Sparse Multisensor Signal Reconstruction

Dmitry Model, Michael Zibulevsky

February 4, 2004

1 Abstract

We propose a technique of multisensor signal reconstruction based on the assumption, that source signals are spatially sparse, as well as have sparse [wavelet-type] representation in time domain. This leads to a large scale convex optimization problem, which involves l_1 norm minimization. The optimization is carried by the Truncated Newton method, using preconditioned Conjugate Gradients in inner iterations. The byproduct of reconstruction is the estimation of source locations.

2 Introduction

The solution of the "Cocktail Party" problem is the active research field. However none of the developed techniques provides an ideal solution. Yet another active research area is source localization. In this paper we propose to benefit from both fields in order to receive a more precise and stable solution.

Our technique is based on the assumption, that incoming signals can be sparsely represented in an appropriate basis or frame (e.g., via the short time Fourier transform, Wavelet transform, Wavelet Packets, etc.). This idea is exploited, for example, in [1],[2]. We also assume that there are few stationary sources, and that they are sparsely located in space. The last assumption is used in [3] and [4]. The combination of both assumptions can lead to an improved performance, as demonstrated by our simulations. An additional advantage of our method, is that it deals with the sensor array model in time domain, and thus is applicable for both narrowband and wideband signals.