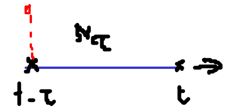
$$① = \frac{(1-e^{-\lambda\tau})}{2\pi} \exp - \frac{z_1^2+z_2^2}{2\sigma^2}$$



$+$

$$② = \underbrace{P(z_t = z_2 \mid z_{t-\tau} = z_1, N_\tau = 0)}_{\delta(z_2 - z_1)} \underbrace{P(z_{t-\tau} = z_1 \mid N_\tau = 0)}_{P_{X_0}(z_1)} \underbrace{P(N_\tau = 0)}_{e^{-\lambda\tau}} = \frac{e^{-\lambda\tau}}{\sqrt{2\pi\sigma^2}} e^{-z_1^2/2\sigma^2} \delta(z_2 - z_1)$$

$$③ \quad \gamma_z(\tau) = e^{-\lambda\tau} \sum_{k=0}^{\infty} \gamma_x(n) \frac{(\lambda\tau)^n}{n!}$$

$$x_n = \alpha x_{n-1} + u_n \qquad \{u_n\} \text{ iid.} \quad \mathbb{E}[u_n] = 0, \quad \mathbb{E}[u_n^2] = \beta$$

$$|\alpha| < 1$$

$$\gamma_x(n) = \mathbb{E}[x_k \cdot x_{k-n}]$$

$$\gamma_x(0) = \mathbb{E}[x_n^2] = \alpha^2 \underbrace{\mathbb{E}[x_{n-1}^2]}_{\gamma_x(0)} + \underbrace{\mathbb{E}[u_n^2]}_{\beta} + 2\alpha \underbrace{\mathbb{E}[x_{n-1} \cdot u_n]}_{0} \rightarrow \gamma_x(0) = \frac{\beta}{1-\alpha^2}$$

$$\underbrace{\mathbb{E}[x_n \cdot x_{n-k}]}_{\gamma_x(k)} = \alpha \underbrace{\mathbb{E}[x_{n-1} x_{n-k}]}_{\gamma_x(k-1)} + \underbrace{\mathbb{E}[u_n x_{n-k}]}_{0} \rightarrow \gamma_x(k) = \alpha \gamma_x(k-1)$$

$$\gamma_x(k) = \frac{\beta}{1-\alpha^2} \cdot \alpha^k \qquad |\alpha| < 1$$

$$\gamma_z(\tau) = e^{-\lambda\tau} \underbrace{\frac{\beta}{1-\alpha^2}}_{\sigma_x^2} \sum_{k \geq 0} \frac{(\lambda\tau)^k}{k!} \alpha^k = \sigma_x^2 e^{-\lambda(1-\alpha)\tau}$$

- * Conditioning on gaussian vectors
- * Lin. Mean square estimation of parameters
- * → Antenna Processing
- * → Spectrum Estimation