Sparse Approximation by Non-uniform B-spline Dictionaries

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Abstract

The interest for sparse representations has enormously increased the last few years, in large part due to their convenience for signal processing techniques and the results produced by the theory of Compressed Sensing with regard to the reconstruction of sparse signals from non-adaptive measurements. In regard to sparse approximations there are two main problems to be looked at. One is in relation to the design of suitable algorithms for finding the sparse approximation. The other involves the construction of the dictionaries endowing the approximation with the property of sparsity.

In this talk, we will survey the algorithm for finding the sparse approximation. Moreover, we will introduce non-uniform B-spline dictionaries on a compact interval. For each given partition, dictionaries of B-spline functions for the corresponding spline space are constructed. It is asserted that, by dividing the given partition into subpartitions and joining together the bases for the concomitant subspaces, slightly redundant dictionaries of B-splines functions are obtained. Such dictionaries are proved to span the spline space associated to the given partition. The proposed construction is shown to be potentially useful for the purpose of sparse signal representation. With that goal in mind, spline spaces specially adapted to produce a sparse representation of a given signal are considered.