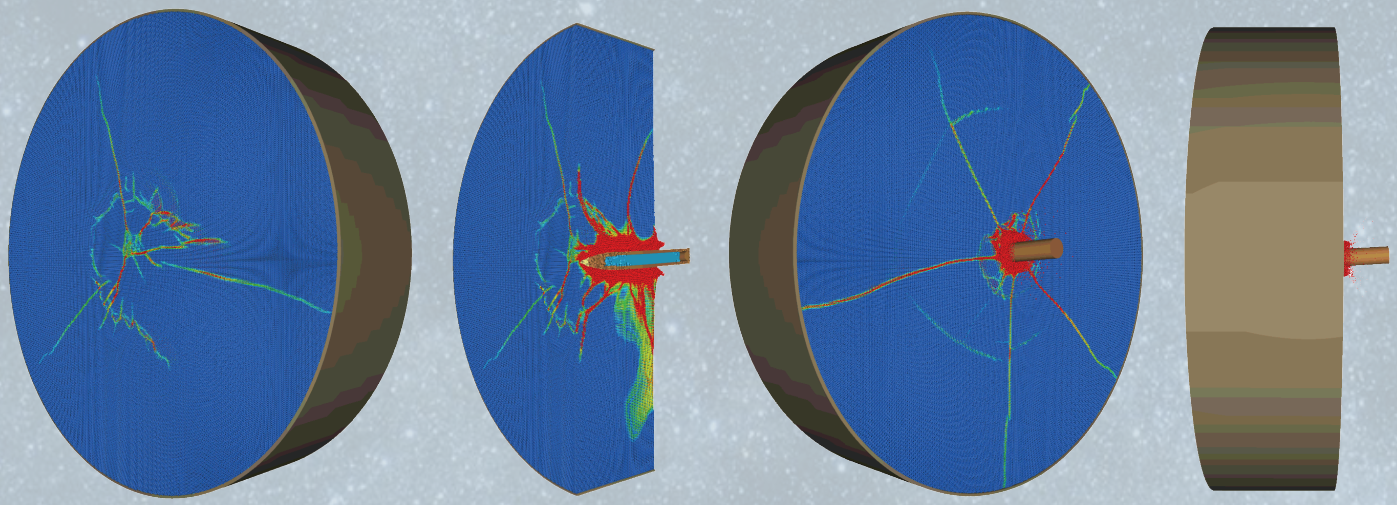
Certa Sim

Providing Innovative Solutions

Impetus ADVANCED

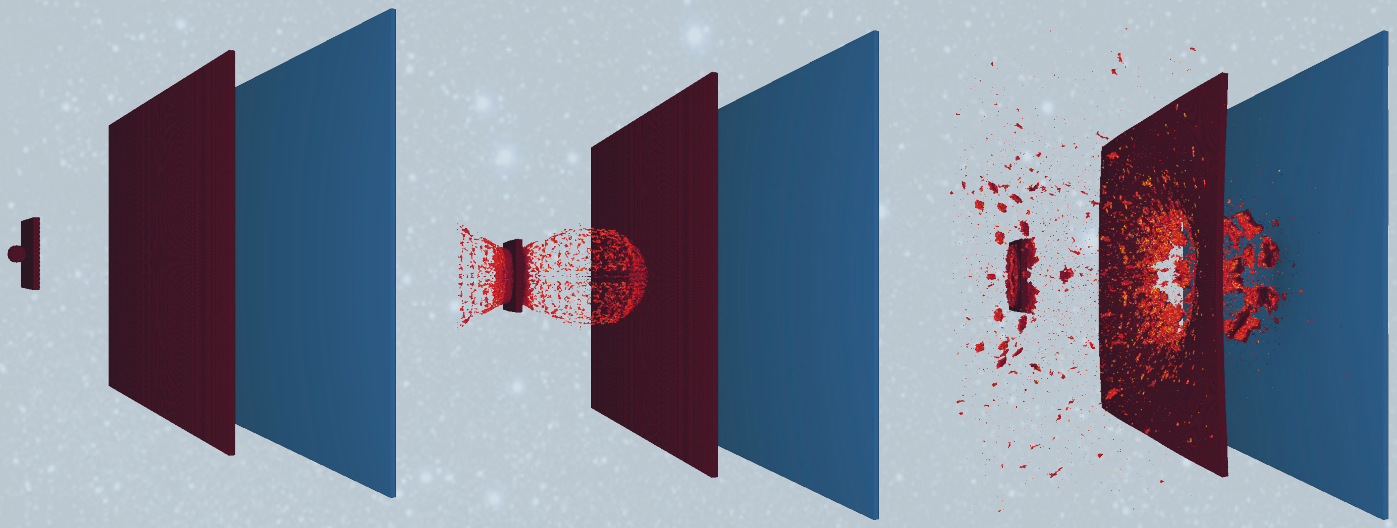
γSPH™ Solver for Structural Dynamics

Modeling extreme deformation events such as space debris impact, shaped charge design, warhead fragmentation or hypervelocity in general, is very difficult due to the complexity of the event, which includes non-linear large deformation and short time duration. The IMPETUS ADVANCED module which is part of the IMPETUS Afea Software Suite provides the Next Generation γSPH™ meshless solver to handle these difficult Multiphysics scenarios. The IMPETUS Afea Solver® is a nonlinear transient dynamic explicit Finite Element solver where structural parts can be modeled with advanced higher order elements, the ASET™ family of elements. Coupled with γSPH™ even more challenging engineering problems can be solved.



With γSPH™ tensile instability and spurious pressure fields that plagued classic Smoothed Particle Hydrodynamics (SPH) implementations when applied to structural dynamics problems is a thing of the past. The IMPETUS γSPH™ development team has developed a meshless solver that is robust, accurate and easy to use. The γSPH™ Solver takes full advantage of GPU Technology for parallelization on a single or multiple GPU's. Fast runtimes with 10's of millions of particles is computationally efficient because of GPU Technology.

The γSPH™ Solver has been proven to be very accurate, matching experimental results!
Aligned with the general philosophy of the IMPETUS Afea Solver®, the model set-up for γSPH™ is very simple. A component using the particles can be any geometrical shape and orientation and objects can easily be embedded in the particle domain.



Post processing of any simulation is a key part of the analysis process. The IMPETUS Afea Solver GUI includes functionality that is specific to assessing the results from γSPH™ simulations. The γSPH™ output can be plotted both as contour and history plots. This includes velocity, particle density, damage and stress/strain and displaying streamlines and path lines which are key to understanding the flow of particle debris.

Key Features and Benefits:

- Easy set-up and generation of particle domains even for complex components.
- Robust handling of Symmetry Planes.
- Contact between particles and structure is simply done by specifying the structural ID - no contact specification necessary. Furthermore, the algorithm is optimized for particle to structure contact.
- Accurate γSPH™ method together with the very accurate Aset™ Finite Element technology provides for an accurate structural response.
- No spurious pressure – a smooth pressure profile can be obtained which makes it possible to compare directly with experimental results.
- No tensile instability as seen for classic formulations extending the use of the γSPH™ Solver.
- Special damage treatment for realistic modeling of fragmentation.
- GPU Technology for efficient massively parallel processing resulting in very fast runtimes for models that require millions of particles.
- Multi-GPU implementation to increase problem size and reduce runtime.

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