Talk announcement

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A preconditioner for Isogeometric Analysis for a parabolic optimal control problem in primal formulation

In this talk, we discuss the preconditioning of an optimal control problem of tracking type with a parabolic evolution problem as constraint and limited observation. We are interested in a preconditioner that is robust in the model parameters, like the regularization/cost parameter and and the diffusion parameter, and in the grid size. The solution to this problem is characterized by the first order optimality system (Karush-Kuhn-Tucker conditions), which is a linear system with saddle point structure. In order to be able to set up a robust preconditioner, we formulate the constraint in its strong form, which leads to a formulation that requires H^2-regularity in space and H^1-regularity in time. A conforming discretization requires C^1 smooth basis functions. While this would need quite some effort with standard finite element methods, in Isogeometric Analysis such basis functions can be set up with ease. Based on this formulation, we set up an operator preconditioner. To establish condition number bounds, we need a discrete inf sup stability result. With our choice of discrete function spaces, the inf sup stability is trivially satisfied if the problem is formulated on the parameter domain. We can show that the inf sup condition carries over to the physical domain if the discretization is fine enough.