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Wavelet coorbit theory in higher dimensions

Coorbit theory provides a functional-analytic framework for the construction and study of Banach frames arising from the action of an integrable representation. This talk is concerned with existence and basic properties of coorbit spaces associated to wavelet transforms arising from an irreducible, square-integrable representation of a semidirect product of the type $G = \mathbb{R}^d \rtimes H$ acting naturally on $\mathrm{L}^2(\mathbb{R}^d)$. Here H is a suitably chosen, closed matrix group.

The talk provides a unified and rather general approach to a setting that so far has only been studied for very special choices of affine group actions (such as the similitude group, or the shearlet group). It establishes the well-definedness of a scale of Besov-type coorbit spaces, and provides the existence of atomic decompositions for these spaces in terms of suitably chosen band-limited Schwartz functions. Under suitable assumptions on the dual action of H I establish easily verified concrete conditions for frame atoms, in terms of vanishing moments, smoothness and decay. In particular, these results imply the existence of compactly supported smooth atoms.