

Signal Statistics Form

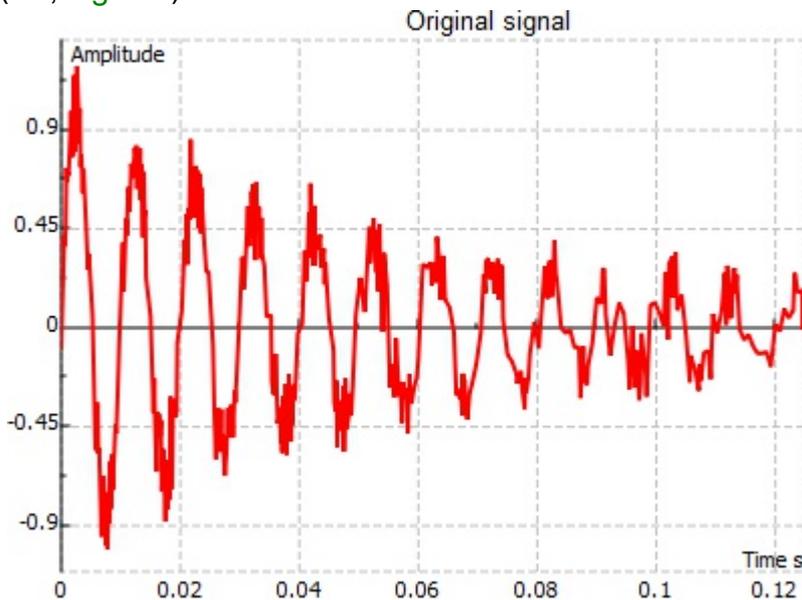
Description

In this example we show how the Signal Statistics Form is used to derive some of the signal features. The signal features include envelope, which can be top, bottom or double sided envelope, peaks or local maxima. The Signal Statistics form can be used to process the signal and remove high frequency noise by using a moving average filter.

Test signal

In order to illustrate the capabilities of the Signal Statistics Form, we generate a test signal. The test signal is a damped sinusoid which is a sinusoidal function whose amplitude approaches zero as time increases. Damped sine waves are commonly seen in signal processing whenever an oscillator loses its energy. The most common form of damping, and what is usually assumed, is an exponential damping, in which the outer envelope of the successive peaks is an exponential decay curve.

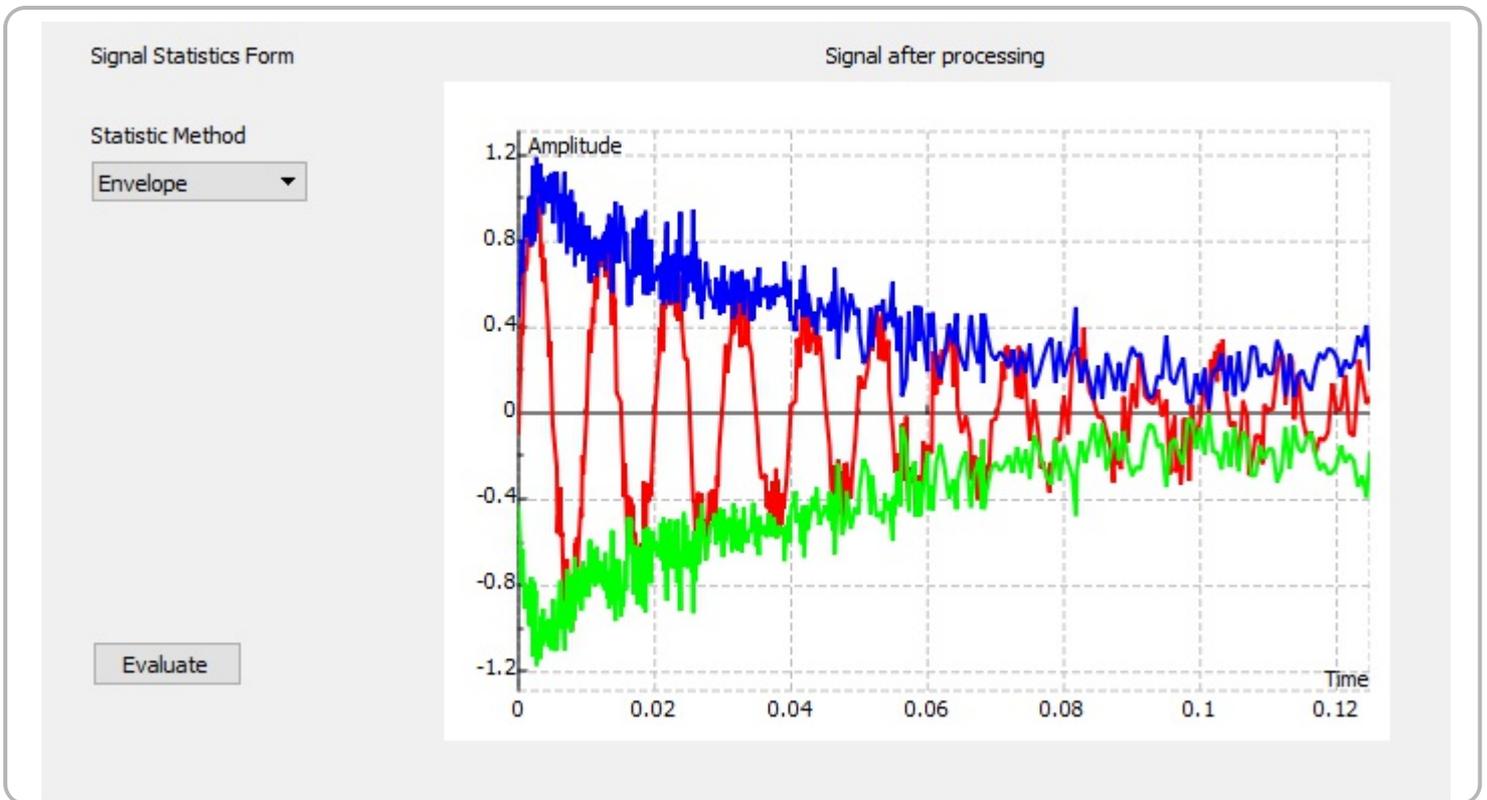
```
Fs := 8000    Hz, sampling rate      Ts1 := 1/Fs    s, sampling period
NI := 1000    signal length
dt := ynodes(tt, 0, (NI - 1) * Ts1, NI)    time axis
a := 20    Dumping factor              f := 100    Hz, frequency of oscillator
signal1 := mul(sin(pi * 2 * f * dt), exp(-a * dt)) + normrandvec(0, 0.1, 1000)
x := join mat cols(dt, signal1)
```



