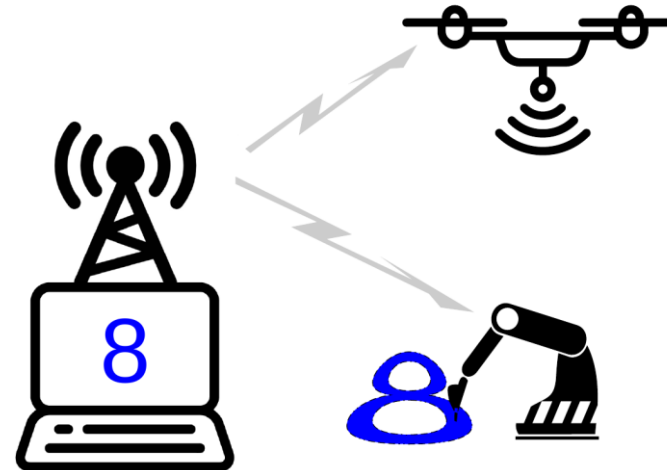


Communication and Control

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.

In this project many small subsystems are distributed in the field and share a common communication channel. A central entity coordinates the transmission of sensor values to controllers and control values to actuators. This task is based on the dynamics of the subsystems as well as the individual states.



Tasks

- Solve a control task with one or two (wireless) communication links
- Optimize communication in terms of control system performance according to (stochastic) control system state constraints
- Simulate the whole system and document results

Requirements

- Good Knowledge in linear algebra and probability theory
- Basics in control theory
- Experience with optimization
- Expertise in MATLAB
- Profound knowledge in Python/NumPy