A QoE-Aware Resource Allocation Strategy for Multi-cell NOMA Networks

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Motivation

- **Quality of experience (QoE) :** QoE is a subjective assessment of media quality of users and has recently become an essential indicator in 5G wireless communication systems
- **Resource Allocation:** QoE-based resource allocation is of great significance for obtain the potential benefits of NOMA in multi-cell networks.
- **Fairness/throughput tradeoff:** QoE driven techniques will bring about the improvement of fairness and efficiency.

Proposed Solutions

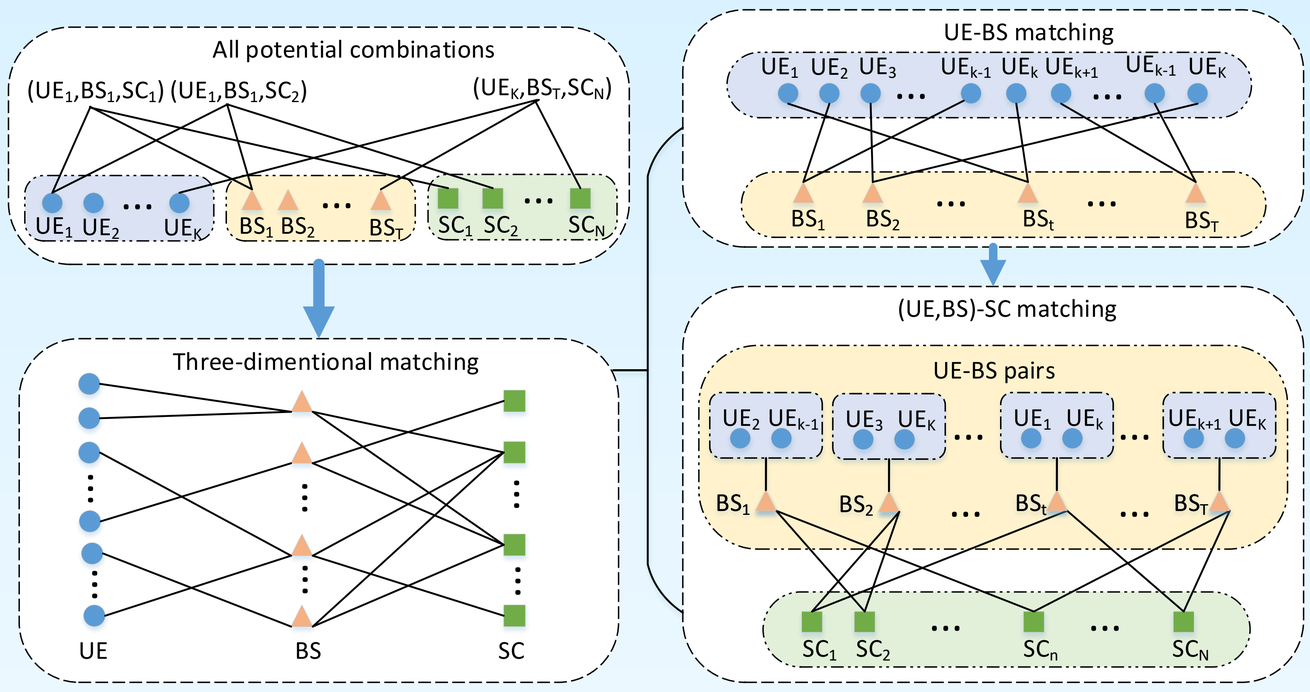


Fig. 2: Graphical expressions of 3D matching among users, BSs and subchannels.

