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**High Order Cut-cell Methods in Multiple Dimensions**[1] PETER BRADY, DANIEL LIVESCU, Los Alamos National Laboratory — Cut-cell methods for unsteady flow problems can greatly simplify the grid generation process and allow for high-fidelity simulations on complex geometries. However, cut-cell methods have been limited to low orders of accuracy. This is driven, largely, by the variety of procedures typically introduced to evaluate derivatives in a stable manner near the highly irregular embedded geometry. The present approach is based on two simple and intuitive design principles. These principles, and an a-priori optimization process, allow for the construction of stable 8th order approximations to elliptic and parabolic problems and stable and conservative 5th order approximations to hyperbolic problems. This is done for both explicit and compact finite differences and is accomplished without any geometric transformations, artificial stabilization or other adhoc in-situ procedures. Test cases with 2-D and 3-D geometries will be discussed.

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