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# Time-discontinuous material point method for transient problems

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**ABSTRACT:** This paper presents a time-discontinuous material point method (TDMPM) for transient problems such as the wave propagation and impact responses in solids. By dividing the continuous time domain into discrete time intervals, the weak form of the TDMPM is established by considering the discrete grid-based governing equations, constraint and discontinuity conditions. The displacement and velocity fields in a time interval are interpolated with the piecewise cubic and linear functions, respectively. By substituting the assumed displacement and velocity fields into the weak form, a novel computational framework for the grid displacements and velocities at the discrete time instants is constructed. In the new formulations, the displacement field at each time instant remains to be continuous, whereas the velocity field at the time instant becomes discontinuous. These unique features ensure the TDMPM could properly capture the discontinuous characteristics and control the spurious numerical oscillations. Two numerical examples under the impact loading

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