Signal Transforms

Description

Signal transformers generate the signal as a collection of waveforms of a particular form: sinusoids for the Fourier transform, mother wavelets for the wavelet transforms and periodic basis functions for the periodicity transforms. The transformations are used to determine the signal features in the transform domain. For example, Fourier transform is used to determine the frequency domain component of the signal. The Signal Transforms toolkit in MatDeck gives a convenient way to perform the following transformations: fft, discrete cosine transform and Welsh-Hadamard transform. The same toolkit is used to determine inverse transformations, which are used to determine the signal samples based on their transform domain.

Test Signal

In order to illustrate the use of the Signal Transforms Form we generate the test signal which consists of two sinusoids and additive white Gaussian nose -AWGN.

$Fs := 24000$ Sampling frequency

$Ts1 := 1 / Fs$ Sampling period

$dt := ynodes(xx, 0, 199\ Ts1, 200)$ Time axis, 200 samples

$f1 := 1000$ Frequency of the first sinusoidal

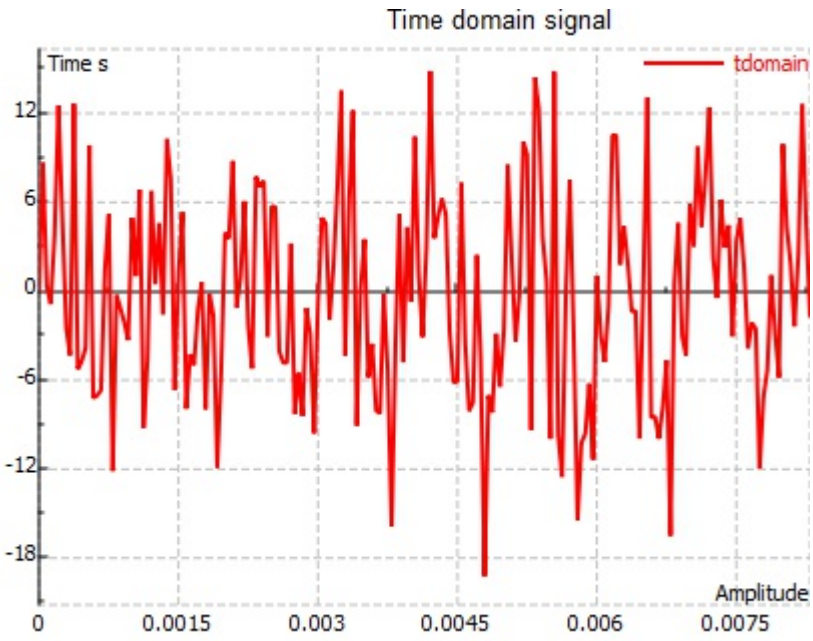
$f2 := 6000$ Frequency of the second sinusoidal

$x := 5\ \sin(2\ \pi \cdot f1\ dt) + 5\ \sin(2\ \pi \cdot f2\ dt)$ Input signal

$noise := normrandvec(0, 5, 200)$ AWGN

$xn := x + noise$

$tdomain := join\ mat\ cols(dt, xn)$

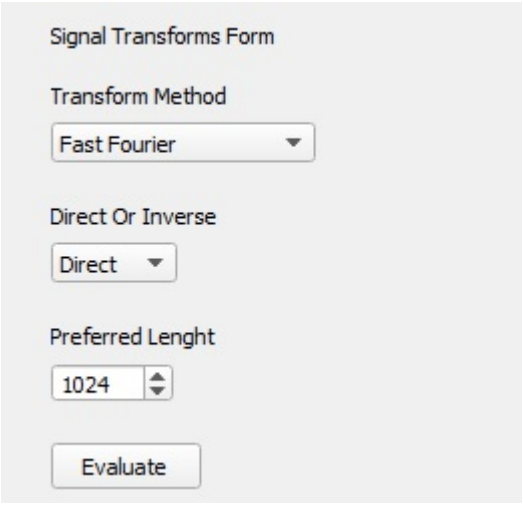


How to use the transform toolkit?

The task at hand is to determine the frequency domain spectrum of the signal above. For that purpose we use fft. In order to have better frequency resolution, we use 1024 points to calculate fft. We plot the amplitude spectrum below.

f := sigtransform(0 , "FormST1") Create form

y := sigtransresult(f , xn) Obtain result by using form



ff := ynodes(xy , 0 , (size(y) - 1)/size(y) , size(y))

graf := join mat cols(ff Fs , abs(y)/1024)