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Automatic Conversion Of Distorted Hexahedral Elements Into Meshless Particles During Dynamic Deformation CHARLES GERLACH, GORDON JOHNSON, Southwest Research Institute — This article presents an algorithm to automatically convert distorted hexahedral elements into meshless particles during dynamic deformation. Automatic conversion from tetrahedral elements to meshless particles has already been shown to be a robust approach for computing impact computations with severe distortions in a Lagrangian framework. With this approach the initial grid is composed of finite elements, and the highly-distorted elements are then automatically converted into meshless particles as the computations progress. This allows mild structural deformations to be accurately and efficiently computed with finite elements, and the highly-distorted regions to be robustly represented with meshless particles. Several contact conditions must be considered: element on element, particles attached to elements, and particles contacting and sliding on elements. Applying these contact conditions to hexahedral elements is made more challenging by some of the inherent properties of those elements, such as non-planar element faces. This article presents the hexahedral element conversion algorithm, along with the implementation of the above contact conditions. Several examples of high-velocity impacts are included to demonstrate the capabilities of the algorithm.

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