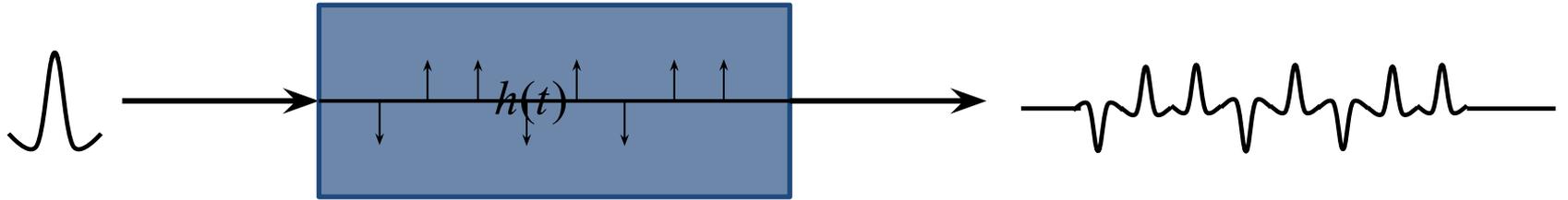


Convolution (Свертка)
(Фильтрация)

Deconvolution (ДеСвертка)
(Обратная
фильтрация)

Convolution



$$\text{Input Curve} * = \text{Output Curve}$$

The diagram shows the input curve from the previous diagram followed by an asterisk symbol, an equals sign, and the output curve from the previous diagram, representing the convolution operation.

Convolution

$$x(t) * h(t) = y(t)$$

$$y(t) = \int_0^t x(\tau) \cdot h(t - \tau) d\tau$$

$$c_k = \sum_{j=0}^n a_{k-j} b_j \quad n = N + M - 1$$

Convolution

$$x(t) * h(t) = y(t)$$

$$X(\omega) \cdot H(\omega) = Y(\omega)$$

Deconvolution

$$y(t) * h^{-1}(t) = x(t)$$

$$Y(\omega) \cdot H^{-1}(\omega) = X(\omega)$$

$$x(t) \xleftrightarrow{F} X(\omega)$$

$$y(t) \xleftrightarrow{F} Y(\omega)$$

$$h(t) \xleftrightarrow{F} H(\omega)$$

$$h^{-1}(t) \xleftrightarrow{F} H^{-1}(\omega)$$

$$H^{-1}(\omega) \cdot H(\omega) = 1$$

Convolution -Deconvolution

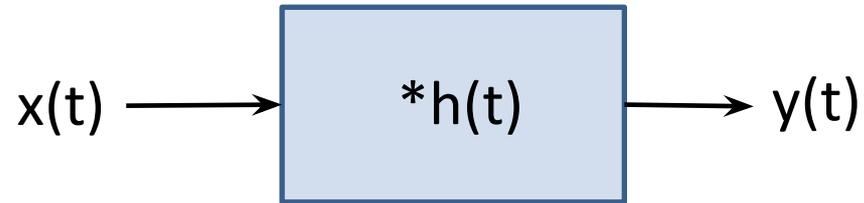
$$x(t) * h(t) = y(t)$$

$$X(\omega) \cdot H(\omega) = Y(\omega)$$

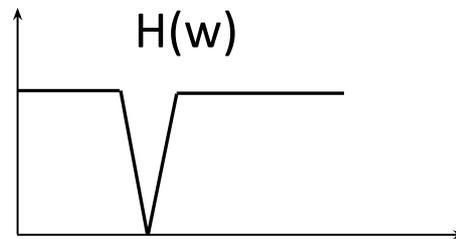
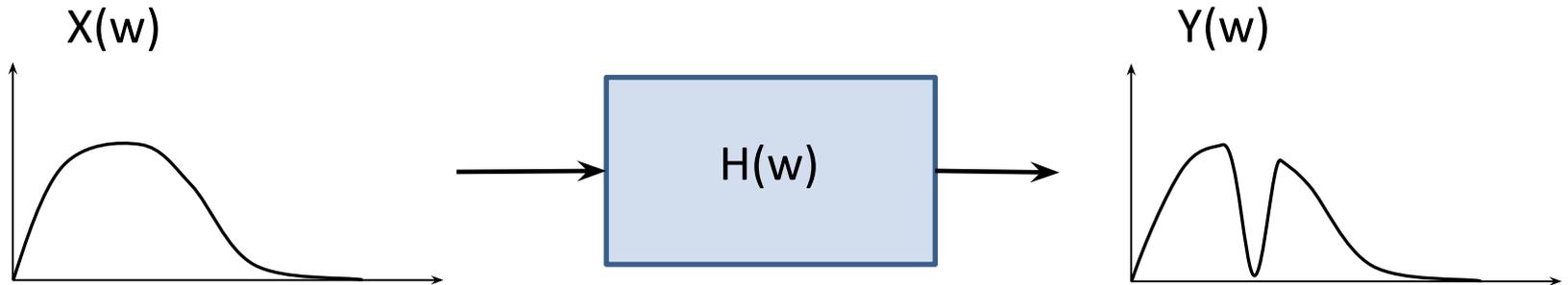
$$H(\omega) = \frac{Y(\omega)}{X(\omega)}$$

