Most Common Mistakes (MCM)

Assignment 4

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1 Problem 4.1

- Please note, that a plot is not a sketch. A sketch is a freehand drawing. The purpose of subtask (a) was to evaluate the magnitude response by the given pole-zero representation and NOT to just plot the outcome with some scientific software.
- Please, do NOT simplify. If $r_p = 0.99$, deal with it. Do not simplify to $r_p = 1$.
- Some people misunderstood subtask (b). You were not supposed to calculate r_p and θ_{notch}. The goal was to find a constant $K(r_p, \theta_{notch})$ such that $H(e^{j\theta})\big|_{\theta=0} = 1$.
- Please note, that the system is stable, if and only if $r_p < 1$.
- A common mistake in subtask (c) was the evaluation of filter coefficients. Given the difference equation

$$y[n] = \sum_{k=0}^{K} b_k x[n-k] - \sum_{l=1}^{L} a_l y[n-l] \tag{1}$$

note the negative sign on the right-hand side. Let's assume a first-order system, $L = K = 1$ with some arbitrary coefficients. Eq.(1) would look something like this

$$y[n] = 2x[n] + 4x[n-1] - 3y[n-1] \tag{2}$$

Indeed, the coefficient $a_1 = 3$ and NOT $a_1 = -3$.

- In subtask (d), some people calculated the attenuation numerically. Please note, that the `log` function in MATLAB refers to the natural logarithm, which yields to a wrong result.
- ... given $r_p = 0.99$ is NOT a sufficient condition on stability, due to rounding of the filter coefficients.

2 Problem 4.2

- a) Keep in mind that the low-pass filter is 2π periodic too.
- a) Please draw the signals at least for one period.
- a) Many people forgot to apply a proper amplitude scaling after downsampling.
- c) Do not forget to multiply with a factor of 2 in order to reconstruct the signal. Alternatively, one can design the low-pass filters in the upper and lower branch with a gain of 2 (as some people did).