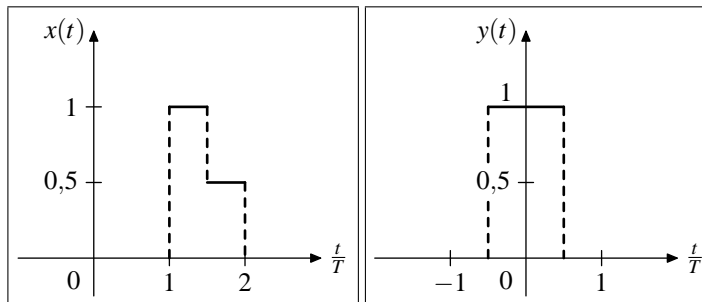


**Aufgabe**

Gegeben sind die beiden Energiesignale $x(t)$ und $y(t)$. Gesucht sind

1. Kreuzkorrelation $s_{XY}(\tau)$ und
2. Autokorrelation $s_{YY}(\tau)$.

**1 Kreuzkorrelation**

$$s_{XY}(\tau) = \int_{-\infty}^{\infty} x(t) \cdot y(t - \tau) dt \quad (1)$$

$$s_{XY}(\tau) = \int_1^{1.5} y(t - \tau) dt + \int_{1.5}^2 \frac{1}{2} y(t - \tau) dt \quad (2)$$

$\tau \leq 0.5$:

$$s_{XY} = 0$$

$0.5 \leq \tau \leq 1$:

$$s_{XY} = t \Big|_1^{\tau+0.5} = \tau + 0.5 - 1 = \tau - 0.5$$

$1 \leq \tau \leq 1.5$:

$$s_{XY} = t \Big|_1^{\tau+0.5} + 0.5t \Big|_{1.5}^{\tau+0.5} = 1.5 - 1 + 0.5\tau + 0.25 - 0.75 = 0.5\tau$$

$1.5 \leq \tau \leq 2$:

$$s_{XY} = t \Big|_{\tau-0.5}^{1.5} + 0.5t \Big|_{1.5}^2 = 1.5 - 1 + \tau + 0.5 + 1 - 0.75 = -\tau + 2.25$$

$2 \leq \tau \leq 2.5$:

$$s_{XY} = 0.5t \Big|_{\tau-0.5}^2 = 1 - 0.5\tau + 0.25 = -0.5\tau + 1.25$$

$\tau \geq 2.5$:

$$s_{XY} = 0$$

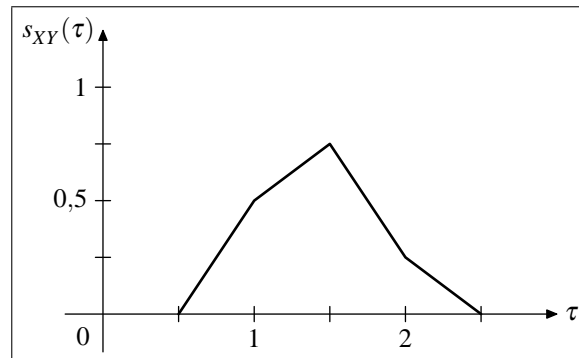


Abbildung 1: Kreuzkorrelation

2 Autokorrelation

$$s_{YY}(\tau) = \int_{-\infty}^{\infty} y(t) \cdot y(t - \tau) dt \quad (3)$$

$$s_{YY}(\tau) = \int_{-0.5}^{0.5} y(t) \cdot y(t - \tau) dt \quad (4)$$

$$\tau \leq -1:$$

$$s_{YY} = 0$$

$$-1 \leq \tau \leq 0:$$

$$s_{YY} = t \Big|_{-0.5}^{0.5\tau} = 0.5 + \tau + 0.5 = \tau + 1$$

$$0 \leq \tau \leq 1:$$

$$s_{YY} = t \Big|_{\tau-0.5}^{0.5} = 0.5 - \tau + 0.5 = -\tau + 1$$

$$\tau \geq 1:$$

$$s_{YY} = 0$$

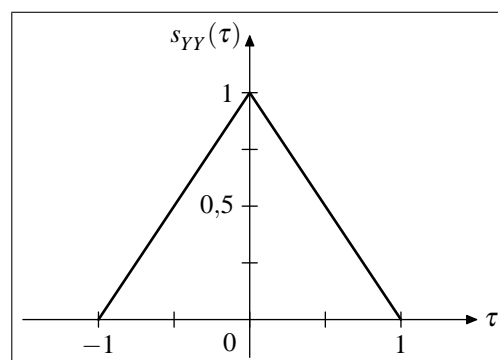


Abbildung 2: Autokorrelation

Mit freundlicher Unterstützung von René Doß.