Hierarchical systems of exponential bases

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Fourier series form a cornerstone of analysis; it allows the expansion of a complex valued 1-periodic function in the basis of integer frequency exponentials. A simple rescaling argument shows that by splitting the integers into evens and odds, we obtain orthogonal bases for functions defined on the first, respectively the second half of the unit interval. We develop generalizations of this curiosity and show that, for example, for any finite partition of the unit interval into subintervals exists a partition of integers into subsets, each of which forms a basis for functions supported on the respective subinterval.

Joint work with David Walnut (George Mason University, USA).