding Efficiency of Steganographic Scheme by Matrix Embedding*
14:45-15:30	Speaker	:	Prof. Michael NG (Hong Kong Baptist University) *Numerical Methods for Interactive Multiple Class Image Segmentation Problems*

Time: 10:00-15:30

Venue: FSC 1217, Fong Shu Chuen Library, Ho Sin Hang Campus, HKBU

Organizers:
Centre for Mathematical Imaging and Vision, Hong Kong Baptist University
Institute for Computational Mathematics, Hong Kong Baptist University

- ***All interested are welcome –***

For further information, please visit **http://www.math.hkbu.edu.hk/ICM/workshop/WIP08/**, or call 34115056.

Title : Information Hiding - An Introduction

Abstract : In the past decade, information hiding has emerged as an exciting and important research field. By the definition, it develops the technique of hiding a secret message under an innocuous looking cover data (e.g. digital images) to yield the watermarked/stego data. In this talk, the basic ideas and concepts of two major branches of information hiding are introduced: digital watermarking, steganography and seteganalysis. Some concrete examples are also presented in details.

Title : On the Matching Pursuit Shrinkage Algorithm

Abstract : This talk contains the study on a hybrid algorithm combining Matching Pursuit (MP) and wavelet shrinkage. In this algorithm, we propose to shrink the scalar product of the element that best correlates with the residue, before modifying the residue. The study concerns for a rather broad family of shrinkage functions. Using simple properties of these shrinkage functions, we show that the algorithm converges towards the orthogonal projection of the data on the linear space generated by the dictionary, modulo a precision characterized by the shrinkage function. Finally, under a mild assumption on the shrinkage function (for instance, the hard shrinkage satisfies this assumption), this algorithm converges in a finite time which can be estimated from the properties of the shrinkage function. Experimental results demonstrate that in the presence of noise, our new algorithm outperforms the original MP algorithm when the correlation of dictionary with the noise is not negligible.

Title : Increasing the Embedding Efficiency of Steganographic Scheme by Matrix Embedding

Abstract : As an important attribute of steganographic schemes directly influencing their security, the embedding efficiency is defined as the expected number of embedded secret data bits per one embedding change. In this talk, we give some recent developments of an important steganographic scheme, named matrix embedding, in order to increase the embedding efficiency of LSB based steganography.

Title : Numerical Methods for Interactive Multiple Class Image Segmentation Problems

Abstract : In this talk, we consider a bilaterally constrained optimization model arising from the semi-supervised multiple class image segmentation problem. We prove that the solution of the corresponding unconstrained problem satisfies a discrete maximum principle. This implies that the bilateral constraints are satisfied automatically and that the solution is unique. The structures of coefficient matrices arising from the optimality conditions of the segmentation problem are different for different input images, we still show that they are M-matrices in general. Therefore we study several numerical methods for solving such linear systems and demonstrate that domain decomposition with block relaxation methods are quite effective and outperform other tested methods. We also carry out a numerical study of condition numbers on the effect of boundary conditions on the optimization problems which provides some insights into the specification of boundary conditions as an input knowledge in the learning context.