

Signal: An electromagnetic representation of data.

Continuous: $y = \sin t$; $0 \leq t \leq 2$; $-1 \leq y \leq 1$

Independent and Dependent are continuous

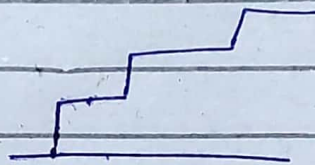
Discrete: $y = \sin t$; $t = 1, 2, 3, \dots, 10$; $-1 \leq y \leq 1$

Independent are discrete, dependent are continuous

Digital: $y = \sin t$; $t = 1, 2, 3, \dots, 10$; $y = -1, 0, 1$

dependent and independent are both discrete

$x(t) * h(t)$



2-10-22

Why DSP?

DSP provides the tools and techniques necessary to analyze, manipulate and process signals in various engineering applications.

Spectrum: List of frequencies
not range of frequencies

$$\rightarrow x[n] = \sum_{k=-\infty}^{\infty} s[n-k]x[k]$$

$$\rightarrow u[n] - u[n-1] = s[n]$$

Discrete-Time System:



Maps input to output.

* Ideal delay System:

$s[n-k]$ delayed or advanced by k .

* Moving average System:
→ it is a filter.

* Memory & memoryless System

* LTI $\begin{cases} \rightarrow \text{Additivity} \\ \rightarrow \text{Homogeneity / Scalability} \end{cases}$

$$E[x^2] - E[x]^2$$