İSTANBUL TEKNİK ÜNİVERSİTESİ

MATEMATİK MÜHENDİSLİĞİ

BÖLÜM SEMİNERİ

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İTÜ, Uçak ve Uzay Bilimleri Fakültesi

An ALE Formulation for Moving Boundary Problems

Abstract. An Arbitrary Lagrangian-Eulerian (ALE) formulation based on the unstructured finite volume method is proposed for solving large moving boundary problems.

The numerical method is based on the side-centered arrangement of the primitive variables that does not require any *ad-hoc* modifications in order to enhance pressure coupling. The continuity equation is satisfied within each element at machine precision and the summation of the continuity equations can be exactly reduced to the domain boundary, which is important for the global mass conservation. A special attention is given to construct an ALE algorithm obeying the discrete geometric conservation law (DGCL) at both local and global levels. The mesh deformation algorithm for the interior fluid nodes is based on the indirect Radial Basis Function (RBF) algorithm which allows significantly large boundary motions and deformations. For the parallel solution of resulting large-scale algebraic equations in a fully coupled form, a matrix factorization is introduced similar to that of the projection method for the whole system and the parallel algebraic multigrid solver BoomerAMG is used for the scaled discrete Laplacian provided by the HYPRE library which we access through the PETSc library. Then the numerical method is extended for the large-scale numerical simulation of fluid structure interaction problems in a fully coupled (monolithic) form. Finally the numerical method is also modified for for multi phase flows with large

viscosity and density ratios. The accuracy and performance of the proposed algorithm are verified for the several classical benchmark problems in the literature and then the numerical method is applied to rather challenging problems.

Tarih: 4 Aralık 2015 Cuma

Yer: Fen-Edebiyat Fakültesi B1-226, 2. Kat

Seminer Saati: 15:00-16:00

İkram: 14:30-15:00

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