NONPARAMETRIC SYSTEM MODELLING

- TIME-DOMAIN: IMPULSE RESPONCE
  STEP RESPONCE
- FREQUENCY-DOMAIN: FFT

NONPARAMETRIC TIME-DOMAIN MODELING

IMPULSE RESPONCE:

$$y(t) = G_0(q)\,u(t) + v(t)$$

$$u(t) = \begin{cases} A & t = 0 \\ 0 & t \neq 0 \end{cases}$$

DIRAC-DELTA
KRONECKER-DELTA

$$y(t) = \sum_{k=0}^{\infty} g_0(k) q^{-k} u(t) + v(t)$$

$$= \sum g_0(k)\,u(t-k) + v(t)$$

$$= A\,g_0(t) + v(t)$$

IF NOISE LEVEL SMALL: $\hat{g}_0(t) = \frac{1}{A} y(t)$

ERROR: $e(t) = \frac{1}{A} v(t)$

STEP RESPONCE:

$$u(t) = \begin{cases} A & t \geq 0 \\ 0 & t < 0 \end{cases}$$

$$y(t) = \sum_{0}^{\infty} g_0(k)\,u(t-k) + v(t) = A \sum_{1}^{t} g_0(k) + v(t)$$

$$\hat{g}_0(t) = \frac{y(t) - y(t-1)}{A} \qquad e(t) = \frac{v(t) - v(t-1)}{A}$$

CORRELATION ANALYSIS

$$\bar{E}\,u(t)v(t-\tau) \equiv 0$$

$$y(t) = \sum_{0}^{\infty} g_0(k)\,u(t-k) + v(t)$$

↳ a. STAT., $R_u(\tau)$

$$\bar{E}\,y(t)u(t-\tau) = R_{yu}(\tau) = \sum_{0}^{\infty} g_0(k)\,R_u(k-\tau)$$

IF INPUT WHITE NOISE $R_u(\tau) = \alpha \delta_{k\tau}$

$$= \alpha\, g_0(\tau)$$