Convolution

Not that convolution...

Definition

Discrete time convolution:

$$ (f \ast g)[n] \equiv \sum_{m = -\infty}^{\infty} f[m]g[n-m] $$

Continuous time convolution:

$$ (f \ast g)(t) \equiv \int_{-\infty}^{\infty} f(\tau)g(t - \tau) d\tau $$

Properties

- Convolution is commutative:

$$ f \ast g = g \ast f $$

- Convolution is associative:

$$ f \ast (g \ast h) = (f \ast g) \ast h $$

- Convolution is distributive over addition:

$$ (f + g) \ast x = f \ast x + g \ast x $$

Frequency domain

- Convolution in the time/spatial domain is equivalent to multiplication in the frequency domain. The inverse is also true.

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Last update: **2024-04-30 04:03**