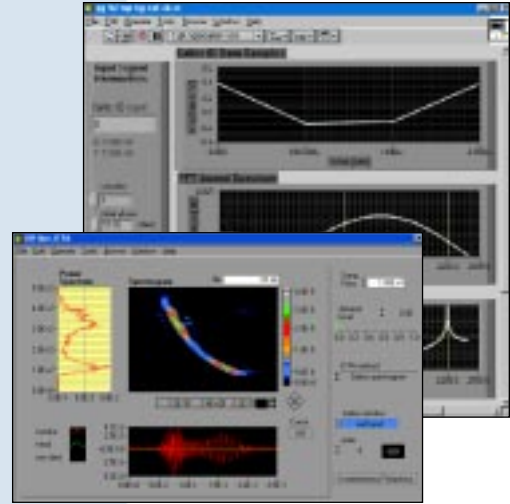


Signal Processing Toolset

Signal Processing Toolset

- Joint time-frequency analysis (JTFA) with the award-winning Gabor spectrograph
- Wavelet and filter-bank design for short-duration signal characterization, noise reduction, and detrending
- Super-resolution spectral analysis for high-frequency resolution model-based spectral estimation with a small data set
- Interactive, graphical filter design of FIR and IIR digital filters



Overview

The National Instruments Signal Processing Toolset is a suite of software tools, example programs, and utilities for time-frequency analysis and digital filter design. With this toolset, you can experiment and develop with modern analysis techniques that include wavelets, super-resolution (model-based) spectral analysis, and joint time-frequency analysis (JTFA). With the Digital Filter Design component of this toolset, you can interactively design and characterize finite impulse response (FIR) and infinite impulse response (IIR) filters.

Time-Frequency Analysis

The JTFA, wavelet and filter bank design, and super-resolution spectral analysis components of the Signal Processing Toolset are all tools that you can use for time-frequency analysis. Time-frequency analysis commonly involves characterizing how transient (short-time) signals evolve over time. This technique can reveal information that is not

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immediately obvious with standard frequency analysis tools such as a fast Fourier transform-based spectrogram.

Function List Highlights

JTFA Component

Library of Functions and VIs

Mean instantaneous frequency

Tools optimized for real- and complex-valued inputs

Linear algorithms

Short-time Fourier transform (STFT) (1D/2D

Gabor coefficients and spectrogram)

Gabor (1D/2D expansion and spectrogram)

Adaptive (representation, transform, and spectrogram)

Quadratic algorithms

Wigner-Ville distribution (WVD)

Applications	JTFA	Wavelet and Filter Bank Design	Super-Resolution Spectral Analysis	Digital Filter Design
Spectral analysis	✓	✓	✓	✓
Machine monitoring	✓	✓	✓	✓
Frequency response	–	✓	✓	✓
Impulse response	–	✓	–	✓
Noise measurements	✓	✓	–	–
SNR improvement	✓	✓	✓	✓
Biomedical signal analysis	✓	✓	–	–
Network analysis	✓	–	–	–
Speech analysis	✓	✓	✓	–
Audio measurement	✓	✓	✓	–
Filter evaluation/testing	✓	✓	–	✓
Dynamic (transient) signal analysis	✓	✓	✓	–
Phase measurement	✓	–	✓	✓
Transfer function estimation	✓	–	✓	✓
Signal identification	✓	✓	✓	–
Data/image compression	✓	✓	–	–

Signal Processing Toolset Application Areas

Signal Processing Toolset

Pseudo Wigner-Ville distribution (PWVD)
Cohen's class
Choi-Williams distribution (CWD)
Cone-shaped distribution

Program Examples

Use of JTFA library VIs demonstrated
1D/2D graphs show transform results
Save/load data to text files
Single-channel data acquisition with online analysis using
National Instruments DAQ hardware

Wavelet and Filter Bank Design Component

Library of Functions and VIs

Wavelet design types
Orthonormal
Biorthonormal
Maximum flat (such as Daubechies wavelets)
Maximum flat (such as the B-spline wavelets)
Equiripple (general or positive)
Continuous wavelet transform (CWT)
Discrete wavelet transform (DWT)
Automatic signal denoising
Signal detrending

Program Examples

1D/2D design tools
Use of wavelet and filter bank design component demonstrated
Load/save wavelet designs as text files
Load/save test signals
Intuitive design method (design a wavelet and immediately see
the results on a test signal/image)
Interactive display graphs any smooth, detail path output of a
wavelet filter bank

Super-Resolution Spectral Analysis Component

Library of Functions and VIs

Covariance
Principal component auto-regressive (PCAR)
Prony's method
Matrix-Pencil method
Minimum description length (MDL)
MDL method-estimate model order from samples
PCAR power spectrum calculates model-based power
spectrum using PCAR method

Program Examples

Use of wavelet and filter bank design component demonstrated
Load/save wavelet designs as text files
Load/save test signals

Digital Filter Design Component

Library of Functions and VIs

Read coefficients generated by the design component
Apply digital filter to signal

Program Examples

Demonstrates how to load coefficients and apply
your filter designs
Stand-alone Windows 2000/NT/XP/Me/9x executable
Three methods of filter design
Set filter parameters (cutoff frequencies, ripple, etc.)
Interactively move poles and zeros around complex plane
Interactively draw your own filter response
Classical IIR filters
Butterworth
Chebyshev
Elliptic
Inverse Chebyshev
FIR filters
Parks-McClellan
Minimize FIR filter order
Filter characterization
Filter coefficients
Impulse/step responses
Magnitude response (dB or linear)
Polar and rectangular forms
Pole-zero plot
Ripple
Z transform
Save filter design (coefficients) as text file

For more information about the Signal Processing Toolset and a complete function list, visit ni.com/analysis

Ordering Information

NI Signal Processing Toolset for LabVIEW
and LabWindows/CVI
Windows 2000/NT/XP/Me/9x777136-01
NI Developer Suite offers this product bundled with other NI software tailored
for test or control applications. See page 39 for ordering information.

LabVIEW Ordering Information

NI LabVIEW for Windows 2000/NT/XP/Me/9x Development Systems

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NI Developer Suite offers many of these products bundled with other NI software tailored for test or control applications. See page 39 for more information.

Part numbers listed denote single-user licenses. For multi-user licenses, contact National Instruments.

¹Please refer to the Training Services section to complete the part number.

*Visit ni.com/mac for the latest Mac OS information.