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Fast P-transforms for signal processing applications

P-transforms arise as associated transforms of finite D-matrices, which find applications in digital signal processing. The columns of a finite D-matrix of size $N \times N$, admit a natural, non-trivial, partition into bands of mutually orthogonal columns. This partition depends only on the size of the matrix and is referred to as the Orthogonal Band Decomposition. The sum of the orthogonal projections onto each band defines a P-transform. Although not sparse, P-transforms can be partitioned into sparse matrices and as such admit fast implementation. Preliminary experiments with P-transforms suggest that the error of approximating signals with partial sums of projections might offer a more suitable metric to generating a particular D-matrix for sparse signal representation.