

ABSTRACT. We construct a multiresolution theory for $L^2(\mathbb{R}) \oplus \cdots \oplus L^2(\mathbb{R})$. For a good choice of the dilation and translation operators on these larger spaces, it is possible to build singly generated wavelet bases, thus obtaining multiresolution super-wavelets. We give a characterization of super-scaling function, we analyze the convergence of the cascade algorithms and give examples of super-wavelets. Our analysis provides also more insight into the Cohen and Lawton condition for the orthogonality of the scaling function in the classical case on $L^2(\mathbb{R})$.