

ASYMPTOTIC BEHAVIOUR OF THE AVERAGE PROBABILITY OF ERROR
FOR LOW RATES OF INFORMATION TRANSMISSION

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ABSTRACT

Consider a code of finite size N with code words of length n for a discrete memoryless channel. Suppose the code words are equally probable for transmission and let the maximum likelihood decoding scheme be used for decoding the messages. Dobrushin investigated in details the asymptotic behaviour of the optimum error probability as $n \rightarrow \infty$ for the case of a binary symmetric channel. Molchanov obtained an asymptotic expression (as $n \rightarrow \infty$) for the average probability of error for a general (asymmetric) binary channel. Using the method of Dobrushin and a result of Gallager, an asymptotic expression (as $n \rightarrow \infty$) for the average probability of error for a general discrete memoryless channel with a binary input alphabet is derived in this paper. However, the results can be easily extended to the case of a general discrete memoryless channel. Some results of Dobrushin are simplified and extended. Properties of the function occurring in the asymptotic expression are discussed. Concurrent with this research, similar results though generalized have been published by Shannon, Gallager and Berlekamp.