

On the structure of anisotropic frames

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Anisotropic frame systems such as shearlets and curvelets have had a profound impact on applied mathematics in the last decade, the main reason being their superior ability to optimally resolve anisotropic structures such as edges in images. By now there exists a whole zoo of such constructions among which we mention second generation curvelets, bandlimited shearlets and compactly supported shearlets, all based on a parabolic dilation operation. These systems share similar properties; this is usually proven in a case-by-case study for each different construction. In this talk I will introduce the concept of parabolic molecules which allows for a unified framework encompassing all known anisotropic frame constructions based on parabolic scaling. The main result is that, roughly speaking, all such systems share the same approximation properties. A consequence is that we can at once deduce all the desirable approximation properties of curvelets for virtually any other system based on parabolic scaling. This is joint work with Gitta Kutyniok.