

DSP Homework 10

1. Write a summary of this week's video(s) and your further thoughts on the content.
2. Describe at least five hardware platforms that can do DSP and compare their architecture differences and usages.
3. An analog signal $x_a(t)$ has its spectrum

$$\tilde{x}_a(f) = \int x_a(t)e^{-j2\pi ft}dt \quad (1)$$

After converting $x_a(t)$ to digital signal $x(n)$ with its DTFT

$$\tilde{x}(f) = \sum_n x(n)e^{-j2\pi nf}, \quad (2)$$

derive the relationship between $\tilde{x}(f)$ in (2) and $\tilde{x}_a(f)$ in (1).

4. The discrete Fourier Transform (DFT) is defined as

$$\tilde{x}(k) = \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}, \quad k = 0, 1, \dots, N-1 \quad (3)$$

Starting from the original analog signal $x_a(t)$, show that the definition in (3) is reasonable.

5. Once we get $\tilde{x}(k)$ in (3), what values of k represent the high analog frequencies? And which ones represent low analog frequencies?