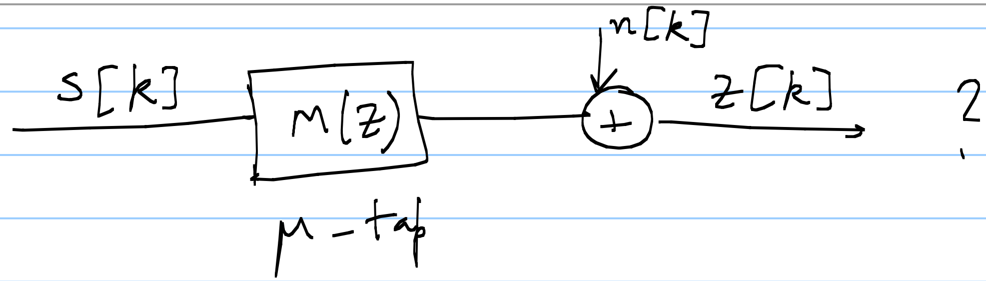
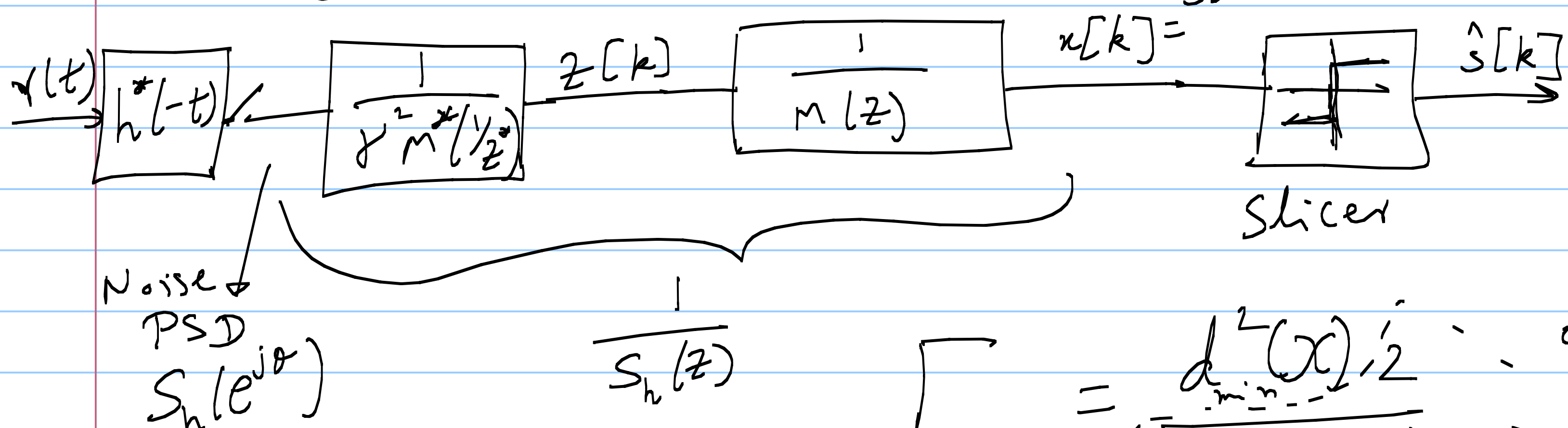
Lecture 26

