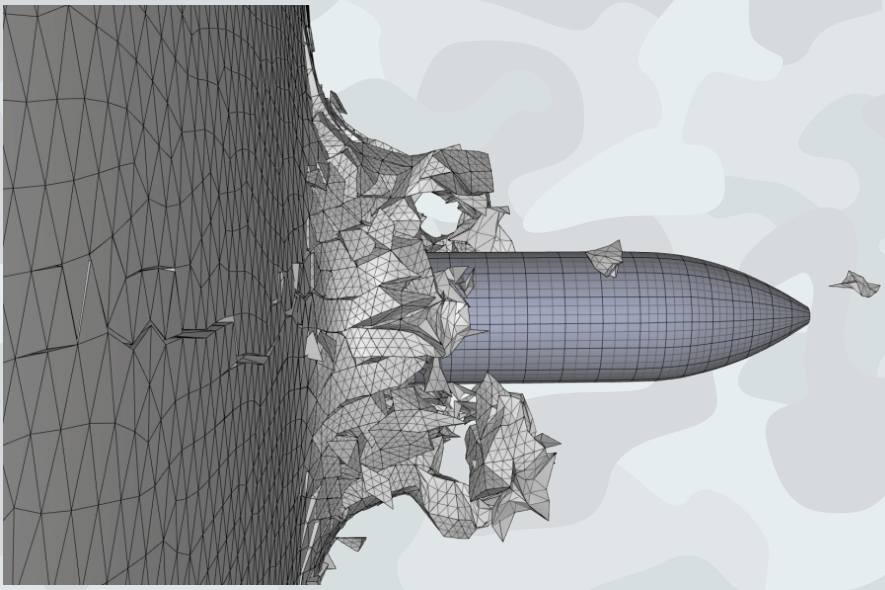
Certa Sim

Providing Innovative Solutions

The IMPETUS Afea Solver®

Modeling Ballistic Impact

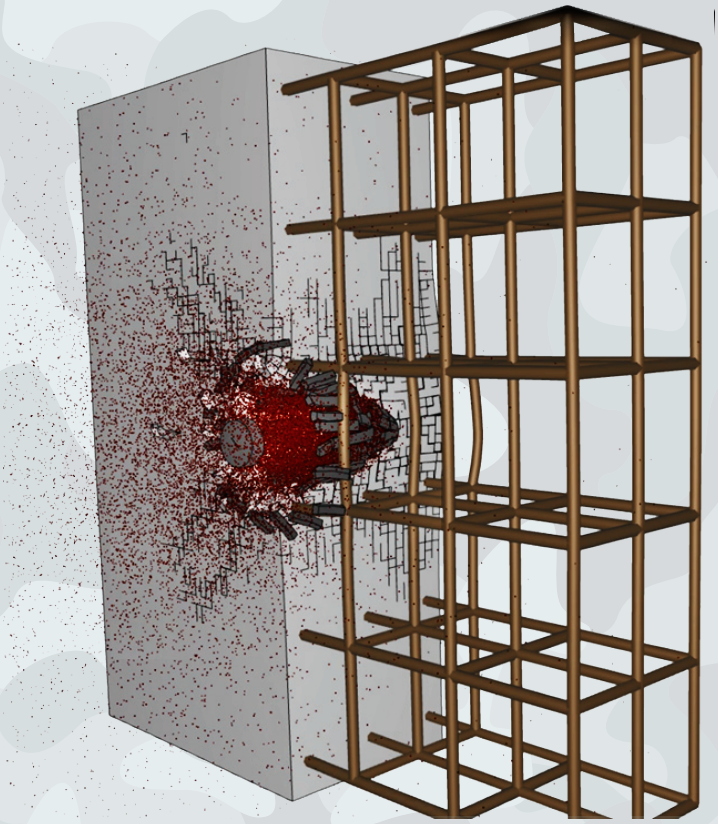
The IMPETUS Afea Solver® leads the way to accurate modeling ballistic impact. The advanced Node Splitting Algorithm developed by the IMPETUS team provides an easy to invoke but accurate method to handle material fragmentation, a key component in ballistic impact. Accurate computations rely on efficient algorithms, robust high order solid elements and advanced parallel processing. This is why IMPETUS relies on GPU Technology for massively parallel processing on a standard workstation or a single node of a cluster.



The Advanced Element Technology, ASET™, at the heart of the IMPETUS Solver®, makes it possible to model the very large deformation that occurs from ballistic impact. The robust elements include accurate Hexahedron, Tetrahedron and Pentahedron quadratic and cubic element formulations. The Tetrahedron elements are unique because unlike classic finite element formulations, the IMPETUS Tetrahedron elements are accurate in both bending and plasticity and are particularly good for ballistic impact. Since these elements are fully integrated the pitfall of non-physical hourglass modes are avoided. The high order elements work in conjunction with a mesh smoothing algorithm to better capture the true physical geometry of a structure and leads to accurate geometrical surfaces to improve contact between parts.

To model impact of brittle materials requires modeling fragmentation and that is why the IMPETUS Node Splitting Algorithm is essential. IMPETUS has been used successfully to model impact and fragmentation of a reinforced concrete structure which included the deformation of the rebar cage.

Key Features and Benefits:



- High order ASET™ Element Technology for accurate and robust computation.
- High order elements create a smooth realistic surface to simulate a bullet traveling down a barrel without the need to have an extremely fine mesh to avoid contact instability.
- Bullet engraving as it travels down the gun barrel can be accurately modeled.
- Node-Splitting Algorithm captures the true nature of ballistic impact which must include fragmentation of the target material, something that element erosion simply cannot do.
- Accurate Tetrahedron elements open the door for automatic meshing of complicated parts but also provide more random surfaces to better capture fragmentation of the target material.
- GPU Technology for massively parallel processing on a standard workstation or the single node of a cluster.
- The IMPETUS Afea Solver® has an advanced Discrete Particle Method (iDPM) to model soil which has been used to model ballistic impact in gravel and sand.
- Special Rebar elements to easily model impact of reinforced concrete structures. The specification of the rebar is straight forward and can be embedded into any structure.

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