



Spectral Audio Signal Processing

Julius O. Smith III

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Spectral Audio Signal Processing is the fourth book in the music signal processing series by Julius O. Smith. One can say that human hearing occurs in terms of spectral models. As a result, spectral models are especially useful in audio applications. For example, with the right spectral model, one can discard most of the information contained in a sound waveform without changing how it sounds. This is the basis of modern audio compression techniques. The chapters are organized in a progression from basic spectrum analysis to more advanced frequency-domain signal processing as follows: * Fourier transforms and theorems * Spectrum analysis windows and their design * FIR digital filter design * Spectrum analysis of sinusoids * Spectrum analysis of noise * Time-frequency displays * The Short-Time Fourier Transform (STFT) * Overlap-add STFT processing * Filter-bank view of the STFT * Applications of the STFT * Multirate polyphase and wavelet filter banks In addition, appendices are provided containing material that extends and supplements various chapters in various directions. Others provide supporting background material: * Notation * Continuous-time Fourier theorems * Statistical signal processing * Gaussian function properties * Bilinear audio frequency warping * Matlab examples * History of spectral modeling by topic

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