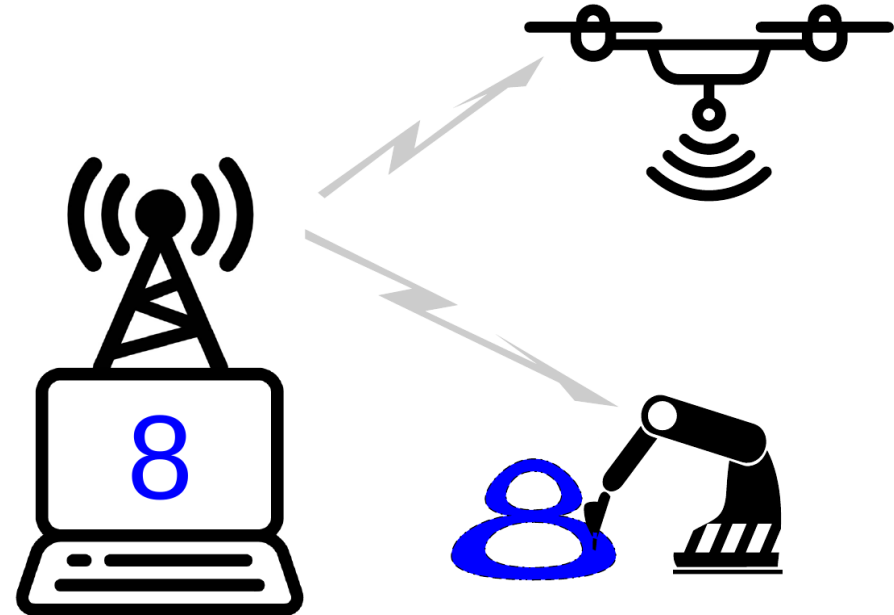


## Communication and Control

Nowadays many sensors are used in the field to gather information about the environment. Small devices with a battery allow for steady operation over an extended period of time. In the future not only sensing of values, but also actions should be done by distributed systems. The tasks often involve transmission of values and commands to remote stations, e. g. for exact positioning. In current implementations the communication between sensors and actors is completely decoupled from the control of the process itself. Each of the two subparts is optimized on its own, which leads to unnecessary strict constraints for the optimization process.

The goal of this project is to find opportunities to reduce the required communication resources for a given control loop, while still maintaining the requirements of the overall system task. This includes thorough investigation of the control problem and adaptation of the communication design.

Current developments on the communication side like MIMO and Adaptive Beamforming will be used to improve the utilization of the available communication resources for a high number of systems simultaneously. The current system state can be used to tune the communication to especially account for devices, which currently need more communication resources to stay inside the desired range of tolerance. This should be done in an adaptive way; not only worst case assumptions should be made and the communication system parameters should be continuously adjusted.



### Tasks

- Solve a control task with a (wireless) communication link
- Optimize communication in terms of rate/power/delay according to system state
- Simulate the whole system and document results

### Requirements

- Knowledge in linear algebra and probability theory
- Basics in control theory
- Experience with optimization
- Expertise in MATLAB