Hw #3

EEC 215

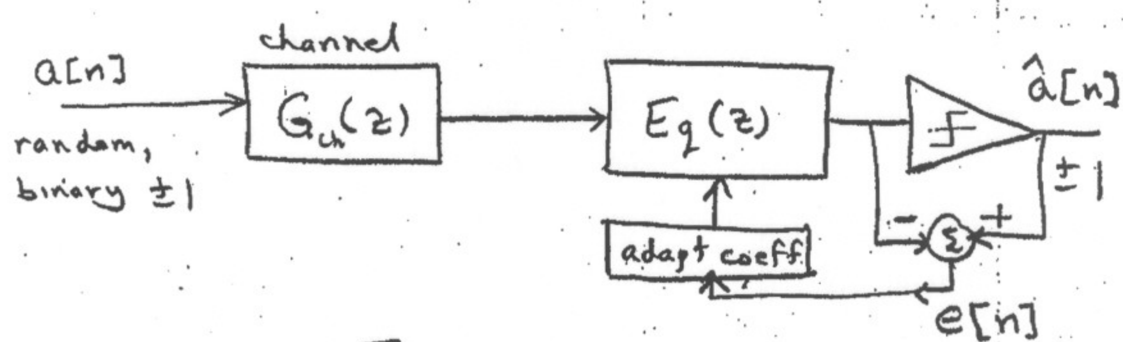


Fig. 1

$Eq(z)$ = adaptive FIR equalizer

1. a) In Fig. 1, let $G_{ch}(z) = \dfrac{K}{1 - 0.6z^{-1}}$, $K = 0.4$.

Use the LMS algorithm to adapt a 2-tap FIR equalizer. Use $\beta = 0.01$.

Preset the equalizer coeffs so $Eq(z) = 1 + 0z^{-1}$ initially. Plot the coeffs versus time.

Also plot $MSE[n] \approx \frac{1}{20} \sum_{i=0}^{19} e^2[n-i]$.

Show 5000 samples.

b) Repeat (a) using a 4-tap FIR equalizer.

What do you notice?

c) Repeat (a) using $\beta = 0.02$. Compare (a) & (c).

d) Repeat (a) using channel $G_{ch}(z)$ with $K=1$.

Compare (d) w/ (a).

2. In Fig. 1, let $G_{ch}(z) = 1 - 0.6z^{-1}$.

a) Use a 5-tap equalizer, initialized to

$E_q(z) = 1 + 0z^{-1} + 0z^{-2} + \cdots + 0z^{-4}$. Use $\beta = 0.01$.

Plot the coeffs vs. time and MSE[n]

vs. time n.

b) Repeat (a) using a 10-tap equalizer.

Compare the coeff values and the

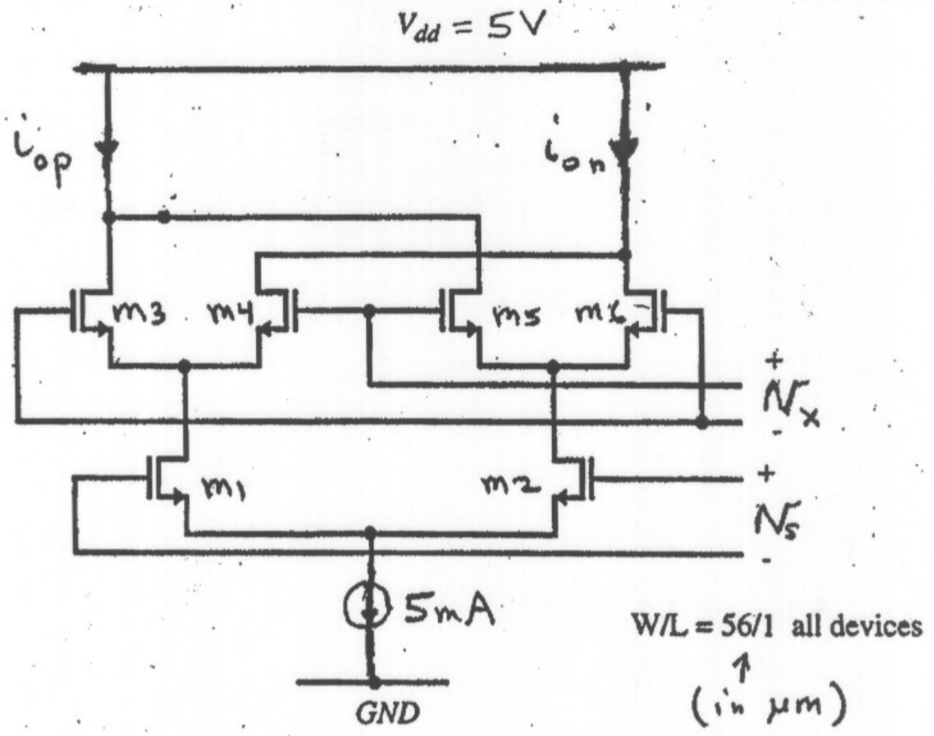
MSE in (a) & (b).

3. For a partial-response Class 4 channel,

$G(z) = 1 - z^{-2}$ (or "$1-D^2$"). Plot

$|G(z=e^{j\omega T})|$.

4.



For the analog multiplier shown above, $i_o = i_{op} - i_{on}$.

a) simulate this circuit to find A in $i_o = A N_x N_s$. Make sure all xtrs are saturated and use the models in ~hurst/215/mos_models (also on the 215 web page).

b) Let N_x be the coeff input (c_i) and N_s be the signal input ($x[n-i]$) in an analog FIR equalizer. Linearity from the $x[n-i]$ input to the output must

meet a spec. For $v_x = 0.6V_{DC}$,
determine the amplitude allowed at v_s to give a total distortion of -40dB at i_o. (Use $v_s = B\sin(2\pi 10kt)$, and use .FOUR to find the distortion - or .FFT.)