

Venue: 15th Annual Material Point Method Workshop

Title: Modeling engineering lattices and their defects

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Abstract: Additive manufacturing techniques now allow for the control of the fine scale structures in 3D printed lattices. This talk looks at how two material point methods (MPM), namely the dual domain material point method (DDMP) and the generalized interpolation material point (GIMP), compare to experimental results for several different 3D printed lattices. With a linear elastic model, the MPMs capture buckling modes seen in the experiments. At small deformations (strains $\sim 10\%$ or less), DDMP and GIMP perform similarly. However, at large deformations (strain $\sim 20\%$ or more), DDMP and GIMP results are noticeably different, but have qualitatively similar trends. Although manufacturing techniques allow for control of the overall structure of these lattices, variability exists throughout the generation and experimentation of these real world structures. Simulations with perturbations and defects based on this variability explore whether some of the changes impact the overall response of the lattices. Finally, high fidelity simulation of these structures is still somewhat limited to relatively small lattices, and a method to bridge this gap is discussed.