System Model

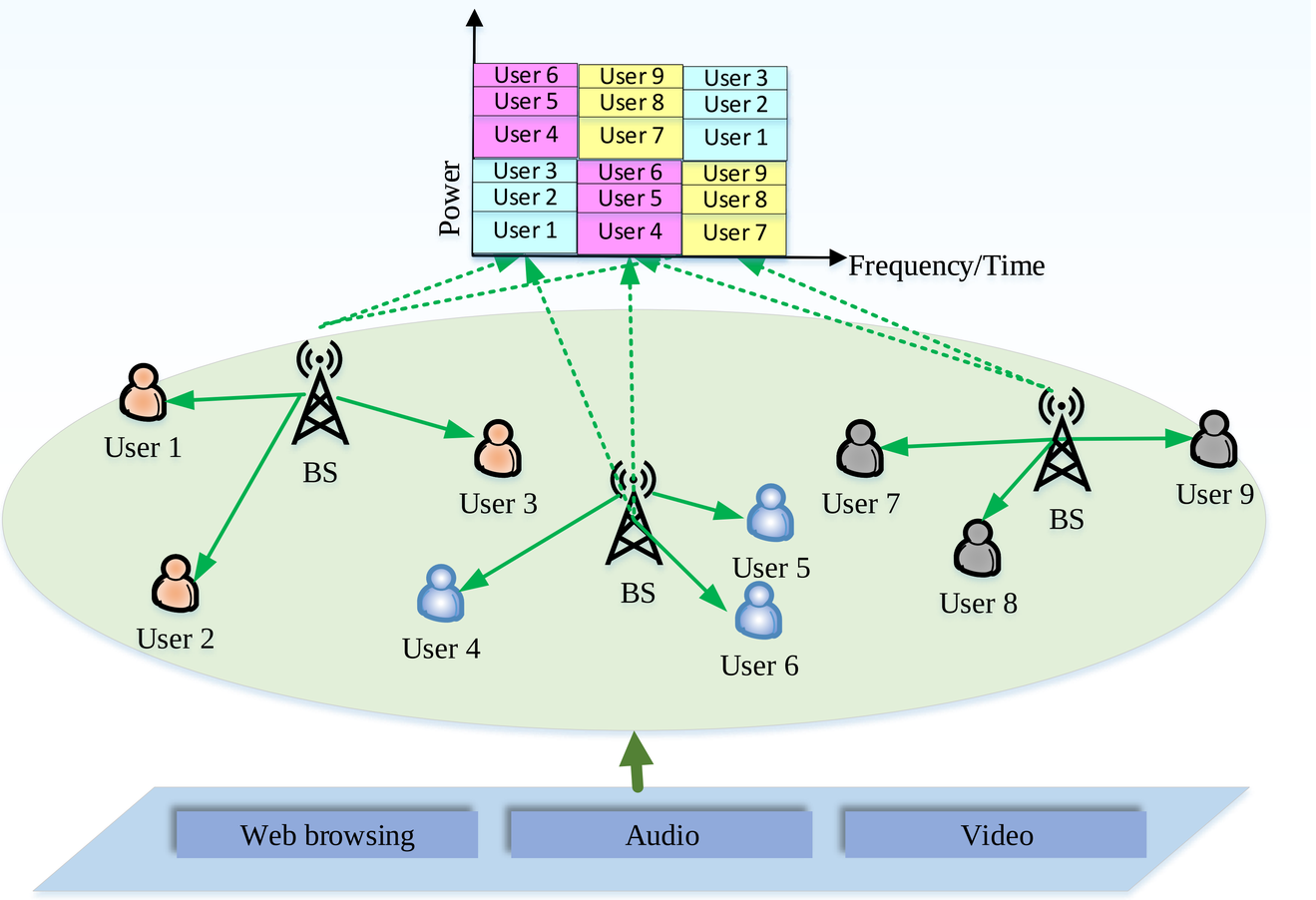


Fig. 1: An exemplary user-BS association and subchannel assignment in downlink multi-cell NOMA scenario.

Consider a multi-cell downlink NOMA transmission scenario, where multiple T base stations (BSs) communicate with K cellular users. The BSs cooperate to jointly serve the users where the CSI of the direct link and the cross link channels are available at the BSs. We consider the universal frequency reuse deployment in which every cell is available to the whole bandwidth. Invoked by the NOMA protocol, each subchannel can be shared by multiple users associated to the same BS.

