

Parallel alternating direction preconditioner for isogeometric simulations of explicit dynamics

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ABSTRACT

In this paper we present a parallel implementation of the alternating direction preconditioner for isogeometric simulations of explicit dynamics. The Alternating Direction Implicit (ADI) algorithm, belongs to the category of matrix-splitting iterative methods, was proposed almost six decades ago for solving parabolic and elliptic partial differential equations, see [1–4]. The new version of this algorithm has been recently developed for isogeometric simulations of two dimensional explicit dynamics [5] and steady-state diffusion equations with orthotropic heterogeneous coefficients [6]. In this paper we present a parallel version of the alternating direction implicit algorithm for three dimensional simulations. The algorithm has been incorporated as a part of PETIGA an isogeometric framework [7] build on top of PETSc [8]. We show the scalability of the parallel algorithm on STAMPEDE linux cluster up to 10,000 processors, as well as the convergence rate of the PCG solver with ADI algorithm as preconditioner.

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