Calculos Teoricos Taller #1.

Funcion de transferencia

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$$\frac{C_1R_1s}{C_1C_2R_1R_2s^2+s(C_1R_1+C_2R_1+C_2R_2)+1}$$

PDF

$$P(X=K)=\frac{(e^{-\lambda}\cdot\lambda^{K})}{K!} \qquad P(X=K)=\frac{(e^{-2}*2^{K})}{K!} \quad , K=0,1,2\ldots,10000.$$

Lambda estimado a la salida del sistema slit.

$$Y(t)=X(t)*h(t)$$

$$E[Y(t)]=E[X(t)*h(t)]$$

$$m_{1y}=E\left[\int X(t-\tau)h(t)dt\right] \text{ (convolucion)}$$

$$m_{1y}=\int E[X(t-\tau)h(t)]dt$$

$$m_{1y}=\int E[X(t)]E[h(t)]dt$$

$$m_{1y}=\int E[X(t)]h(t)dt$$

$$m_{1y}=\int m_{1x}h(t)dt$$

Teniendo en cuenta que:

$$E[X]=\sum_{K=0}^{\infty}K\left(\frac{e^{-\lambda}\lambda^{K}}{K!}\right)=e^{-\lambda}\sum_{K=1}^{\infty}\frac{K\lambda^{K}}{K!}=e^{-\lambda}\sum_{K=1}^{\infty}\frac{\lambda^{K}}{(K-1)!}=\lambda e^{-\lambda}\sum_{K=1}^{\infty}\frac{\lambda^{K-1}}{(K-1)!}$$

$$=\lambda e^{-\lambda}\sum_{j=0}^{\infty}\frac{\lambda^{j}}{j!}=\lambda e^{-\lambda}e^{\lambda}=\lambda.$$

$$=\lambda_y=\int\lambda_x h(t)dt$$

$$\lambda_y = \lambda_x \int h(t)(1)\,dt$$

$$\lambda_y = \lambda_x \int h(t)\, e^{-jwt}\,dt \Big|_{w=0}$$

$$\lambda_y = \lambda_x\, H(0)$$

$$\lambda_y = 2 \cdot \frac{C_1R_1(0)}{C_1C_2R_1R_2(0)^2 + 0(C_1R_1 + C_2R_1 + C_2R_2) + 1}$$

$$\lambda_y = 2 \cdot \frac{0}{1} = 0$$

$$\lambda_y = 0$$

Maxima Verosimilitud de Lambda.

$$X \to P(\lambda) \;/\; P(x = x_i) = \frac{e^{-\lambda}\cdot\lambda^{x}}{x!}$$

$$P(x,\lambda) = P(x_1,\lambda)\cdot P(x_2,\lambda)\cdot \ldots \cdot P(x_n,\lambda) = \left(\frac{e^{-\lambda}\cdot\lambda^{x_1}}{x_1!}\right)\left(\frac{e^{-\lambda}\cdot\lambda^{x_2}}{x_2!}\right)\cdot\ldots$$

$$\ldots\cdot\left(\frac{e^{-\lambda}\cdot\lambda^{x_n}}{x_n!}\right) = \left(\frac{e^{-n\lambda}\cdot\lambda^{\sum x_i}}{\prod^{n} x_i!}\right) =$$

$$= L(x_1, x_2, \ldots, x_n, \lambda) \to \text{Funcion de Verosimilitud.}$$

$$\ln\left[L(x_1,x_2,\ldots,x_n,\lambda)\right] = \ln\left[\frac{e^{-n\lambda}\cdot\lambda^{\sum x_i}}{\prod^{n} x_i!}\right] = (-n\lambda)\cancelto{1}{\ln e} + \sum x_i \ln\lambda - \ln \prod x!$$

$$\frac{\partial}{\partial\lambda}\left[\ln\left[L(x_1,x_2,\ldots,x_n,\lambda)\right]\right] = \frac{\partial}{\partial\lambda}[-n\lambda] + \frac{\partial}{\partial\lambda}\left[\sum x_i \ln\lambda\right] + \cancelto{0}{\frac{\partial}{\partial\lambda}\left[\ln\prod x_i\right]}$$

$$= \frac{\partial}{\partial\lambda}[-n\lambda] + \frac{\partial}{\partial\lambda}\left[\sum x_i \ln\lambda\right] = -n + \frac{\sum x_i}{\lambda}$$

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$$\frac{\partial}{\partial \lambda}\left[\ln\left[L(x_1, x_2, \ldots, x_n, \lambda)\right]\right] = 0 \Rightarrow -n + \frac{\sum x_i}{\lambda} = 0$$

$$= \frac{\sum x_i}{\lambda} = n \; ; \; \lambda n = \sum x_i \; ; \; \hat{\lambda} = \frac{\sum x_i}{n}$$

Teniendo una distribucion de poisson aleatoria.

$$x_i = [2, 5, 0, 3, 2, 4, 1, 0, 4, 2, 4, 1, 5, 3, 5, 2, 1, 4, 1, 5, 4, 2,$$
$$1, 0, 2, 3, 1, 2, 0, 2, 5, 2, 1, 2, 3, 4, 2, 3, 1, 1, 1, 2, 1, 3, 2, 1,$$
$$1, 0, 0, 4]$$

Obtenemos por la formula pasada

$$\hat{\lambda} = \frac{110}{50} = 2.2$$