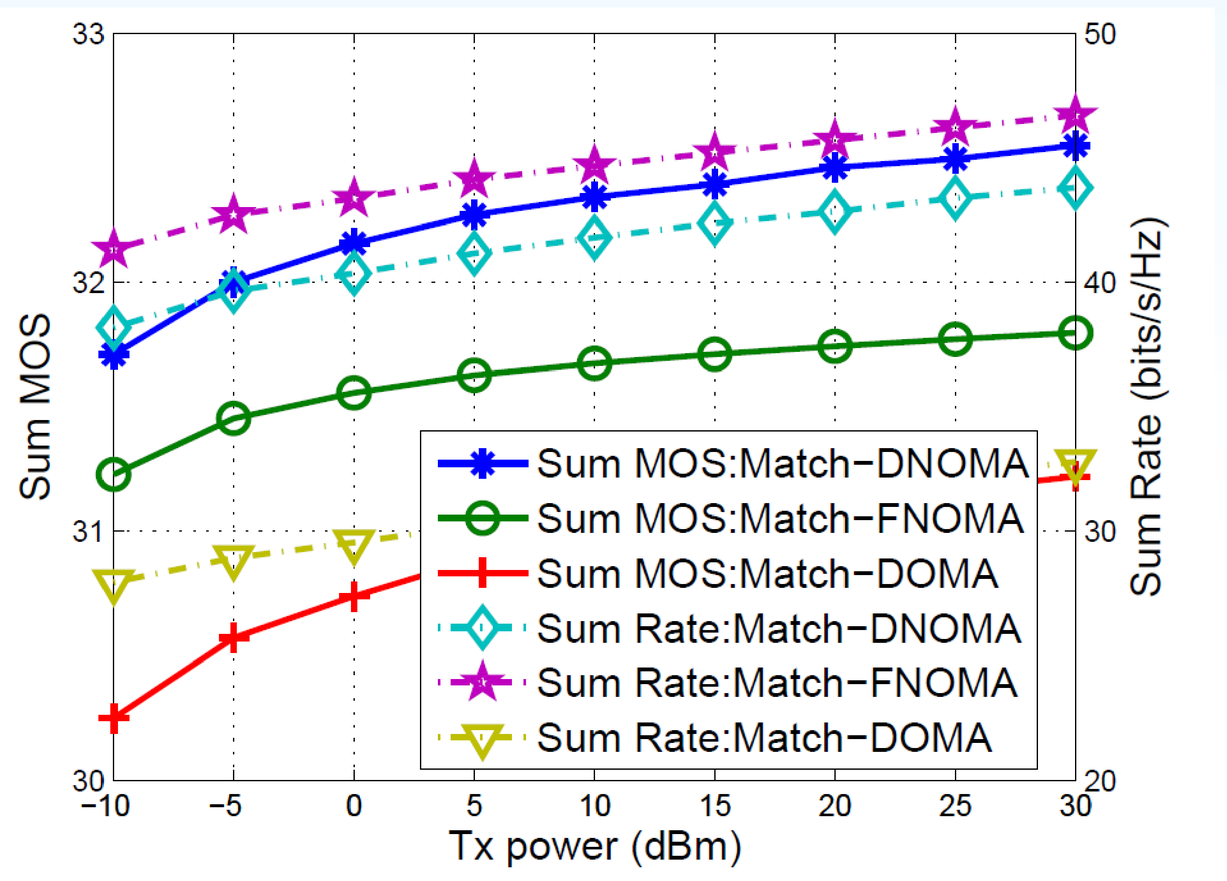
MOS Model for Web Browsing:

Inspired by the widely used QoE metric, MOS model is used as a measure of the user's QoE for the services like web browsing.

