

Inverse Problems Network Meeting 1

Monday, 24th April 2017 - Tuesday, 25th April 2017

WX/3.14, Queens Buildings, Cardiff University

Abstract of Talk

DISJOINT SPARSITY FOR SIGNAL SEPARATION AND APPLICATIONS TO QUANTITATIVE PHOTOACOUSTIC TOMOGRAPHY

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This is joint work with H Ammari. The main focus of this talk is the reconstruction of the signals f and $g_i, i = 1, \dots, N$, from the knowledge of their sums $h_i = f + g_i$, under the assumption that f and the g_i s can be sparsely represented with respect to two different dictionaries A_f and A_g . This generalises the well-known ‘morphological component analysis’ to a multi-measurement setting. The main result states that f and the g_i s can be uniquely and stably reconstructed by finding sparse representations of h_i for every i with respect to the concatenated dictionary $[A_f, A_g]$, provided that enough incoherent measurements g_i s are available. The incoherence is measured in terms of their mutual disjoint sparsity.

This method finds applications in the reconstruction procedures of several hybrid imaging inverse problems, where internal data are measured. These measurements usually consist of the main unknown multiplied by other unknown quantities, and so the disjoint sparsity approach can be directly applied. In this case, the feature that distinguishes the two parts is the different level of smoothness. As an example, I will show how to apply the method to the reconstruction in quantitative photoacoustic tomography, also in the case when the Grüneisen parameter, the optical absorption and the diffusion coefficient are all unknown.