PARALLEL MULTIPATCH SPACE-TIME IGA SOLVERS FOR PARABOLIC INITIAL-BOUNDARY VALUE PROBLEMS

ULRICH LANGER

Institute of Computational Mathematics
Johannes Kepler University Linz
Altenberger Str. 69
A-4040 Linz, AUSTRIA
e-mail: ulanger@numa.uni-linz.ac.at

ABSTRACT

We propose and investigate new robust parallel solvers for the huge systems of linear algebraic equations arising from the multipatch space-time Isogeometric Analysis (IGA) discretization of parabolic initial boundary-value problems. This discretization scheme has recently been proposed in [2], and is based on the stabilized singlepatch IGA discretization introduced in [3]. The space-time cylinder, in which the parabolic problem is posed, is decomposed into time-slabs which are coupled via a discontinuous Galerkin technique. Each time-slab has a single or multipatch geometrical representation. The time-slabs provide the structure for the time-parallel multigrid solver proposed in [1]. The most important part of this time-parallel multigrid solver is the smoother. We use the special tensor structure of the involved matrices to decouple its inversion into several spatial problems by means of fast diagonalization or Schur decompositions techniques [4]. For the spatial problems, robust solvers or preconditioners are available. Finally, we present numerical experiments confirming the robustness and the scalability of our parallel space-time IGA solver.

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