Fourier Transform and Visualization Tool

Project Description:

I developed a tool for conducting Fourier Transform, which means converting functions from time domain to frequency domain, and visualizing both the origin and resulting functions. The Fourier Transform is an important signal processing method which simplify the calculations in processing.

Method:

Three user-defined functions were developed to fulfill the tasks. One was responsible for plotting the origin function. Another one conducted the Fast Fourier Transform, which is an efficient Fourier transform method for discrete functions, and plotted the resulting frequency domain functions. The other one generates an amplified figure with specific range of frequencies, and lists the above three figures in one column.

Demo:

To demonstrate the function of this tool, the following window functions w_1 and w_2 were converted to frequency domain and visualized.

$$y(t) = \begin{cases} w(t), -0.5 < t < 0.5 \\ 0, elsewhere \end{cases}$$

(a) $w_1(t) = 1$

(b) $w_2(t) = 1 - 2|t|$

Result: