

Multi-Scale Pressure-Residual-Based Anti-Hourglass Scheme in Compatible Staggered Lagrangian Method

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ABSTRACT

Hourglassing is a well-known pathological numerical artifact produced by the Lagrangian methods, decreasing robustness of the simulation and resulting in its early breakdown. There exist a large number of methods dealing with hourglass-control, many of them are summarized in the seminal work [1]. In the community of the staggered compatible Lagrangian methods, the approach of subzonal pressure forces [2] is widely used. However, in case of multi-material simulations, one needs to deal with the material pressure or density in each subzone to construct such forces, which requires to perform material reconstruction on the subzonal level. To avoid this problem, we have adapted the multi-scale residual-based stabilization [3] for the staggered compatible discretization. Here, we describe two discretizations of the new approach and demonstrate its properties on selected numerical problems.

References

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