Master Project 2019

Joint Resource/Power Allocation in Multiple Access Systems for 5G

Non-Orthogonal Multiple Access (NOMA) has been recently proposed as a promising multiple access method for 5G to avert radio resource shortage due to a huge increase of the number of connected devices expected within the next few years. NOMA has attracted extensive attention in both academia and industry due to its capability to bring substantial spectral efficiency gains. Unlike traditional Orthogonal Multiple Access (OMA) techniques, deployed in the current LTE networks; with NOMA, multiple users can be served at different power levels while simultaneously reusing a given resource block in time, frequency and space. Successive interference cancellation (SIC) is then applied at the receiver(s) to decode the message signals.
As both dense deployment of small cells in 5G networks and the non-orthogonality in resource sharing bring severe interference, receivers may suffer from high complexity. Therefore, ***utilization of hybrid multiple access methods combining NOMA and Orthogonal Frequency Division Multiple Access (OFDMA) appear as a good compromise choice*** ensuring massive connectivity, and high spectral efficiency in presence of a negligible amount of interference.
The study of resource allocation and spectrum sharing techniques for ***OFDMA-based NOMA*** is a key research area in 5G. While the potential of NOMA has been theoretically demonstrated, the still open question is: how joint power and resource allocation in OFDMA-based NOMA systems affect the global performance of the network under realistic constraints of latency or using the non-ideal SIC conditions?

In this project, the objectives are twice:

- Joint optimization of power and resource allocation in OFDMA-based NOMA systems assuming a unique optimization problem, under realistic latency constraints and/or using imperfect SIC conditions.
- Evaluating the performance of the proposed power and resource allocation algorithms in practical environments (using SDR (Software Defined Radio)-based platform).

The considered SDR-based system will use universal software radio peripheral (USRP) for the hardware platform and GNU Radio for software framework. This part will rely on the expertise of the IETR SCEE team in this research area and will benefit from their available Testbed (*http://www-scee.rennes.supelec.fr/wp/testbed/*).

This project is part of a collaborative project with Ireland and the candidate may have a scientific trip to Maynooth University in Ireland.

Contacts

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