Evaluation of signal envelope

In order to evaluate a signal envelope we use the Signal Statistics Form. The Form is created first, after that it is used to evaluate the result. The Form contains the relevant graph, the blue graph is top envelope, and green is the bottom envelope.

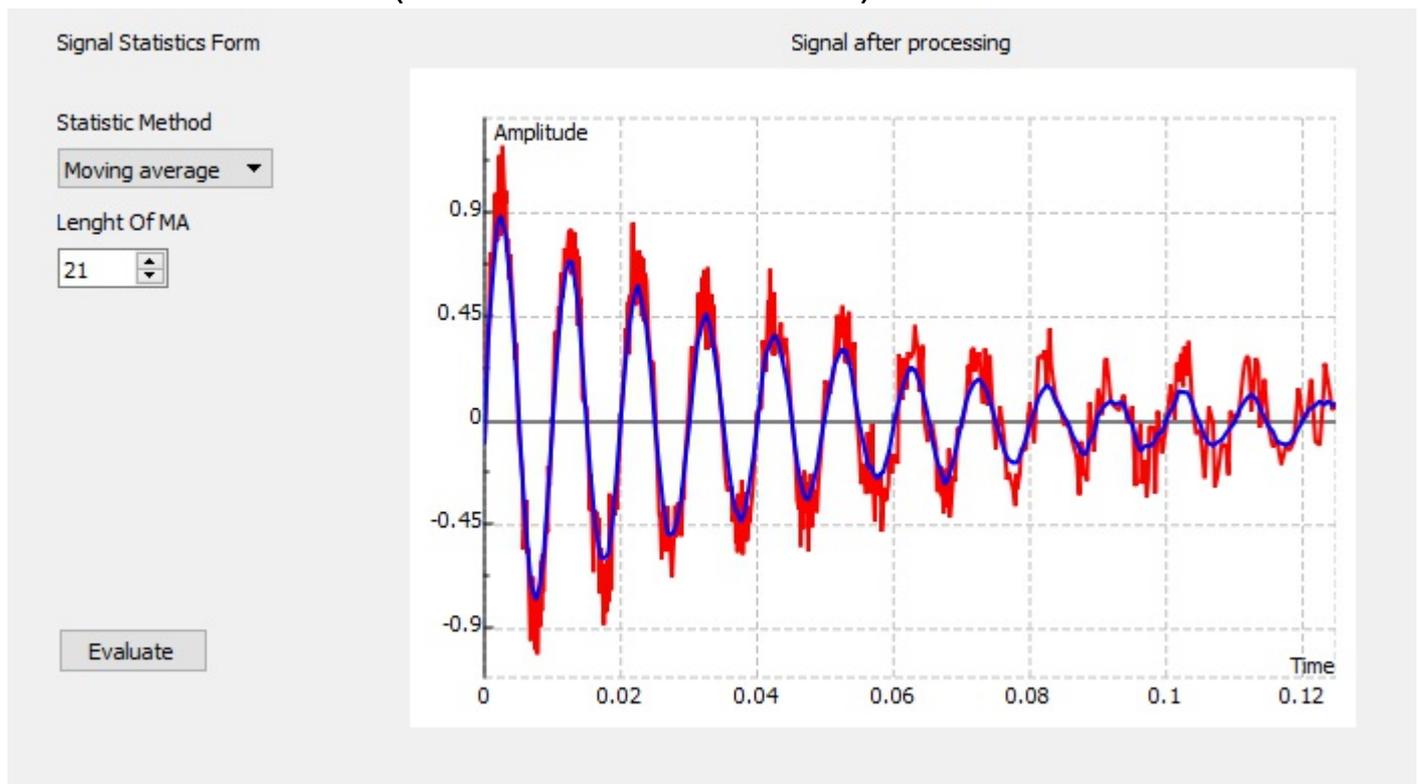
```
ff := signalstatisticsform(0, "FormStatistic")    Generate form
y := signalstatisticsresult(ff, join mat cols(dt, signal1))    Evaluate result
```



Moving average

The signal contains noise, in this case additive white Gaussian noise -AWGN. The easiest way to remove AWGN noise is to use a moving average filter. The Signal Statistics Form can be used for moving average filtering. Moving average filter with a length of 21 is used. The filtered signal is shown in blue in the graph.

```
ffma := signalstatisticsform(0, "FormStatistic2")
yma := signalstatisticsresult(ffma, join mat cols(dt, signal1))
```



Finding peaks

The filtered signal contains peaks which can be found by the Signal Statistics Form. The peaks are displayed in the graph within form. The peaks are local maxima of the signal.

```
ffp := signalstatisticsform(0 , "FormStatistic3")
```

```
ymp := signalstatisticsresult(ffp , yma)
```

