Fourier analysis

The Fourier analysis category consists of a collection of basic transforms and operators associated with Fourier analysis. It mainly consists of Fourier transforms with associated operator frameworks and generalizations of these, as well as the generalized Goertzel algorithms, algorithm transforms and functional Fourier transforms.

Gabor analysis

The Gabor analysis category consists of a collection of time-frequency transforms on both bounded and unbounded lattices, and includes several associated operators. The main time-frequency transforms are the Gabor, Wilson and modified discrete cosine transforms.

Non-stationary Gabor Analysis

Non-stationary Gabor transforms

Non-stationary Gabor transforms provide a framework for analyzing non-stationary signals, including those with time-varying frequency content. The toolbox includes functions for computing non-stationary Gabor transforms and frames, as well as for analyzing and visualizing the results.

Wavelet analysis

The wavelet analysis category consists of a collection of time-frequency transforms with an adaptively refined or logarithmic frequency scale in contrast to the linear frequency scale with an adaptable time-scale, or linear frequency scale of the sections on Gabor and Non-stationary Gabor analysis, respectively.

Operators

The operator framework makes use of the frame framework with an operator-like interface to allow the use of both mathematical and graphical frames.

Block processing

The block processing framework is a self-contained framework within the LTFAT for real-time audio processing in MATLAB and Octave. Together with the time-frequency analysis and synthesis capabilities of the LTFAT, it allows audio processing in the transform domain.

Filterbanks

The filterbank category consists of a collection of computational routines for finite impulse response (FIR), frequency defined and band-limited filters. The filterbanks can be used as the filter coefficients for implementing a frame and are therefore strongly related to the other linear transforms in the LTFAT. The linear filters that belong exclusively to the filterbank section are the constant Qtransform and ERBF transforms.

Non-stationary Gabor Analysis

The non-stationary Gabor analysis category consists of a collection of time-frequency transforms on both bounded and unbounded lattices, and includes several associated operators. The main time-frequency transforms are the Gabor, Wilson and modified discrete cosine transforms.

Wavelet analysis

The wavelet analysis category consists of a collection of time-frequency transforms with an adaptively refined or logarithmic frequency scale in contrast to the linear frequency scale with an adaptable time-scale, or linear frequency scale of the sections on Gabor and Non-stationary Gabor analysis, respectively.

References


The Large Time-Frequency Analysis Toolbox (LTFAT) is a software toolbox for time-frequency analysis and synthesis. It is maintained both as an educational and a computational tool. The toolbox consists of a collection of linear frames for time-frequency analysis. The toolbox provides a variety of audio and video processing applications and generalizations of these in the shape of signal processing algorithms, algorithm transforms and functional Fourier transforms.

In the following sections the outline under the main categories of the LTFAT will be shortly explained and a selection of their like will be listed. Most of the categories of the LTFAT are extensively described in [1] and [2].

Frames

The frames framework consists of several types of frames and methods associated with frames. The frames are presented in an object-oriented framework. This object-oriented framework provides an operator-like interface for working with frames rather than explicitly creating frame matrices. Therefore the properties of a frame are related to the attributes of an object and the methods associated with a frame with the methods of an object.

Filterbanks

The filterbank category consists of a collection of computational routines for finite impulse response (FIR), frequency defined and band-limited filters. The filterbanks can be used as the filter coefficients for implementing a frame and are therefore strongly related to the other linear transforms in the LTFAT. The linear filters that belong exclusively to the filterbank section are the constant Qtransform and ERBF transforms.