

Mathematical and Computational Challenges for Optimization and Control of PDE Systems

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Abstract

The problem of “optimally locating” actuators and sensors by its very nature requires the consideration of spatial information about the object to be controlled. In particular, the question involves asking, “Where (in space) should I place a sensor or actuator”? Consequently, such problems are naturally formulated within the framework of distributed parameter optimization where the dynamics are often governed by partial differential equations. Even if one uses reduced order models for control and estimation, these models must capture some spatial information that allows for determining where in space a sensor or actuator must be placed. In this talk we consider sensor and actuator location problems for distributed parameter systems governed by PDEs and use the spatial information provided by the spatial dynamics to formulate the problem and to guide the development of numerical methods. Examples are given to illustrate the ideas and the results are applied to a problem of control for energy efficient buildings.