Linear System Decomposition into FOT-Deterministic and FOT-Purely-Random Components

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Linear systems are characterized in the fraction-of-time (FOT) probability framework. The impulse-response function is expressed as sum of two terms. The first one is the impulse-response function of a system that transforms almost-periodic functions into almost-periodic functions. It is referred to as the FOT- deterministic component. The second one is the residual term. It is the impulse-response function of a system whose output does not contain any finite-strength additive sinewave component when excited by a sinewave. Thus, it is referred to as the FOT-purely-random component.

The structure of the impulse-response function and of its double Fourier transform, the transmission function, are analyzed for FOT-deterministic systems. It is shown that such a structure arises also from a completely different problem. In fact, FOT-deterministic linear systems are solution of the Wiener filtering problem when the signals are spectrally correlated.