

Deconvolution Manual (Ver. 1.0)

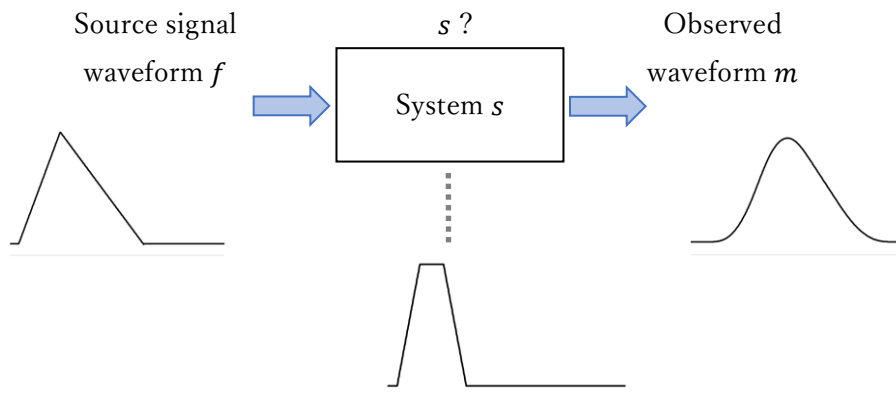
2023.3 AO Quest

Introduction

Have you ever wanted to specify the system response function? This software can deconvolute 1Dimension signal waveform. The signal waveform's input is CSV format file. The deconvolution result can be saved by CSV format file.

What is Deconvolution?

This software specifies the system response function s from the source signal waveform f and the observed waveform(convoluted signal waveform) m .



$$m(t) = f(t) \otimes s(t)$$

\otimes : Convolution

$f(t)$: Source signal waveform

$s(t)$: System response function

By contrast, if f and s were exchanged, the source signal waveform could be specified by the known system response function, too. The convolution becomes a multiplication in the frequency domain.

$$M(\omega) = F(\omega) \times S(\omega)$$

$F(\omega)$: $f(t)$'s spectrum

$S(\omega)$: $s(t)$'s spectrum(transfer function)

Specifying s is the deconvolution. The deconvolution becomes a division in the frequency domain.

$$S(\omega) = M(\omega)/F(\omega)$$

But this software uses Wiener deconvolution.

$$S = M \times \frac{F^*}{|F|^2 + r}$$

*: Complex conjugate

$$S/N[\text{dB}] = 10 \log_{10} \frac{1}{r}$$

The software calculates the spectrum by FFT(Fast Fourier Transform). Therefore, **the input data must be one period length for its repetition, definitely.**