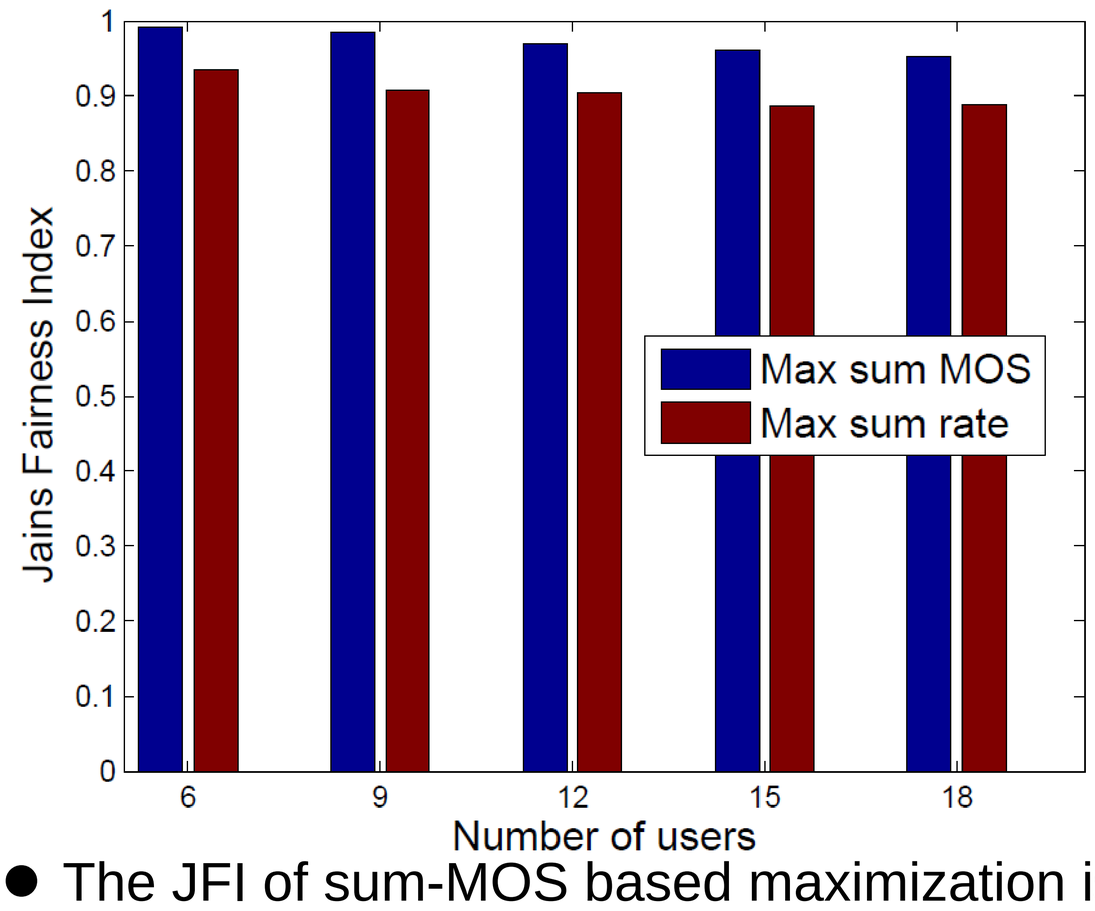
$$\mathrm{MOS}_{web} = -C_1 \ln(d(R_{web})) + C_2,$$

where R_{web} is the data rate. d(Rweb) is the delay time between a user sent a request for a web page and the entire web contents displayed. C1 and C2 are constants determined by analyzing the experimental results of the web browsing applications.

Simulation Results



- The fixed power allocation scheme in NOMA, called as FNOMA, as a baseline.
- The proposed low-complexity suboptimal power allocation scheme based on SCA as DNOMA.
- Both the performance of sum MOS can be greatly enhanced by 'Match-DNOMA' compared with 'Match-FNOMA' and 'Match-DOMA'.



- The JFI of sum-MOS based maximization is higher than that of sum-rate based
- The JFIs in terms of the two schemes decrease with the total number of users.

Conclusions

- The QoE-based resource allocation algorithm design of an multi-cell MC-NOMA system was studied.
- A low-complexity two-step approach for solving a 3D matching problem was proposed.
- A power allocation approach based on SCA was developed