Improved Regular And Semi-Random Rate-Compatible Low-Density Parity-Check Codes With Short Block Lengths

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Summary

Powerful rate-compatible codes are essential for achieving high throughput in hybrid automatic repeat request (ARQ) systems for networks utilising packet data transmission. The paper focuses on the construction of efficient rate-compatible low-density parity-check (RC-LDPC) codes over a wide range of rates. Two LDPC code families are considered; namely, regular LDPC codes which are known for good performance and low error floor, and semi-random LDPC codes which offer performance similar to regular LDPC codes with the additional property of linear-time encoding. An algorithm for the design of punctured regular RC-LDPC codes that have low error floor is presented. Furthermore, systematic algorithms for the construction of semi-random RC-LDPC codes are proposed based on puncturing and extending. The performance of a type-II hybrid ARQ system employing the proposed RC-LDPC codes is investigated. Compared with existing hybrid ARQ systems based on regular LDPC codes, the proposed ARQ system based on semi-random LDPC codes offers the advantages of linear-time encoding and higher throughput.

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