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SPACE-TIME MESHFREE COLLOCATION METHOD BY INTERPOLATING MOVING LEAST SQUARES

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ABSTRACT

We present a Space-Time Meshfree Collocation Method based on Interpolating Moving Least Squares (STMCM-IMLS). The Moving Least Squares (MLS) technique and its interpolating counterpart (IMLS), introduced in [2] for scattered data approximation and interpolation respectively, are the basis for most of the meshfree methods, i.e. methods which use only a set of points without a node-to-node connectivity to find numerical solutions of partial differential equations. The meshfree collocation method based on IMLS was introduced by authors in primary studies [3, 4]. The idea of the Space-Time Meshfree Collocation Method (ST-MCM) was presented in [5], and applied to tracking the evolution of dynamic interfaces under heavy deformations by level-set method in [6]. The aim of this contribution is a numerical study of the accuracy and convergence properties of the method when applied to different kind of PDEs with known analytical solutions. We investigate the time discretization properties by solving ordinary differential equations, the discretization in space solving an elliptic (parabolic) model problem, and end up by showing the numerical properties of the method when applied to hyperbolic PDEs.

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