

Polar coding methods for write once memories

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ABSTRACT

Write once memories are storage devices in which it is impossible or costly to erase memory cells. Flash memory is one important example. A practical coding scheme for write once memory (WOM) using polar codes is presented based on recent work in our group. It is shown that the scheme achieves the capacity region of noiseless WOMs when an arbitrary number of multiple writes is permitted. The encoding and decoding complexities scale approximately linearly with the blocklength. For blocklength sufficiently large, the error probability decreases sub exponentially in the blocklength. Furthermore, the required blocklength scales polynomially with the gap to capacity. The results can be generalized from binary to generalized WOMs, described by an arbitrary directed acyclic graph, using nonbinary polar codes. Some simulation results with finite length codes are presented. We briefly discuss some extensions.