Note Title 9/20/2008



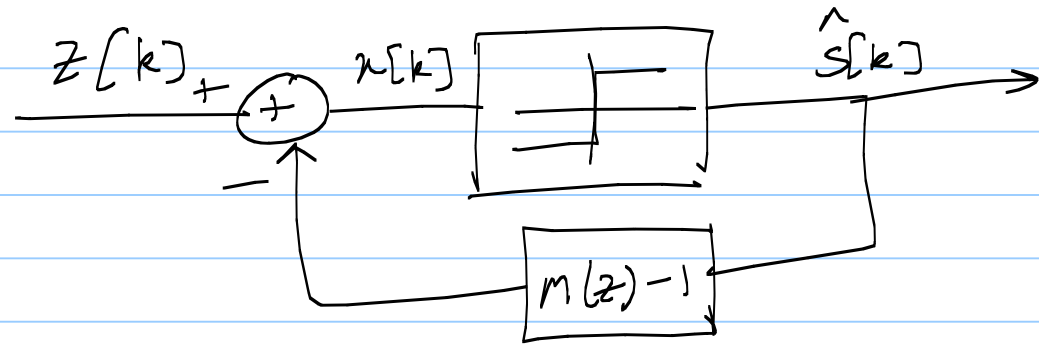
→ ZF-LE



$$\Gamma_{ZF\text{-}LE} = \frac{d_{min}^2(\mathcal{X})/2}{N_0 \left\langle \frac{1}{S_h(e^{j\theta})} \right\rangle_A}$$

σ^2

ZF-DFE:



$M(z) = 1 + m_1 z^{-1} + m_2 z^{-2} + \cdots$

$M(z) - 1 = m_1 z^{-1} + m_2 z^{-2} + \cdots$

→ past decisions are error-free.

$$x[k] = z[k] - \hat{s}[k] * m_{-1}[k]$$

$$= s[k] * m[k] + n[k] - \hat{s}[k] * m_{-1}[k]$$

$$= s[k] + n[k]$$

$$\Gamma_{ZF\text{-}DFE} = \frac{d_{min}^2(\mathcal{X})\, 2\gamma^2}{N_0}$$

σ^2 for real/imaginary part of $n[k]$.

$$\gamma^2 = \exp\left\{ \frac{1}{2\pi} \int_{-\pi}^{\pi} \log S_h(e^{j\theta})\, d\theta \right\}$$

$$= \frac{1}{\exp\left\{ \frac{1}{2\pi} \int_{-\pi}^{\pi} \log \frac{1}{S_h(e^{j\theta})}\, d\theta \right\}} = \frac{1}{\left\langle \frac{1}{S_h(e^{j\theta})} \right\rangle_G}$$

ZF-LE : $\dfrac{d_{min}^2(x) \quad 2}{N_0 \left\langle \frac{1}{S_h(e^{j\theta})} \right\rangle_A}$

ZF-DFE : $\dfrac{d_{min}^2(x) \quad 2}{N_0 \left\langle \frac{1}{S_h(e^{j\theta})} \right\rangle_G}$

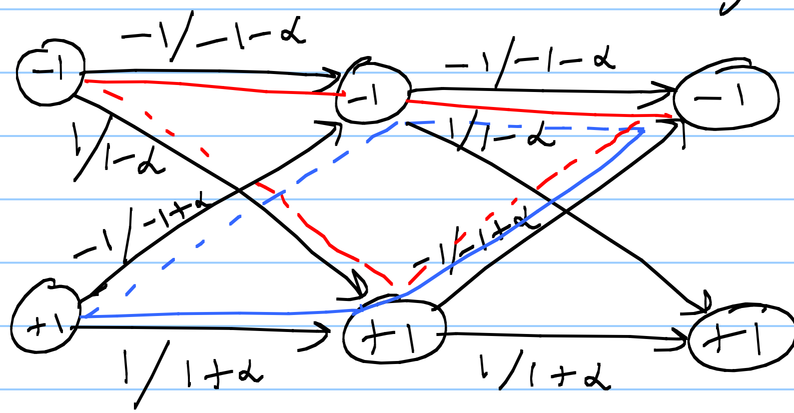
ML SD :

$$\frac{d_{min}^2}{\sigma^2} \longrightarrow$$

Ex:

