

Low-density parity-check (LDPC) codes are linear error correcting codes which are capable of performing near channel capacity. Furthermore, they admit efficient decoding algorithms that provide near optimum performance. Their main disadvantage is that most LDPC codes have relatively complex encoders. In this thesis, we begin by giving a detailed discussion of the sum-product decoding algorithm, we then study the performance of LDPC codes on the binary erasure channel under sum-product decoding to obtain criteria for the design of codes that allow reliable transmission at rates arbitrarily close to channel capacity. Using these criteria we show how such codes are designed. We then present experimental results and compare them with theoretical predictions. Finally, we provide an overview of several approaches to solving the complex encoder problem.