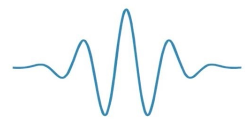

$$F(a,b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{+\infty} f(t)\, \psi^*\left(\frac{t-b}{a}\right) dt$$

Wavelets Transform Classifications

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Objective

- talk about briefly the classifications of wavelet transforms

1. Classes of Wavelet Transforms

- divided into two broad classes:
  - continuous wavelet transforms
  - discrete wavelet transforms

(1) Continuous Wavelet Transforms (CWT)

- continuous scale parameter(a) and shift (position) parameter (b)

$$C(a,b) = \int_{-\infty}^{\infty} f(t)\psi^*_{a,b}(t)dt$$

where: the * is the complex conjugate symbol, $a \in \mathbb{R}^{+*}$, $b \in \mathbb{R}$

- Base wavelet:

$$\psi_{a,b}(t) = \frac{1}{\sqrt{a}}\psi(\frac{t-b}{a})$$

By continuously varying the values of the scale parameter, a, and the position parameter, b, we obtain the cwt coefficients $C(a,b)$.

(2) Discrete Wavelet Transforms

- Any wavelet transforms for which the wavelets are discretely sampled
- the sampling of the frequency axis corresponds to dyadic sampling
- the scale parameter is discretized to integer powers of 2
- Base wavelet:

$$\psi_{s,\tau}(t) = \frac{1}{\sqrt{2^j}}\psi(\frac{t-2^jk}{2^j})$$

$$\text{where: } a = 2^j, b = 2^jk$$

As the signal $f(t)$ occurs at discrete integer time steps t, the dyadic discrete wavelet transforms can be written as:

$$C(j,k) = \frac{1}{\sqrt{2^j}}\sum_{j,k\in Z} f(t)\psi_{(2^j,2^jk)}$$

- The discrete wavelet transforms (DWT) decomposes a signal into a set of mutually orthogonal wavelet basis functions.

2. Other Classification Methods

- Data Dimentions
  - 1D
  - 2D
  - nD
- Decomposition Levels
  - single level
  - multilevel
- Discrete Wavelet Transforms
  - Discrete Wavelet Transform (DWT)
  - Sationary Wavelet Transform (SWT)
  - Multiresolutiom Analysis (MRA)
  - Wavelet Packet Transform (WPT)
  - Maximum Overlap Discrete Wavelet Transform (MODWT)
  - Multiresolutiom Analysis based on MODWT (MODWTMRA)