Digital Signal Processing Lab

Demo 8 - Exercise 1 (Echo system)

Saad Zubairi
shz2020

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1 Difference Equation

From the code:

$$y(n) = b_0 x(n) + G x(n - N)$$

with $b_0 = 1.0$, $G = 0.8$, and $N =$ the delay in samples.

2 Transfer Function

Take the Z-transform

$$Y(z) = b_0 X(z) + G z^{-N} X(z)$$

so the transfer function becomes:

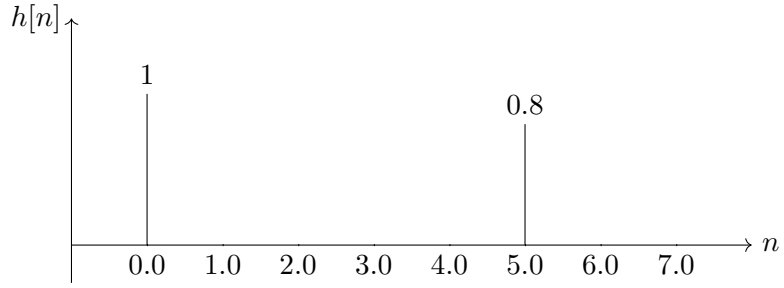
$$H(z) = \frac{Y(z)}{X(z)} = b_0 + G z^{-N}$$

3 Impulse Response

Impulse response will just be the inverse Z transform of the transfer function, which will be:

$$h(n) = b_0 \delta(n) + G \delta(n - N)$$

The sketch of which is as follows:
(for this example, we'll take a small value of $G = 5$)



4 Pole Zero Plot

Here's the pole zero plot of this filter: