Mixed-integer optimal control for PDEs

Falk Hante

In this talk we consider mixed-integer optimal control problems for dynamical systems with states that are distributed in a space-time domain. For this problem class, a discrete control value (eventually together with a continuous and spatially distributed one) has to be chosen for each instant in time in order to minimize a cost functional.

Motivated by networked flow problems, we present a gradient based method for optimal switching boundary control of semilinear hyperbolic systems. Relaxation techniques will be discussed on a more abstract level based on semigroup theory. A-priori estimates for the integer-control optimality gap are obtained in particular for semilinear parabolic systems.

Numerical results are presented for a bimodal semilinear plug-flow example, spatial scheduling of different actuators for a linearized heat equation motivated by thermal manufacturing and bang-bang optimal control of a semilinear reaction-diffusion equation modeling Lotka-Volterra type population dynamics.