# SIGNAL PROCESSING SUITE

The Signal Processing Suite software package contains the Digital Filter Design Toolkit, Third-Octave Analysis Toolkit, Joint Time-Frequency Analysis Toolkit, Wavelet and Filter Bank Design Toolkit, and VirtualBench-DSA. This software performs various specialized signal processing tasks, such as finding the power spectrum of a signal, representing signals in the joint time-frequency domain, and interactively designing digital filters and wavelets.

You can use the Signal Processing Suite with programming environments such as LabVIEW and BridgeVIEW, LabWindows/CVI, or Microsoft Visual Basic. The diverse applications for the suite include acoustics, radar, sonar, seismology, remote sensing, instrumentation, and vibration analysis.

This document provides an overview of the software comprising the Signal Processing Suite. For detailed information about each component, refer to the corresponding reference manual.

## Digital Filter Design Toolkit

The Digital Filter Design Toolkit provides a general-purpose design tool for signal conditioning, control systems, digital signal processing (DSP), and virtual instrument (VI) applications. Using the Digital Filter Design Toolkit, you can design bandpass, bandstop, lowpass, and highpass filters, as well as filters with an arbitrary magnitude response. Use the powerful graphical user interface (GUI) to design finite impulse response (FIR) and infinite impulse response (IIR) filters.

You design filters by interactively editing the magnitude response graph or the pole-zero plot in the *z*-plane. You test your design online with a built-in function generator, and you analyze the filter using the step and impulse responses, magnitude and phase responses, and pole-zero plot. When you complete your design, you can save the filter coefficients to a file for use in other applications.



  

# Third-Octave Analysis Toolkit

Scientists and engineers in the fields of acoustics and vibration use the Third-Octave Analysis Toolkit to determine the spectral energy contained in a specific set of third-octave bands. With the Third-Octave Analysis Toolkit, you can measure sound, vibration, and noise signals quickly and easily. Third-octave analysis applications include vibration tests of machines, architectural acoustics, power measurements, and appliance testing.

The Third-Octave Analysis Toolkit conforms to ANSI Standard S1.11-1986 and features an easy-to-use graphical user interface for third-octave analysis and data acquisition. You can choose from one to four input channels, each with its own windowing, weighting, and averaging capabilities. You can compare the results of third-octave analysis on the signal from each channel to those of a reference signal you have analyzed previously.

# Joint Time-Frequency Analysis Toolkit

Using the Joint Time-Frequency Analysis Toolkit, you can enhance computer-based signal processing on nonstationary signals. Applications include speech processing, sound analysis, sonar, radar, machine testing, vibration analysis, and dynamic signal monitoring.

The Joint Time-Frequency Analysis Toolkit provides several algorithms for applications in which the frequency content of a signal varies with time. These algorithms include the award-winning and patented Gabor spectrogram, the Wigner-Ville distribution, the Choi–Williams distribution, the short-time Fourier transform, the cone-shaped distribution, and the adaptive spectrogram.

# Wavelet and Filter Bank Design Toolkit

The Wavelet and Filter Bank Design Toolkit provides an intuitive and interactive interface for designing wavelet transforms and filter banks. You can use wavelets for feature extraction and data compression. By interactively selecting a wavelet prototype (equiripple or maxflat) and different FIR combinations, you easily can find the best wavelet or filter bank for your application.

As you design the wavelets, you can apply them to both one-dimensional and two-dimensional signals (images) and immediately see the effect of the design on your signal. The Wavelet and Filter Bank Design Toolkit is

extremely powerful for signals that have short time duration and wide frequency bandwidth.

# VirtualBench-DSA

Use the VirtualBench-DSA (Dynamic Signal Analyzer) to acquire signals and measure the power spectrum, harmonic content, amplitude spectrum, cross-power spectrum, frequency response, coherence, and impulse response. You also can use the VirtualBench-DSA as a low-frequency oscilloscope to view signals separately in the time and frequency domains simultaneously.

With the VirtualBench-DSA, you gain the functionality of simultaneously analyzing signals on two channels. VirtualBench-DSA also provides markers for measuring the total harmonic distortion (THD).

# Customer Communication

National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, the reference manuals for each component of the Signal Processing Suite contain comment and configuration forms for you to complete.

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