date: 26 May 2020

Course: Signals and systems

Topic: 1. fourier series & transform
2. Laplace transform
3. Application of z-transform

github repository: Shradha-courses

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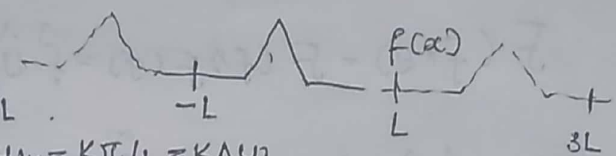
Semester & section: 4th sem 'A'

fourier transform



$f(x) = \sum_{K=-\infty}^{\infty} c_K e^{iK\pi x/L}$.

$\omega_K = K\pi/L = K\Delta\omega$

$\Delta\omega = \pi/L$

$c_K = 1/2\pi \langle f(x), \psi_K \rangle = 1/2L \int_{-L}^{L} f(x) \underbrace{e^{-iK\pi x/L}}_{\psi_K} dx$

$f(x) = \lim_{\Delta\omega \to 0} \sum_{K=-\infty}^{\infty} \frac{\Delta\omega}{2\pi} \int_{-\pi}^{\pi} f(\xi) e^{-i\Delta\omega\xi} d\xi \, e^{iK\Delta\omega x}$

$L \to -\infty$ $L \to \infty$

$= \int_{-\infty}^{\infty} 1/2\pi \underbrace{\int_{-\infty}^{\infty} f(\xi) e^{-\omega\xi} d\xi}_{f(\xi\omega)} e^{i\omega x} d\omega$

$$\boxed{\begin{aligned} f(\omega) &= \mathcal{F}(f(x)) = \int_{-\infty}^{\infty} f(x) e^{-i\omega x} dx \\ f(x) &= \mathcal{F}(A\omega) = 1/2\pi \int_{-\infty}^{\infty} f(\omega) e^{i\omega x} dx \end{aligned}}$$

fourier transform derivative

$U_{tt} = C u_{xx} \xRightarrow{\mathcal{F}} \boxed{\hat{u}_{tt} = -\omega^2 \hat{u}}$ (ODE)

$u(x,t) \Rightarrow \hat{u}(\omega, t)$

$\mathcal{F}(d/dx \, f(x)) = \int_{-\infty}^{\infty} \underbrace{\frac{df}{dx}}_{dv} \underbrace{e^{-i\omega x}}_{u} dx$

$$= \underbrace{\left[f(x)\, e^{-i\omega x}\right]_{-\infty}^{\infty}}_{uv} - \int_{-\infty}^{\infty} \underbrace{f(x)}_{v} \underbrace{(-i\omega e^{-i\omega x})}_{du}\, dx$$

$$= i\omega \underbrace{\int_{-\infty}^{\infty} f(x) e^{-i\omega x}}_{F(f(x))} dx = \underbrace{i\omega F(f(x))}_{F(df/dx)}$$

fourier transform and convolution

$$F(f * g) = F(f)F(g) = \hat{f}\,\hat{g} \qquad (f*g) = \int_{-\infty}^{\infty} f(x-\xi) g(\xi)\, d\xi$$

$$F(\hat{f}\,\hat{g})(x) = 1/2\pi \int_{-\infty}^{\infty} \hat{f}(\omega)\, \hat{g}(\omega) e^{i\omega x}\, d\omega$$

$$= 1/2\pi \int_{-\infty}^{\infty} \hat{f}(\omega) \left(\int_{-\infty}^{\infty} g(y) e^{-i\omega y}\, dy\right) e^{-i\omega x}\, d$$

$$= 1/2\pi \int_{-\infty}^{\infty} g(y) \underbrace{\int_{-\infty}^{\infty} \hat{f}(\omega)\; e^{i\omega(x-y)}\, d\omega}\, dy$$

