FFT

Uses Complex Fourier Series

$$f(x) = \sum_{k=-\infty}^{\infty} c_k e^{-ik\pi x/L} = a_0 + \sum_{1}^{\infty} a_n \cos\left(\frac{n\pi x}{L}\right) + b_n \sin\left(\frac{n\pi x}{L}\right)$$

$$c_k = \frac{a_k + i b_k}{2} \quad k>0, \quad c_0 = a_0, \quad c_{-k} = \frac{a_k - i b_k}{2}, \quad k>0$$

Orthogonal set on $[-L, L]$ $\left\{ e^{in\pi x/L} \right\}_{n=-\infty}^{n=\infty}$

$$\int_{-L}^{L} \bar{h}_1 h_2 \, dx = 0 \text{ if } h_1 \neq h_2$$

$\bar{\ }$ means complex conjugate