ZF, MMSE Equalizer

2022112807
이규환

1. ZF equalizer

$$W_{ZF} = (h^* h)^{-1} h^*$$

2. MMSE equalizer

$$G = E(xy^*)E(yy^*)^{-1} = h^*(hh^* + I_n/(S/N))$$

where

$$SNR = 10\log(S/N)$$

3. Matlab구현

$$h(t) = h_1\delta(t) + h_2\delta(t-\tau)$$

$$\tau = 3\mu s$$

$$h = \begin{bmatrix} h_1 \\ h_2 \end{bmatrix} = \begin{bmatrix} 0.775 \\ -0.632 \end{bmatrix}$$

<Matlab code>

```
%%ZF equalizer

h=[0.775;-0.632]


ZF=inv(h'*h)*h'
```

```
SNR_db =

    20


G =

    0.0077   -0.0063
```

```
%%MSE equalizer
prompt='SNR_db';
SNR_db=input(prompt)

G=h'*inv(h*h'+(10^(SNR_db/10))*eye(2))
```

```
h =

    0.7750
   -0.6320


W_ZF =

    0.7750   -0.6320
```

MMSE SNR=0dB

```
SNR_db =

     0


G =

    0.3875   -0.3160
```

MMSE SNR=10dB

```
SNR_db =

    10


G =

    0.0705   -0.0575
```

SNR=20dB

```
SNR_db =

    20


G =

    0.0077   -0.0063
```

SNR=30dB

```
SNR_db =

    30


G =

   1.0e-03 *

    0.7742   -0.6314
```