$$H^{-1}(\omega) = \frac{X(\omega)}{Y(\omega)}$$

Convolution – Deconvolution

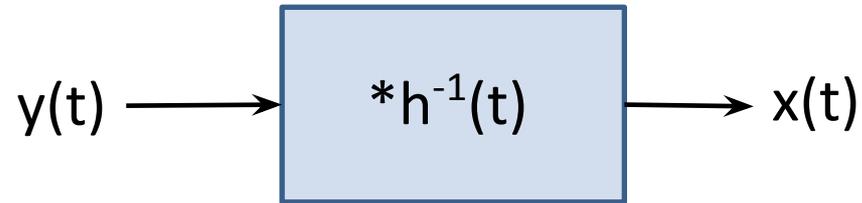


Time domain

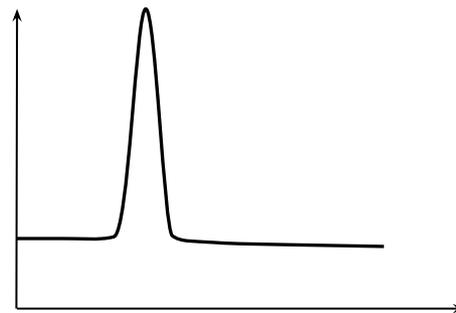
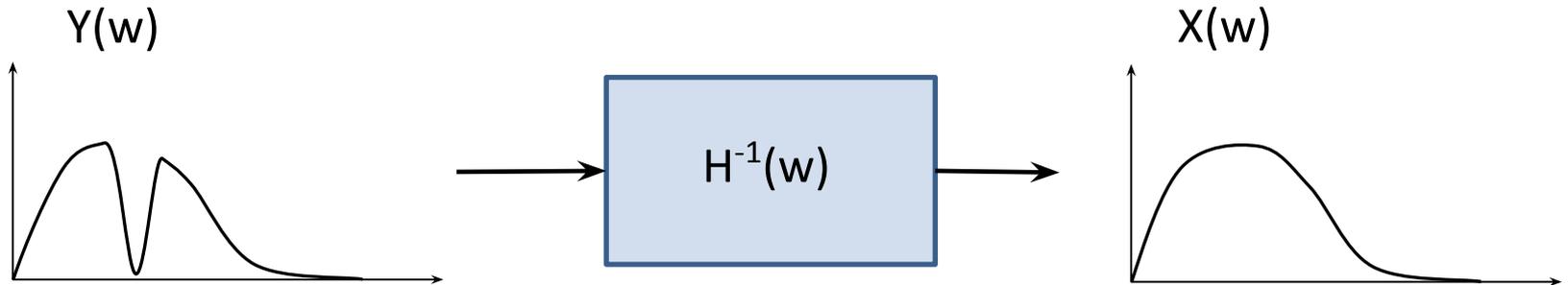


Frequency domain

Convolution – Deconvolution



Time domain



Frequency domain

Convolution (Свертка)

$$x(t) * h(t) = y(t)$$

$$X(\omega) \cdot H(\omega) = Y(\omega)$$

Deconvolution

$$y(t) * h^{-1}(t) = x(t)$$

$$Y(\omega) \cdot H^{-1}(\omega) = X(\omega)$$

$$x(t) \xleftrightarrow{F} X(\omega)$$

$$y(t) \xleftrightarrow{F} Y(\omega)$$

$$h(t) \xleftrightarrow{F} H(\omega)$$

$$h^{-1}(t) \xleftrightarrow{F} H^{-1}(\omega)$$

$$H^{-1}(\omega) \cdot H(\omega) = 1$$

Метод наименьших квадратов (МНК, Ordinary Least Squares, OLS)

$$L = \sum_{k=0}^n [x_k - y_k * f_k]^2 \rightarrow \min \quad f_k \rightarrow h_k$$

$$\left\{ \begin{array}{l} \frac{\partial L}{\partial f_k} = 0 \end{array} \right.$$

$$y_k = (1; -\frac{1}{2})$$

$$x_k = (1; 0; 0)$$

$$f_k = (f_1; f_2)$$

Задание домой

По трем точка получить уравнение параболы. Парабола выбирается каждым самостоятельно. Решение принести с собой.