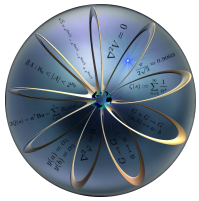

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multiresolution analysis

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Definition A *multiresolution analysis* is a sequence $(V_j)_{j\in\mathbb{Z}}$ of subspaces of $L_2(\mathbb{R})$ such that

1. (nesting) $\ldots \subset V_{-1} \subset V_0 \subset V_1 \subset \ldots$
2. (density) $\overline{\operatorname{span} \bigcup_{j\in\mathbb{Z}} V_j} = L_2(\mathbb{R})$
3. (separation) $\bigcap_{j\in\mathbb{Z}} V_j = \{0\}$
4. (scaling) $f(x) \in V_j$ if and only if $f(2^{-j}x) \in V_0$
5. (orthonormal basis) there exists a function $\Phi \in V_0$, called a *scaling function*, such that the system $\{\Phi(t-m)\}_{m\in\mathbb{Z}}\}$ is an orthonormal basis in V_0.

Notes Multiresolution analysis, particularly scaling functions, are used to derive wavelets. The V_j are called approximation spaces. Several choices of scaling functions may exist for a given set of approximation spaces— each determines a unique multiresolution analysis.