Frame recycling

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Grafakos and Sansing have shown how to obtain directionally sensitive time-frequency decompositions in $L^2(\mathbb{R}^n)$ based on Gabor systems in $L^2(\mathbb{R})$; the key tool is the "ridge idea," which lifts a function of one variable to a function of several variables [1]. We generalize their result by showing that similar results hold starting with general frames for $L^2((\mathbb{R})$, both in the setting of discrete frames and continuous frames. This allows to apply the theory for several other classes of frames, e.g., wavelet frames and shift-invariant systems. We will consider applications to the Meyer wavelet and complex B-splines. In the special case of wavelet systems we show how to discretize the representations using ϵ-nets [2]. We will close with a short discussion of partial ridges [3].
This is joint work with Peter Massopust (TU München), Ole Christensen (DTU Lyngby) and Florian Heinrich (University of Passau).

References

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[3] Florian Heinrich and Brigitte Forster: *Lifting of quaternionic frames to higher dimensions with partial ridges*. Advances in Applied Clifford Analysis, Vol. 31 (2021), Article No. 12.