Approximately dual frames in Hilbert spaces and applications to Gabor frames

Approximately dual frames are studied in the Hilbert space setting. Approximate duals are easier to construct than classical dual frames, and can be tailored to yield almost perfect reconstruction. Bounds on the deviation from perfect reconstruction are obtained for approximately dual frames constructed via perturbation theory. An alternative bound is derived for the rich class of Gabor frames, by using the Walnut representation of the frame operator to estimate the deviation from equality in the duality conditions. To illustrate these results, we construct explicit approximate duals of Gabor frames generated by the Gaussian; these approximate duals yield almost perfect reconstruction. Surprisingly, the method applies also to certain Gabor frames that are far from being tight.

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