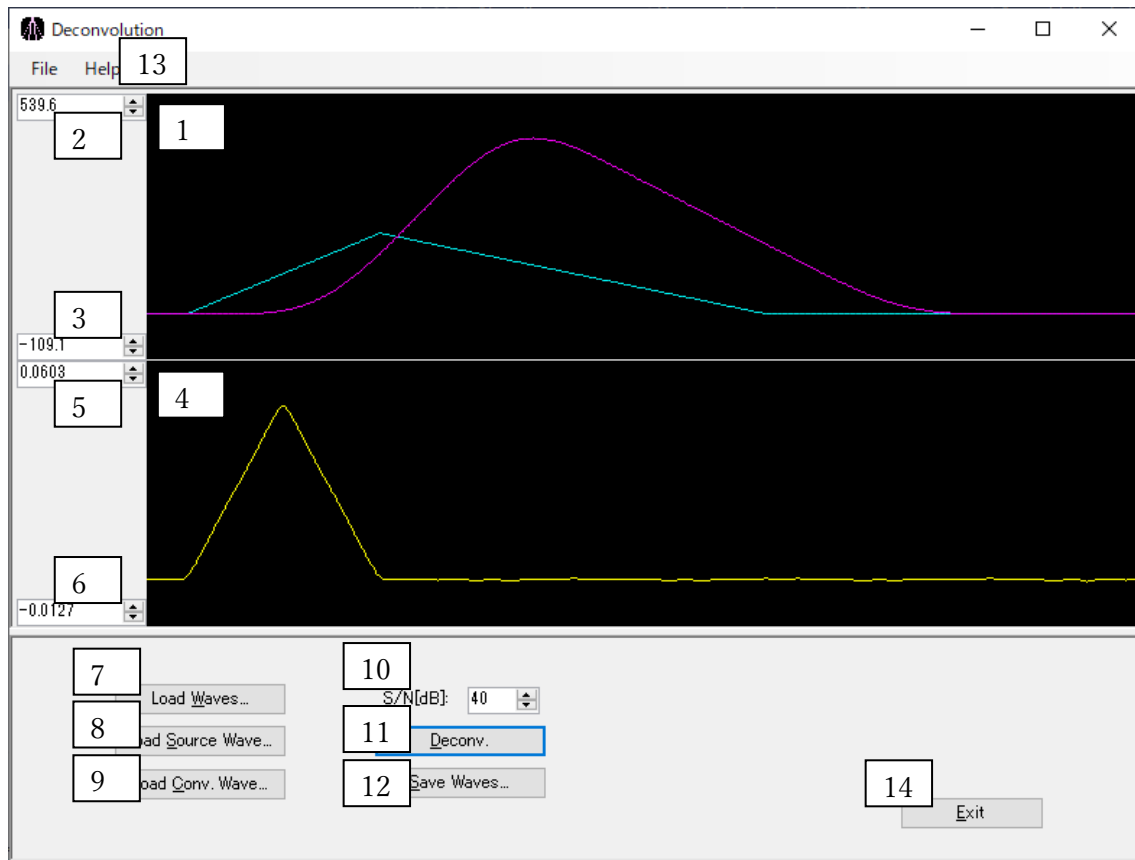
Operation Environment

- * Windows10 64bit, or later
- * .Net Framework4.8

Installation Method

There isn't installer. Copy the software-folder to any local directory, then execute the software(Deconvolution.exe).

Software Function Description



1. Input Waveform's Display Pane

This pane is for displaying the source signal waveform f (cyan) and the observed waveform m (magenta). Besides, to load the waveform's CSV file can be available by dragging and dropping.

2. Input Waveform's Display Range(Upper Limit Threshold)

This is an upper limit threshold of the input waveform. Adjust the display range.

3. Input Waveform's Display Range(Lower Limit Threshold)

This is a lower limit threshold of the input waveform. Adjust the display range.

4. Deconvolution Waveform's Display Pane

This pane is for displaying the deconvolution waveform s .

5. Deconvolution Waveform's Display Range(Upper Limit Threshold)

This is an upper limit threshold of the deconvolution waveform. Adjust the display range.

6. Deconvolution Waveform's Display Range(Lower Limit Threshold)

This is a lower limit threshold of the deconvolution waveform. Adjust the display range.

7. Load Waves

Load the input waveforms. The input file is CSV format. Besides, dragging and dropping CSV file to (1) can be available. CSV file must be 2 columns format.

f	m
0	0
2	0
4	8
6	20
8	40
10	70

The first column is the source signal waveform f , the second column is the observed waveform m . The data after the third column will be ignored. The data count must be above 16, and the row which have the data except digits will be skipped to read.

8. Load Source Wave

Load the source signal waveform f . The input file is CSV format. CSV file must be 1 column format.

f
0
2
4
6
8
10

The data after the second column will be ignored. The data count must be above 16, and the row which have the data except digits will be skipped to read.

9. Load Conv Wave

Load the observed waveform m . The input file is CSV format. CSV file must be 1 column format.

m
0
0
8
20
40
70

The data after the second column will be ignored. The data count must be above 16, and the row which have the data except digits will be skipped to read.

10. S/N[dB]

Specify S/N ratio(r) of Wiener deconvolution.

11. Deconv.

Execute Wiener deconvolution.

12. Save Waves

Save the input waveforms and the deconvolution waveform as CSV format file.

f	m	s
0	0	0
2	0	1
4	0	2
6	0	3
8	0	4
10	0	5

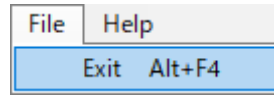
13. Help

Help
View Help... Ctrl+F1
About Version Information...

View Help	Display Help (this document).
About Version Information	Display Version information.

14. Exit

Exit the software. This can be available from File Menu.



Terms of Service

This software is freeware. AO Quest does not take any responsibility for the damage caused by the software.

Inquiry

Please visit the following URL for the bug or the request.

<https://ao-quest.com/>