Signal Sampling and Recovery: From Shannon to Rice

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Abstract: The problem of reconstructing an analog signal from its discrete samples plays a critical role in the modern digital communication and signal processing technology. The efficiency of sampling schemes and corresponding reconstruction algorithms depends strongly on the *a priori* knowledge of an assumed class of signals. For a class of band-limited signals the signal sampling and recovery theory builds upon the celebrated Whittaker- Shannon interpolation scheme [1-3]. In this talk we present the statistical aspects of signal sampling and recovery originating from the Shannon theory. This includes the fundamental problem of the signal recovery from noisy samples and testing the hypothesis on the restricted signal class [4], [5]. This leads to the unified framework for the joint signal sampling and testing.

In the recent decade, the event-based signal processing techniques, based on the theory of level-crossings developed in the seminal work of Rice [6], [7], have been developed [8], [9]. This approach brought a new class of analog-to-digital algorithms that can outperform the traditional Shannon sampling strategy. This is particularly true for signals with activities varying locally in time which can be characterized by the concept of local bandwidth. In this talk we give a brief introduction to this new paradigm of signal sampling and recovery relying on level-crossings of stochastic signals.

References

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