$$= \int_{-\infty}^{\infty} g(y)\, f(x-y)\, dy$$

$$= f * g$$

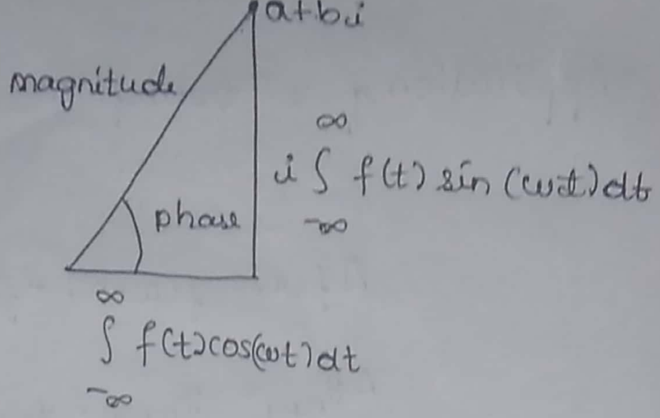
Intuition of fourier transform and Laplace transform:

$$F(\omega) = \int_{-\infty}^{\infty} f(t) e^{-i\omega t}\, dt$$

$$e^{-i\omega t} = \cos(-\omega t) + i\sin(-\omega t)$$

$$F(\omega) = \int_{-\infty}^{\infty} f(t)(\cos\omega t - i \sin \omega t)\, dt$$

$$F(\omega) = \int_{-\infty}^{\infty} f(t)\cos(\omega t)\,dt - i\int_{-\infty}^{\infty} f(t)\sin(\omega t)\,dt$$



$\omega = 2.853$

Laplace transform of first order:

The transform of $f(t)$ & $y(t)$ are $F(s)$ and $Y(s)$

defination: $\boxed{F(s) = \int_0^{\infty} f(t)\, e^{-st}\, dt}$

example

$f(t) = e^{at}$

$$F(s) = \int_0^{\infty} e^{at}\, e^{-st}\, dt = \left[\frac{e^{(a-s)t}}{a-s}\right]_0^{t=\infty}$$

$$\boxed{= \frac{1}{s-a} = F(s)}$$

$dy/dt - ay = 0$ $\quad \int_0^{\infty} dy/dt\, e^{-st} dt$

$$= \int_0^{\infty} y(t)\,(-s e^{-st}\,dt) + \left[y e^{-st}\right]_0^{\infty}$$

$$= sY(s) - y(0)$$

$sY(s) - y(0) - aY(s) = 0$

$$Y(s) = \frac{y(0)}{s-a} \xrightarrow[L.T]{\text{Inverse}} \boxed{y(t) = y(0)e^{at}}$$

$-aY(s) = \frac{1}{s-c} + y(0)$

$Y(s)$ $\quad Y(s) = \frac{1}{(s-c)(s-a)} + \frac{y(0)}{s-a}$

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$$Y(s) = \frac{1}{(s-c)(s-a)} = \frac{1}{(s-c)(c-a)} + \frac{1}{(a-c)(s-a)} \to \frac{e^{ct}}{c-a}$$

Application of z-transform:

$$\Delta f(x) = f(x+h) - f(x)$$

$$\Delta y_{n+1} = y_{n+2} - y_{n+1}$$

& hence

$$\Delta y_{n+1} + y_n = 2$$

$$\Rightarrow y_{n+2} - y_{n+1} + y_n = 2$$

$$\Delta y_{n+1} + \Delta^2 y_{n-1} = 1$$

$$y_{n+2} - y_{n+1} + \Delta(\Delta y_{n-1}) = 1$$

now $\Delta y_{n-1} = y_n - y_{n-1}$

& $\Delta(\Delta y_{n-1}) = \Delta(y_n - y_{n-1})$

$$= \Delta y_n - \Delta y_{n-1}$$

$$= y_{n+1} - y_n - (y_n - y_{n-1})$$

$$= y_{n+1} - 2y_n + y_{n-1}$$

$$y_{n+2} - y_{n+1} + y_{n+1} - 2y_n + y_{n-1} = 1$$

$$y_{n+2} - 2y_n + y_{n-1} = 1$$

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date: 26 May 2020 Name: SHRADHA

Course: python USN: 4AL17EC088

Topic: 1. graphical user interfaces tinkter

Semester & section: 4th sem 'A'

2. interacting with databases

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1. graphical user interface with ~~Tkakter~~ Tkinter

* Setting up a GUI with widgets

* connecting GUI widgets with call back functions

* create a multi widget GUI

2. interacting with databases.

* post greSQL & MySQL are two of the most common open source databases for storing python web application data

* selecting, ~~inste~~ inserting, deleting & upadating post greSQL Records

* Querying data from MySQL database