Network coding schemes with efficient LDPC coded MIMO–NOMA in two-way relay networks

ABSTRACT

The combination of non-orthogonal multiple access (NOMA) and multi-input multi-output (MIMO) approaches has been considered as assuring multiple access for the fifth generation technology. In this study, the performance of a 2×2 MIMO- NOMA system with low-density parity check (LDPC) codes is investigated. Redundancy with randomly interleaved differential encoding (R-RIDE) is proposed and applied to LDPC encoded messages by two users. LDPC decoding is done using the sum-product algorithm (SPA), which has two types of decoding methods, hard-decision and soft-decision. For hard-decision, bit-flipping decoder is used and for soft-decision, probability domain, log-domain, and simplified log-domain decoders are used. Bit error rate (BER) versus signal-to-noise ratio (SNR) in (dB) and average mutual information (AMI) in (bps/Hz) versus SNR (dB) are evaluated to compare the performance of the proposed and conventional LDPC schemes in NOMA and MIMO-NOMA systems. Simulation results show that both AMI and BER of the proposed LDPC-R-RIDE in MIMO-NOMA system greatly outperforms conventional LDPC coded schemes in NOMA and MIMO-NOMA systems. Moreover, the proposed R-RIDE-LDPC in MIMO-NOMA system outperforms the proposed scheme in the NOMA system. From the simulation results, LDPC-R-RIDE with simplified log-domain decoder has the best AMI result and BER performance compared with other decoding methods.