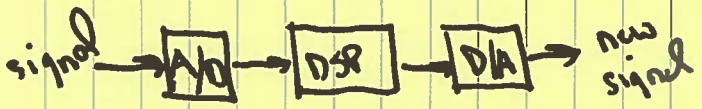
Lecture 40

"The Discrete-Time Version of Signals"



(1) A/D conversion:

The Nyquist Theorem

$f_s > 2f_{max}$

Spectrum of the sampled signal

Sinc Interpolate

Quantization: Linear/Uniform

Nonlinear/logarithmic

Sigma Delta

- Linear: SNR of 6B (B is # of bits)

(2) Systems:

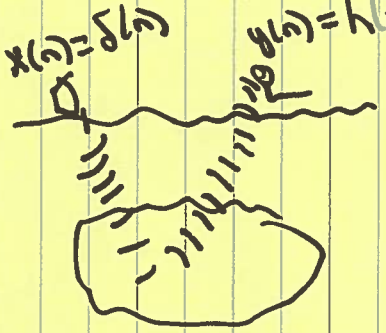
"Engineering is all about modeling systems as differential equations"

Continuous time diff. eq. ⇔ discrete-time difference equations

Linear constant coefficient difference eq.

↳ LCCD

Linearity and Time-Invariance (LTI)



h(n) ⇒ H(f)

Convolution

Direct Difference Eq. computation

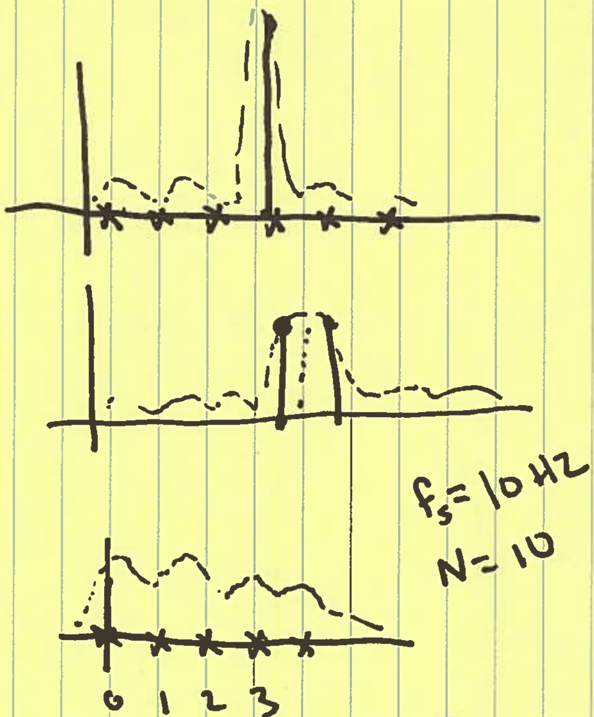
Causality ($h(n)=0$ $n<0$)

Stability (poles must be inside the unit circle)

Digital Filter Realizations

Direct Form
Canonical I + II

Aside:



$\{x_1, x_2, \ldots, x_{10}, 0\}$

11-pt DFT

$f_k = \frac{10}{11}$

$\{x_1, x_2, \ldots, x_{10}, x_{11}\}$