$M(z) = 1 + \alpha z^{-1}$ $\quad 0 < |\alpha| < 1$

$\mathcal{X} = \{\pm 1\}$



$d_{min}^2 = 4(1+\alpha^2)$

$\Gamma_{MLSD} = \dfrac{4(1+\alpha^2)}{\sigma^2}$

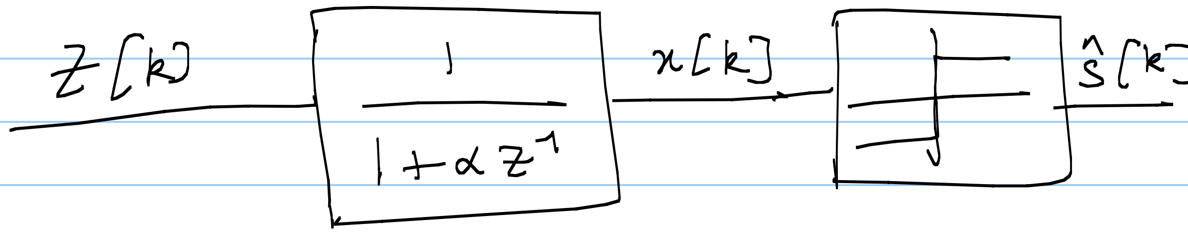
$2^2 + (2\alpha)^2 = 4(1+\alpha^2)$

$2^2 + (2\alpha)^2 = 4(1+\alpha^2)$

$S_h(z) = (1+\alpha z^{-1})(1+\alpha z)$

MF-bound: $\dfrac{4(1+\alpha^2)}{\sigma^2}$

ZF-LE:



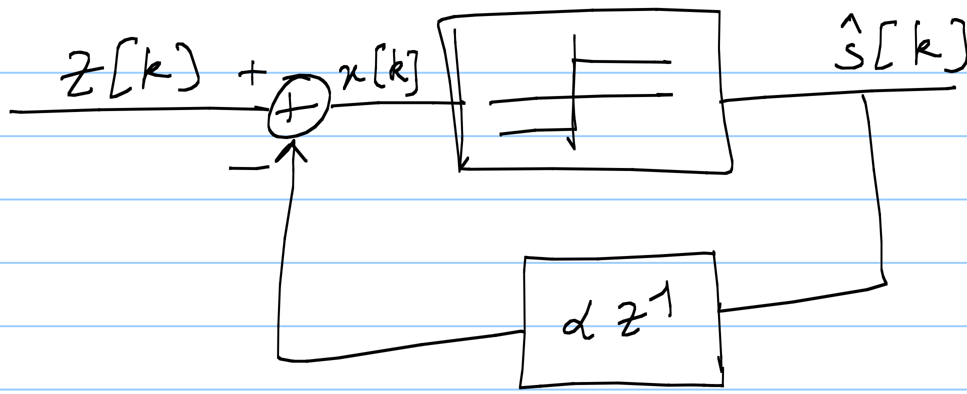
$$x[k] = z[k] - \alpha\, x[k-1]$$

$$\Gamma_{ZF\text{-}LE} = \frac{4 \cdot 2}{N_0 \cdot \left(\frac{1}{1-\alpha^2}\right)} = \frac{4(1-\alpha^2)}{\sigma^2}$$

$$\frac{1}{S_h(z)} = \frac{1}{(1+\alpha z^{-1})(1+\alpha z)} = \frac{z^{-1}}{\alpha(1+\alpha z^{-1})(1+\frac{1}{\alpha} z^{-1})}$$

$$= \frac{\frac{1}{1-\alpha^2}}{1+\alpha z^{-1}} - \frac{\frac{1}{1-\alpha^2}}{1+\frac{1}{\alpha} z^{-1}} \rightarrow \text{coeff of } z^0 = \frac{1}{1-\alpha^2}$$

ZF-DFE :



$$x[k] = z[k] - \alpha\, \hat{s}[k-1]$$

$$\Gamma_{ZF\text{-}DFE} = \frac{4}{\sigma^2}$$

Repeat $\quad M(z) = \dfrac{1}{1+\alpha z^{-1}} \qquad 0 \le |\alpha| \le 1$

$$\mathcal{X} = \{\pm 1\}$$