Big Book of Wireless Communication Notes

Table of Contents

Optimal Receivers

Consider received signal through a wireless channel:

$$r(t) = s_m(t) + n(t) \tag{1}$$

where $s_m(t)$ is one of M possible received waveforms. e.g. one of the symbols of an N-QAM constellation.

$$s_m(t) \in \{s_1(t), s_2(t), \cdots, s_M(t)\} \tag{2}$$

each signal has finite energy:

$$\mathcal{E}_m = \int_{-\infty}^{\infty} s_m^2(t)dt < \infty \tag{3}$$

the received signal is corrupted by zero-mean white Gaussian noise $n(t)$:

$$E\left[n(t)\right] = 0 \tag{4}$$

$$E\left[n(t)n(t-\tau)\right] = \frac{N_o}{2}\delta(0) \tag{5}$$

i.e. the noise signal at any time is uncorrelated with the noise at any other time.

$\frac{N_o}{2}$ is the noise power spectral density.

After receiving $r(t)$, the receiver has to decide which of the M possible signals was transmitted. There are many ways to decide. One example is the maximum likelihood (ML) receiver.

Maximum A-Posteriori (MAP) receiver