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The Multiscale Material Point Method for Simulating Transient Responses¹ ZHEN CHEN, DUT / MU, YU-CHEN SU, MU, HETAO ZHANG, TU / MU, SHAN JIANG, THOMAS SEWELL, MU — To effectively simulate multiscale transient responses such as impact and penetration without invoking master/slave treatment, the multiscale material point method (Multi-MPM) is being developed in which molecular dynamics at nanoscale and dissipative particle dynamics at mesoscale might be concurrently handled within the framework of the original MPM at microscale (continuum level). The proposed numerical scheme for concurrently linking different scales is described in this paper with simple examples for demonstration. It is shown from the preliminary study that the mapping and re-mapping procedure used in the original MPM could coarse-grain the information at fine scale and that the proposed interfacial scheme could provide a smooth link between different scales. Since the original MPM is an extension from computational fluid dynamics to solid dynamics, the proposed Multi-MPM might also become robust for dealing with multiphase interactions involving failure evolution.

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