

EE3025 Assignment-1

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Download all python codes from

https://github.com/Adithya-Vardhan/gvv_1/tree/main/codes

and latex-tikz codes from

https://github.com/Adithya-Vardhan/gvv_1

$$H(z) = \frac{1 + z^{-2}}{1 + \frac{1}{2}z^{-1}} \quad (2.0.6)$$

$$H(z) = z^{-1} \left[\frac{1}{1 + \frac{1}{2}z^{-1}} + \frac{z^{-2}}{1 + \frac{1}{2}z^{-1}} \right] \quad (2.0.7)$$

By applying inverse z-transform we get,

$$h(n) = \left[\frac{-1}{2} \right]^n u(n) + \left[\frac{-1}{2} \right]^{n-2} u(n-2) \quad (2.0.8)$$

1 PROBLEM

Compute

$$X(k) \triangleq \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \dots, N-1 \quad (1.0.1)$$

and $H(k)$ using $h(n)$.

By using equation 1.0.1

$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \dots, N-1 \quad (2.0.9)$$

2 SOLUTION

and

Let

$$x(n) = \left\{ \underset{\uparrow}{1}, 2, 3, 4, 2, 1 \right\} \quad (2.0.1)$$

$$H(k) = \sum_{n=0}^{N-1} h(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \dots, N-1 \quad (2.0.10)$$

and the given difference equation is

$$y(n) + \frac{1}{2}y(n-1) = x(n) + x(n-2) \quad (2.0.2)$$

By applying Z-transform to the above equation we get,

$$Y(z) + \frac{1}{2}z^{-1}Y(z) = X(z) + z^{-2}X(z) \quad (2.0.3)$$

$$Y(z) = \frac{2(z^2 + 1)}{z(2z + 1)}X(z) \quad (2.0.4)$$

Therefore $H(z)$ is

$$H(z) = \frac{2(z^2 + 1)}{z(2z + 1)} \quad (2.0.5)$$

from above mentioned python codes we get the following plots

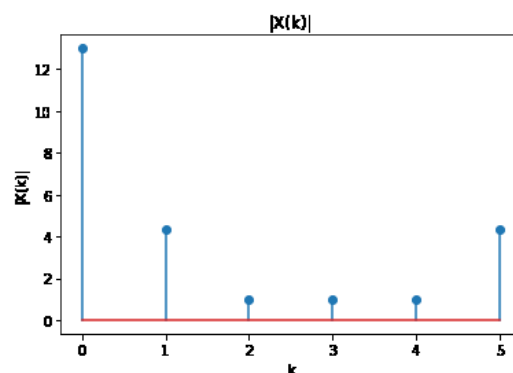


Fig. 0: Magnitude of $X(k)$

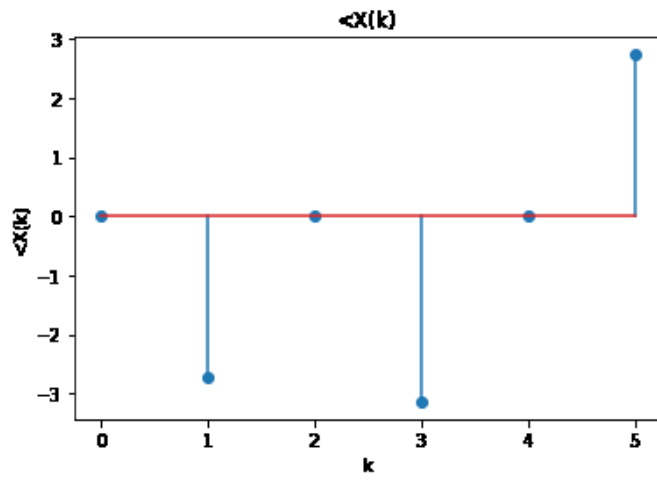


Fig. 0: Phase of $X(k)$

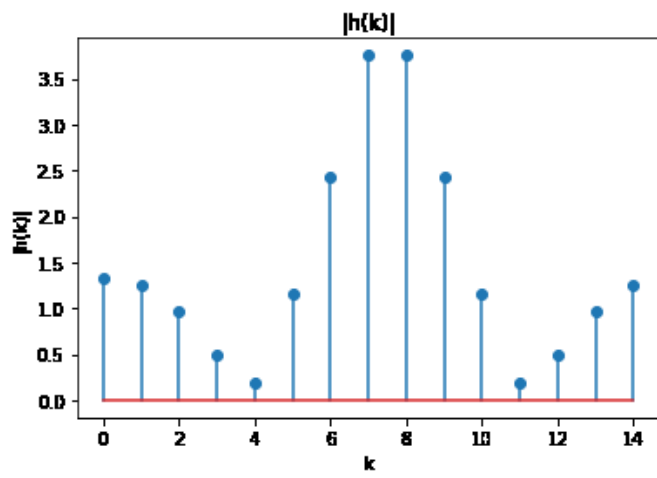


Fig. 0: Magnitude of $h(k)$

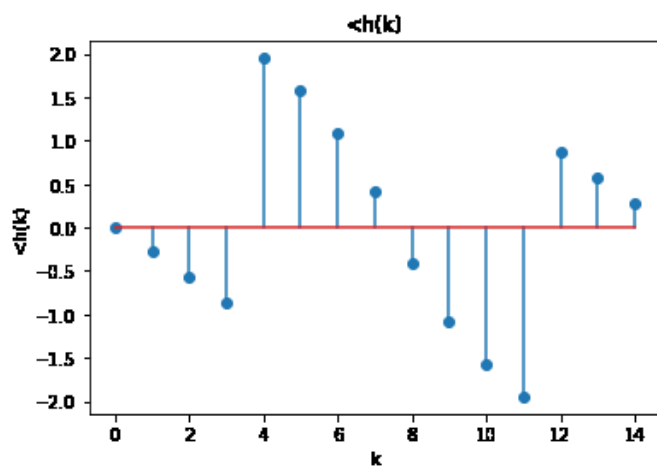


Fig. 0: Phase of $h(k)$