Evaluating the Karhunen-Loeve Transform for SETI

YURU NIU, DANIEL FLEISCH, Wittenberg University — One of the significant challenges in the Search for Extraterrestrial Intelligence (SETI) is the detection and identification of unusual signals. Traditional signal-processing techniques employing the Fast Fourier Transform (FFT) are very effective for extracting sinusoidal signals from noise and interference, but are less effective for non-sinusoidal signals. Some SETI researchers have suggested that the Karhunen-Loeve Transform (KLT) is well-suited to detecting signals with unknown characteristics. To evaluate this possibility, we have built a MATLAB simulation that allows us to synthesize a variety of signals and then apply both FFT and KLT processing. Initial results indicate that the KLT is more effective than the FFT for detecting signals with low signal-to-noise ratio and significantly outperforms the FFT for non-sinusoidal signals.

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