



Digital Filtering

preparing for the exam - part 3, Z-plane & Crossovers

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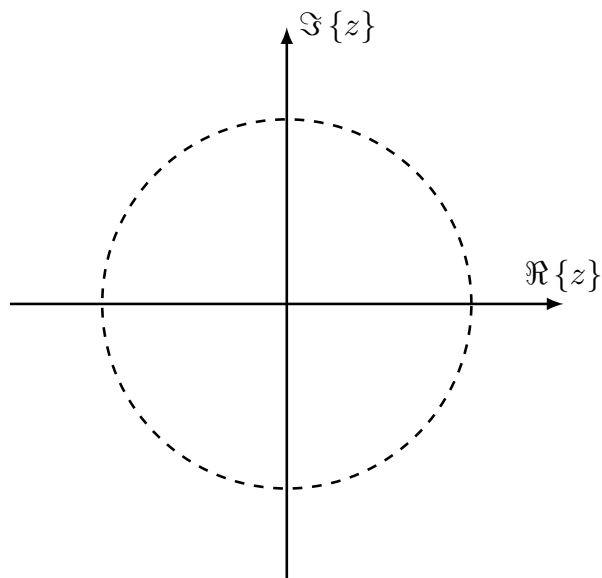


Theoretical Examples

1. A digital filter is described by the transfer function

$$H(z) = \frac{b_0}{1 - 0.4 z^{-1} + 0.29 z^{-2}}.$$

- a Find the poles and zeros of the filter.
- b Draw the poles and zeros into the unit circle.



2. A 2nd order IIR filter has 2 poles $[0.3 + j0.4, 0.3 - j0.4]$ and two zeros $[0, -1]$. Find the filter coefficients **a** and **b**.

Practical Examples

3. Prepare the filter coefficients for a 3-way 4th order Linkwitz-Riley (LR4) crossover in Python. The cutoff frequencies are $f_1 = 100$ Hz between the woofer and the midrange; $f_2 = 1$ kHz between the midrange and the tweeter; and the sample rate is 48 kHz. Export the coefficients of each filter in .txt files for Sigma Studio.

hint: `np.savetxt('coeffs.txt', np.append(b, a[1:]))`

4. Create a mono 3-way 4th order Linkwitz-Riley (LR4) crossover in Sigma Studio without using the block **Crossover**. You can use the block **General (2nd order)** that is under **Filters - Second Order - Double Precision - 1 Ch**. The cutoff frequencies are $f_1 = 100$ Hz between the woofer and the midrange; $f_2 = 1$ kHz between the midrange and the tweeter.