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Editorial

Physics-compatible numerical methods

Physics-compatible numerical methods are methods that aim to preserve key mathematical and physical properties of continuum physics models in their finite-dimensional algebraic representations. They include methods which preserve properties such as energy, monotonicity, maximum principles, symmetries, and involutions of the continuum models. Examples are mimetic methods for spatial discretizations, variational and geometric integrators, conservative finite-volume and finite-element methods, etc. Research on physics-compatible numerical methods is rapidly becoming a major research thrust across multiple disciplines within the broader area of computational science and engineering.

Our principal goal in arranging this issue was to provide readers with a representative sample rather than a comprehensive survey of this flourishing field. As a result, we welcomed papers with a more pronounced review flavor as well as papers with a more substantial formal mathematical content than what is common for the Journal of Computational Physics.

We hope that the resulting special issue will prove to be informative and useful for all researchers interested in the current state-of-the-art in physics-compatible numerical methods.

We thank all people who have helped us in preparing this special issue: the reviewers, the technical editors of the Journal of Computational Physics, and most of all the authors.

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