Solution of hyperbolic problems on cut cell meshes

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Cut cells methods have been developed in recent years for computing flow around bodies with complex geometries. For mesh generation, the flow body is cut out of a regular Cartesian grid resulting in so called *cut cells*. Cut cells can have irregular shape and can become arbitrarily small. For the solution of time-dependent hyperbolic conservation laws, this causes the *small cell problem*: explicit time stepping schemes are not stable on the arbitrarily small cut cells.

In this talk, we first illustrate the small cell problem from different perspectives and then give an overview over some existing solution approaches from the literature. We then present two solution approaches, the *mixed explicit implicit scheme* and the *DoD stabilization*, in more detail.

The mixed explicit implicit scheme has been developed in the context of finite volume schemes and is based on treating cut cells fully implicit for stability while using explicit time stepping away from the embedded boundary. The Domain of Dependence (DoD) stabilization has been developed in the context of DG schemes. The stabilization is based on adding suitable penalty terms to the spatial discretization. In time, one can then use a standard explicit time stepping scheme. The terms are designed to restore proper domains of dependence.

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