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Modern Coding Schemes for Unequal Error Protection

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Zusammenfassung für die Buch-Rückseite

This work presents modern and efficient channel coding techniques for the protection of user data with heterogeneous error sensitivities. Especially multimedia data often consist of unequally important parts, such as header information, essential payload, and additional data for increased quality. Protecting all data equally can make the transmission inefficient. A system providing unequal error protection (UEP) may be much more efficient and improve the perceptual quality at the receiver

UEP transmitters and receivers should be designed such that transmission errors only lead to graceful degradation. For good channel conditions, the quality at the receiver is usually good. If the channel conditions degrade, UEP receivers should still be capable of exploiting at least the most important data in order to allow for graceful degradation instead of complete failure.

In this thesis, UEP is achieved by different approaches. The thesis investigates variable-rate convolutional and Turbo codes by applying pruning as an alternative to puncturing. Furthermore, a flexible design strategy for multilevel codes with UEP is presented. Finally, irregular LDPC codes are investigated with respect to UEP. On the one hand, they are designed for coded modulation using a detailed density evolution. On the other hand, UEP properties of parity check matrices constructed by different algorithms are analysed, and a modified algorithm is designed, leading to increased UEP capabilities.