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Symmetry preserving compact schemes for numerical solution of PDEs ERSIN OZBENLI, PRAKASH VEDULA, University of Oklahoma — In this study, a new approach for construction of invariant, high order accurate compact finite difference schemes that preserve Lie symmetry groups of underlying partial differential equations (PDEs) is presented. It is well known that compact numerical schemes based on Pade approximants achieve high order accuracy with a relatively small number of stencil points and are found to have good spectral-like resolution. Considering applicable Lie symmetry groups (such as translation, scaling, rotation, and projection groups) of underlying PDEs, invariant compact schemes are developed based on the use of equivariant moving frames and extended group transformations. This work represents an extension of the authors recent work on construction of invariant, high-order, non-compact, finite difference schemes based on the method of modified equations. Performance of the proposed symmetry preserving compact schemes is evaluated via consideration of some canonical PDEs like linear advection-diffusion equation, inviscid Burgers' equation, and viscous Burgers' equation. Effects on accuracy due to choice of subgroups used in construction of these schemes will be discussed. Generalization of the proposed framework to multidimensional problems and non-orthogonal grids will also be presented.

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