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Master thesis (60 cr.): Joint Beamforming and Resource Optimization for Drone-Assisted Mission Critical Communications

Background

One can think about a disaster or emergency situation, where the coverage and capacity provided by the existing cellular network at the emergency area may not be available or enough to meet the mission critical communication (MCC) needs. To bring efficient, low latency, and high reliable connectivity for mission critical users in such situations, deployable systems in the form of moving base stations (BSs) forming moving cells such as cells on wheels (e.g., portable BSs on trucks) or cells on wings (e.g., portable BSs on drones) are emerging as promising candidates to meet the challenge in future wireless networks.

Despite the appealing features such as flexible deployment and remarkable coverage extension, drone-based portable systems have limited on-board battery, and the presence of air-to-ground links may cause drastic interferences. These issues become more severe when the drone serves multiple users in MCCs. Hence, it is important to 1) design proper beamforming algorithms to ensure reliable and high-capacity connections between the on-ground BS and the drone as well as the connections between the drone and the users, and at the same time, 2) optimize the power consumptions to enable sustainable communication links, considering the practical power constraints for the drone.

Thesis Description

This master thesis project will investigate how to jointly optimize beamforming and resource allocation for supporting drone-assisted MCCs, in order to provide coverage extension or capacity boosting in a given area. Specifically, this thesis consists of three main tasks:

1. Review and identify challenges and the state-of-the-art methods for drone-assisted MCCs;
2. Considering both in-band and out-of-band operations (with full/half duplex), study antenna requirements and power consumption models for drone-assisted MCCs, investigating both unicast and multicast transmissions.
3. Develop methods and algorithms to jointly optimize the power and beamforming of the drone-assisted MCCs, securing the service requirements for mission critical users.

Qualifications

This project aims at master students majored in communication engineering, electrical engineering, computer science/engineering or similar.

Additional Details

Extent: 1-2 students, preferably for a duration of one year (60 cr.).

Preferred starting Date: Autumn 2021.

Location: Ericsson AB/Chalmers in Gothenburg, Sweden.

Contact

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