

Tight Frames and Five Dimensional Soda Straws

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Abstract

A Parseval frame for a Hilbert space \mathcal{H} is a spanning set $\{x_i\}$ that maintains some of the useful properties of orthonormal bases. Namely, every vector $x \in \mathcal{H}$ can be reconstructed from the elements of the frame using $\langle x, x_i \rangle$ as coefficients. Tight frames are a slight abstraction of Parseval frames that retain this reconstruction property with the addition of a scalar. We investigate methods for producing tight frames in \mathbb{R}^3 and \mathbb{C}^2 by adding carefully chosen vectors to the frame. Also, we investigate the use of certain transformations to other spaces in an attempt to simplify these problems. We refer to these transformations of our frame vectors as *diagram vectors*.