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A pseudo-matched filter for chaos

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A matched filter maximizes the signal-to-noise ratio of a signal. In the recent work of Corron et al. [Chaos 20, 023123 (2010)], a matched filter is derived for the chaotic waveforms produced by a piecewise-linear system. Motivated by these results, we describe a pseudo-matched filter, which removes noise from the same chaotic signal. It consists of a notch filter followed by a first-order, low-pass filter. We compare quantitatively the matched filter's performance to that of our pseudo-matched filter using correlation functions in a simulated radar application. On average, the pseudo-matched filter performs with a correlation signal-to-noise ratio that is 2.0 dB below that of the matched filter. Our pseudo-matched filter, though somewhat inferior in comparison to the matched filter, is easily realizable at high speed (> 1 GHz) for potential radar applications.

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