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High Order Scheme for Mixed Formulation of Problems with Moving Internal Boundaries

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For mixed formulation problems we present an extension of the shifted boundary method [1] to simulate partial differential equations with moving internal interfaces on unstructured meshes. The physical interface is replaced by a numerical interface called surrogate, where the geometry is only refined around the interface area. Our objective is to apply the method to phase transitions modeled by the Stefan problem, where the moving boundary is a phase front which progresses at a speed determined by the normal flux jump. To allow an accurate prediction of the temperature field on both sides of the discontinuity, as well as the position of the discontinuity itself, we propose an enhanced variant of the shifted boundary method based on an enriched stabilized mixed form [2]. The mixed formulation is chosen to provide precision on the flux used to improve the accuracy of the temperature field [3]. Numerical results will confirm the expected overall second order accuracy of the method and the ability to properly simulate de-icing problems.

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