Stable sampling and density conditons for Fourier-like systems

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Abstract

This paper discusses the techniques for multi-channel stable sampling for spaces generated by Fourier-like systems in the vector-valued space $L^2(X, \mathcal{H})$, where X is a σ-finite measure space and $\mathcal{H}$ is a separable Hilbert space. The stability of the sampling set is characterized in both global and local (pointwise) forms of the Shannon-like sampling formula employing range functions. We explore the sampling theory within these spaces, capturing signals/functions as their filtered versions through a set of linear-time invariant systems. Additionally, we establish connections among the stability, interpolating property of sampling sets and the density of these sets, considering ideal Nyquist rates. These findings are discussed in the context of the stability of filter banks and critically sampled filter banks. As an application, we explore the sampling theory for translation-invariant spaces using the Zak transform.

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