Periodogram

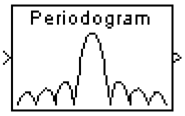
Compute nonparametric estimate of spectrum

Library

Estimation / Power Spectrum Estimation

`dspspect3`

Description



Periodogram

The Periodogram block computes a nonparametric estimate of the spectrum. The block averages the squared magnitude of the FFT computed over windowed sections of the input and normalizes the spectral average by the square of the sum of the window samples.

Both an M-by-N frame-based matrix input and an M-by-N sample-based matrix input are treated as M sequential time samples from N independent channels. The block computes a separate estimate for each of the N independent channels and generates an N_{fft}-by-N matrix output. When you select the **Inherit FFT length from input dimensions** check box, N_{fft} is specified by the frame size of the input, which must be a power of 2. When you clear the **Inherit FFT length from input dimensions** check box, N_{fft} is specified as a power of 2 by the **FFT length** parameter, and the block zero pads or wraps the input to N_{fft} before computing the FFT.

Each column of the output matrix contains the estimate of the corresponding input column's power spectral density at N_{fft} equally spaced frequency points in the range $[0,F_s)$, where F_s is the signal's sample frequency. The output is always sample based.

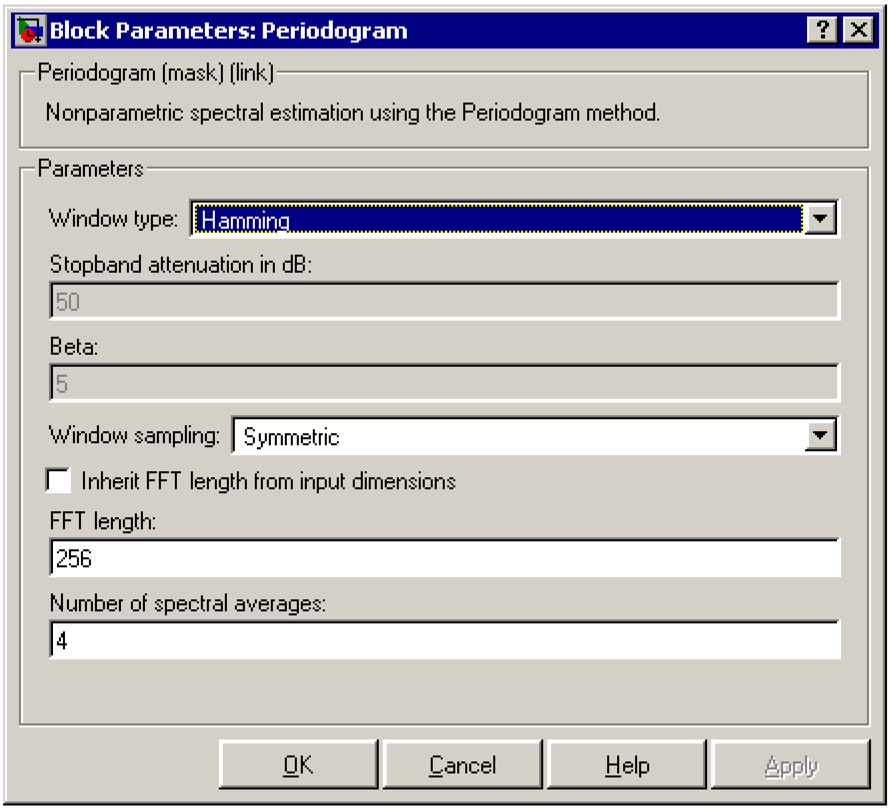
The **Number of spectral averages** specifies the number of spectra to average. Setting this parameter to `1` effectively disables averaging.

The **Window type**, **Stopband ripple**, **Beta**, and **Window sampling** parameters all apply to the specification of the window function; see the Window Function block reference page for more details on these four parameters.

Example

The `dspstfft` demo provides an illustration of using the Periodogram and Matrix Viewer blocks to create a spectrogram. The `dspsacomp` demo compares the Periodogram block with several other spectral estimation methods.

Dialog Box



Window type

Enter the type of window to apply. See the Window Function block reference page for more details. Tunable.

Stopband attenuation in dB

Enter the level, in dB, of stopband attenuation, R_s, for the Chebyshev window. This parameter is enabled if, for the **Window type** parameter, you choose `Chebyshev`. Tunable.

Beta

Enter the β parameter for the Kaiser window. This parameter is enabled if, for the **Window type** parameter, you chose `Kaiser`. Increasing **Beta** widens the mainlobe and decreases the amplitude of the window sidelobes in the window's frequency magnitude response. Tunable.

Window sampling

From the list, choose `Symmetric` or `Periodic`. Tunable.

Inherit FFT length from input dimensions

When you select this check box, the block uses the input frame size as the number of data points, N_{fft}, on which to perform the FFT.

FFT length

Enter the number of data points on which to perform the FFT, N_{fft}. When N_{fft} is larger than the input frame size, each frame is zero-padded as needed. When N_{fft} is smaller than the input frame size, each frame is wrapped as needed. This parameter is enabled when you clear the **Inherit FFT length from input dimensions** check box.

Number of spectral averages

Enter the number of spectra to average; setting this parameter to `1` disables averaging.

References

Oppenheim, A. V. and R. W. Schafer. *Discrete-Time Signal Processing* . Englewood Cliffs, NJ: Prentice Hall, 1989.

Orfanidis, S. J. *Introduction to Signal Processing* . Englewood Cliffs, NJ: Prentice-Hall, 1995.

Proakis, J. and D. Manolakis. *Digital Signal Processing.* 3rd ed. Englewood Cliffs, NJ: Prentice-Hall, 1996.

Supported Data Types

Port	Supported Data Types
Input	• Double-precision floating point • Single-precision floating point
Output	• Double-precision floating point • Single-precision floating point

See Also

Burg Method	Signal Processing Blockset
Inverse Short-Time FFT	Signal Processing Blockset
Magnitude FFT	Signal Processing Blockset
Short-Time FFT	Signal Processing Blockset
Spectrum Scope	Signal Processing Blockset
Window Function	Signal Processing Blockset
Yule-Walker Method	Signal Processing Blockset
`pwelch`	Signal Processing Toolbox

See Power Spectrum Estimation for related information.