Robust beamforming and user clustering for guaranteed fairness in downlink NOMA with partial feedback

ABSTRACT

In this paper, a downlink multiuser non-orthogonal multiple access (NOMA) with full and partial channel state information (CSI) feedback is considered. We investigate beam design and user clustering from the throughput-fairness trade-off perspective. To enhance this trade-off, two proportional fairness (PF) based scheduling algorithms are proposed, each has two stages. The first algorithm is based on integrating the maximum product of effective channel gains and the maximum signal to interference ratio with the PF principle (PF-MPECG-SIR), to select the strong users in the first stage and the weak users in the second stage. This algorithm is designed to maximize the throughput with moderate fairness enhancement. Whereas, in the second algorithm, the MPECG and the maximum correlation are combined within the PF selection criterion (PF-MPECG-CORR) in order to maximize the fairness with a slight degradation in the total throughput. In addition, we present an optimal power allocation that can achieve a high data rate for the overall system without sacrificing the sum-rate of weak users under full and partial CSI. Simulation results show that the proposed PF-MPECG-CORR can significantly improve the fairness up to 50.82% and 44.90% with only 0.42% and 1.13% degradation in the total throughput, for full and partial CSI, respectively. All these performance gains are achieved without increasing the computational complexity.

Keyword: 5G; MPECG; NOMA; Partial channel state information; Proportional fairness; Power allocation; Zero-forcing beamforming