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Minimal scalings and structural properties of scalable frames

Abstract

For a unit-norm frame $F = \{f_i\}_{i=1}^k$ in $\mathbb{R}^n$, a scaling is a vector $c = (c(1), \ldots, c(k)) \in \mathbb{R}^k_{\geq 0}$ such that $\{\sqrt{c(i)} f_i\}_{i=1}^k$ is a Parseval frame in $\mathbb{R}^n$. If such a scaling exists, F is said to be scalable. A scaling c is a minimal scaling if $\{f_i : c(i) > 0\}$ has no proper scalable subframe. It is known that the set of all scalings of F is a convex polytope with vertices corresponding to minimal scalings. In this talk, we provide a method to find a subset of contact points which provides a decomposition of the identity, and an estimate of the number of minimal scalings of a scalable frame. We provide a characterization of when minimal scalings are affinely dependent. Using this characterization, we can conclude that all strict scalings $c = (c(1), \ldots, c(k)) \in \mathbb{R}^k_{>0}$ of F have the same structural property. We also present the uniqueness of orthogonal partitioning property of any set of minimal scalings, which provides all possible tight subframes of a given scaled frame

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