Discrete-Time Signal Processing Notes

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1 Introduction

DSP = good

2 Discrete-Time Signals and Systems

discrete time signals = sequence of number x, in which the nth number in the sequence is denoted $x[n]$

$$x = x[n], \quad n \in \mathbb{Z}$$

or more commonly and conveniently referenced as "the sequence $x[n]$"

some important sequences:

the *unit sample sequence* is defined as the sequence

$$\delta[n] = \begin{cases} 0 & n \neq 0 \\ 1 & n = 0 \end{cases}$$

the unit sample sequence plays the same role for discrete-time signals and systems that the unit impulse function (Dirac delta function) does for continuous-time signals and systems but without the weird maths stuff

one of the important aspects of the impulse sequence is that an arbitrary sequence can be represented as a linear combination of delayed impulses

$$x[n] = \sum_{k \in \mathbb{Z}} x[k]\delta[n-k]$$

the unit step:

$$u[n] = \begin{cases} 1 & n \geq 0 \\ 0 & n < 0 \end{cases}$$

or

$$u[n] = \sum_{k \in \mathbb{N}} \delta[k]$$