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An extended discontinuous Galerkin method for high-order shock treatment

Jakob Sebastian[1], **Florian Kummer**[1,2]

[1] TU Darmstadt, Chair of Fluid Dynamics, Otto-Berndt-Straße 2, 64287 Darmstadt, Germany, geisenhofer@fdy.tu-darmstadt.de, www.fdy.tu-darmstadt.de

[2] TU Darmstadt, Graduate School Computational Engineering, Dolivostraße 15, 64293 Darmstadt, Germany, www.gsc.tu-darmstadt.de

In this talk, we are going to present a high-order shock fitting approach based on a cut-cell method. We make use of multiple Level Sets to represent first, the shock front and second, the geometry. Due to high-order representation of the Level Set fields, high-order convergence rates can be achieved.

In the first part, we present a discontinuous Galerkin (DG) solver [1] that was extended to immersed boundaries where the considered geometry is represented by the zero iso-contour of a Level Set function. We apply cell-agglomeration that averts problems with small and ill-shaped cut cells [2].

In the second part, we focus on our current work on shock-fitting techniques (see [3] for an overview) applied to an XDG method [4]. We show results of a novel Level Set Reconstruction algorithm aiming to reconstruct the shock front. We also derive an optimization approach aiming for the correction of the Level Set.

Furthermore, the application of the XDG method to supersonic flows with shocks will be demonstrated. Here, we aim to correct the position of the Level Set by means of an optimization algorithm in order to obtain a stable solution algorithm for a series of benchmark problems.

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