TUM

Master's Thesis

Polar Coding for Multiple Access Communications

Multiple access channel (MAC) can be seen as the model where two or more transmitters send information to a common receiver. For instance, multiple mobile phones communicating to a base station can be modeled as a MAC. The main challenge in MAC is that the receivers may share the transmission channel in an uncoordinated way, such that their transmissions can interfere. This problem is solved in many modern communication systems by allocating orthogonal resources (like time slots or frequency bands) to the transmitters such that the interference is avoided. However, although it is a practical solution, orthogonalization is not the optimal solution if considered from an information theoretic point of view. According to the theory, non-orthogonal transmission in MAC can be beneficial in many scenarios, however for these scenarios the coding schemes should be designed carefully to benefit from the non-orthogonal communication.

Next generation cellular systems will support a multitude of services where multiple nodes are involved in the communications simultaneously, including vehicle-to-vehicle communications and massive machine communications.
For these highly challenging communication scenarios, the design of the multiple access schemes will be of practical importance. In this thesis, practical coding schemes based on polar codes for MAC should be investigated, implemented and compared to the theory and to the existing solutions.

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