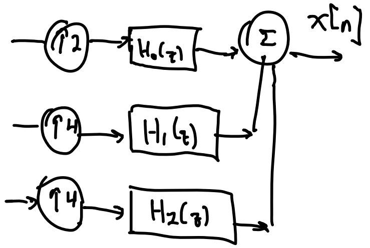


$$x[n] = a\,\psi[n] + b\,\psi[n-\delta] + \cdots$$

$$\alpha\,\phi[n] + \beta\,\phi[n-\delta] + \cdots$$

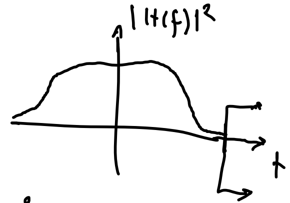
$$A\,\psi[2^{-1}n] + B\,\psi[2^{-1}n-\delta_1] + \cdots$$

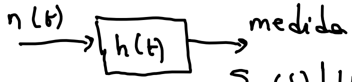
$$R_x(\tau) = E\{x(t)\,x(t-\tau)\}$$

$$S_x(f) = \mathcal{F}\{R_x(\tau)\}$$

Branco $\Rightarrow S_x(f) = N_0 \Rightarrow R_x(\tau) = N_0\,\delta(\tau)$

$$\int f(x)\,\delta(x)\,dx = f(0)$$

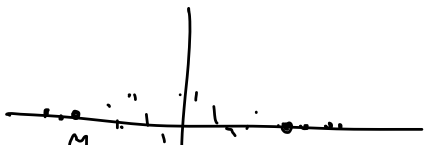




$S_n(f)\,|H(f)|^2$

$S_n(f)$ a partir daqui não importa.

$$x[n] = 0 \quad |n| \geq M$$



$$X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n]\,e^{-j\omega n} \qquad \omega: \text{rad}$$

Eu preciso saber $X(e^{j\omega})$ em quais valores de ω para determinar $x[n]$ usando o fato de que $x[n] = 0$ $|n| \geq M$.

$$X[k] = \sum_{n=-M}^{M} x[n]\,e^{-j\frac{2\pi}{N}kn} \qquad N = 2M-1$$

$$x[n] = \frac{1}{N}\sum_{k=-M}^{M} X[k]\,e^{j\frac{2\pi}{N}kn}$$

$\Rightarrow$ Preciso de $X[k]$, $k = -M, \ldots, M$

$$X[k] = X(e^{j\omega})\Big|_{\omega = \frac{2\pi}{N}k}$$

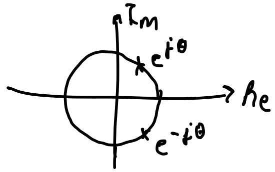
$$X(e^{jw}) = X^*(e^{-jw})$$

$$x[n] = \frac{1}{2\pi}\int_{-\pi}^{\pi} X(e^{jw})\, e^{jwn}\, dw$$

Pegue um w_0. Aparece

$$\frac{1}{2\pi}\int_{0}^{\pi} \left(X(e^{jw})\, e^{jwn} + X(e^{-jw})\, e^{-jwn}\right) dw$$

$$(e^{jwn})^* = e^{-jwn}$$



$$z + z^* = 2\, Re\{z\} \qquad z - z^* = 2jb$$

$$\underbrace{a+jb}_{z} + (\underbrace{a-jb}_{z^*}) = 2a$$

Colocando a condição $\boxed{X(e^{jw}) = X^*(e^{-jw})}$, integral fica

$$x[n] = \frac{1}{2\pi}\int_{0}^{\pi} \Big(\underbrace{X(e^{jw})\, e^{jwn} + \left(X(e^{jw})\, e^{jwn}\right)^*}_{2Re\{X(e^{jw})\, e^{jwn}\}} \Big)\, dw$$

Para um dado w_0, $X(e^{jw_0}) = j$ e $X(e^{-jw_0}) = -j$

$$j e^{jw_0 n} - j e^{-jw_0 n} = -2\, \mathrm{sen}\, w_0 n$$

$$j(\cos + j\,\mathrm{sen}) - j(\cos - j\,\mathrm{sen}) =$$

$$j\cos - \mathrm{sen} - j\cos - \mathrm{sen} = -2\,\mathrm{sen}$$

E a simetria $X(e^{jw}) = X(e^{-jw})$? Não sei

Se $X(e^{jw}) = -X^*(e^{-jw}) \Rightarrow Re\{x[n]\} = 0$

$$\left.\begin{aligned} x[n] &= \sum_{k=0}^{N-1} X[k]\, e^{j\frac{2\pi}{N}kn} \\ X[k] &= \sum_{n=0}^{N-1} x[n]\, e^{-j\frac{2\pi}{N}kn} \end{aligned}\right\} \text{DFT}$$

$$\left.\begin{aligned} x[n] &= \frac{1}{2\pi}\int X(e^{jw})\, e^{jwn}\, dw \\ X(e^{jw}) &= \sum_{n=-\infty}^{\infty} x[n]\, e^{-jwn} \end{aligned}\right\} \text{DTFT}$$

$$X(e^{jw}) = X(e^{j(w+2\pi)})$$

Fato: $e^{jwn} = e^{j(w+2\pi)n}$

Série e transformada de Fourier