Mathematical Problems in Engineering

Hindawi

Special Issue on

Advanced Mesh-Based and Particle-Based Numerical Methods for Engineering and Applied Mathematics Problems

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In the past decade, advanced mesh-based and particle-based numerical methods have been extensively developed and applied to many engineering and scientific problems. The development of those advanced numerical methods was motived by vastly different needs in engineering and scientific analyses. Among them, some methods have been developed to tackle down challenging industrial problems that are difficult to be solved by traditional numerical methods, while some developments were driven by simulating new applications in multitime, multiscale, and multiphysics problems. Those advanced numerical methods have emerged as a powerful tool to feasibly model the complex mathematical equations and provide precise prediction on how physical systems behave in real world applications.

The feasibility of an advanced numerical method also concerns the computational cost and computational complexity. Despite the advances of computing environments, the requirements of efficient computation, cost-effective memory, and stable solvability are critical to the success of an advanced numerical method in practice. This demands the developments of a corresponding high-level parallel algorithm together with specialized optimization in code and solver for specific applications.

The purpose for this special issue is to present the state-of-the-art and prospective directions on those advanced mesh-based and particle-based numerical methods from the research areas to computation and application fields for engineering and applied mathematical problems.

Potential topics include, but are not limited to:

- Recent advances and new applications in mesh-based and particle-based numerical methods
- Generalized and extended finite element methods (XFEM)
- Mixed, hybrid, and discontinuous Galerkin methods
- Boundary element methods
- Galerkin and non-Galerkin mesh-free methods
- Isogeometric analysis (IGA)
- Numerical methods based on phase-field, peridynamics, or other nonlocal theories
- Coupling and bridging techniques in multiscale and multiphysics computing
- Algorithms and software for high performance computing

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