

16 Discrete Source, Continuous Channel

Suppose we have a binary source $X \in \{0, 1\}$, where $\Pr[X = 1] = p$. The channel output $Y = X + N$, where the additive noise N is uniformly distributed over $[0, N_{\max}]$.

- (a) What is the channel capacity when $N_{\max} < 1$?
- (b) What is the channel capacity when $N_{\max} > 1$?
- (c) We use the Hamming distortion measure.

$$d(X, \hat{X}) = \begin{cases} 0, & X = \hat{X} \\ 1, & X \neq \hat{X} \end{cases}$$

What is the smallest possible average distortion when $N_{\max} > 1$?