Frame properties of systems arising via iterated actions of operators

Motivated by recent progress in dynamical sampling we prove that every frame which is norm-bounded below can be represented as a finite union of sequences \( \mathcal{V} \) for some bounded operators \( T_j \) and elements \( \phi_j \) in the underlying Hilbert space. The result is optimal, in the sense that it turns out to be problematic to replace the collection of generators \( \phi_1, \ldots, \phi_J \) by a singleton: indeed, for linearly independent frames we prove that we can represent the frame in terms of just one system \( \mathcal{V} \) but unfortunately this representation often forces the operator \( T \) to be unbounded. Several examples illustrate the connection of the results to typical frames like Gabor frames and wavelet frames, as well as generic constructions in arbitrary separable Hilbert spaces.

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Corresponding author: Christensen, O.
Contributors: Christensen, O., Hasannasabjaldehbakhani, M.
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