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Title: High-Resolution Spectral Analysis (HSA) vs. Discrete Fourier Transform (DFT)

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Abstract:

The Discrete Fourier Transform (DFT) is the standard technique for performing spectral analysis. It is used in the form of the well-known fast implementation (FFT) in almost all areas that deal with signal processing. However, the DFT algorithm has some limitations in terms of its resolution in time and frequency: the higher the time resolution, the lower the frequency resolution, and vice versa. The product of time (analysis duration) and analysis bandwidth (frequency resolution) is a constant. DFT results depend on the analysis window used (type and duration), although the physical signal properties do not change. The High-Resolution Spectral Analysis (HSA) method, published at the ASST '90, considers the window influence through spectral deconvolution and thus leads to a much lower time-bandwidth product, correlating better with human perception. Recently, variants of the HSA have been used for a psychoacoustic standard (roughness). Additionally, HSA is planned for a new model of fluctuation strength. This paper describes the improvements made to the HSA algorithm as well as its robustness against noise, and compares application results for both methods: HSA and DFT.