STRUCTURES

Ansys LS-DYNA Smooth Particle Hydrodynamics

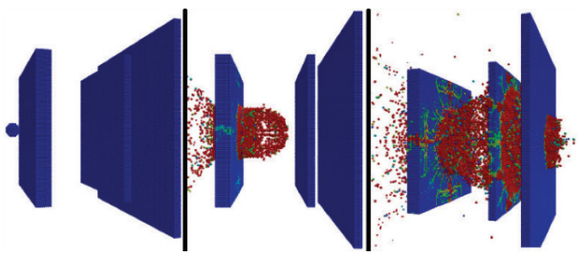
Smooth particle hydrodynamics (SPH) is a Lagrangian particle method for modeling impacts, explosions or fluid–structure interaction (FSI) problems. The method was developed to avoid the limitations of mesh entangling encountered with the finite element method in extreme deformation problems, and to model complex free surface and material interface behaviors, including solid fragmentation. A main difference between classical methods and SPH is the absence of a grid: The particles are the computational framework on which the governing equations are resolved. SPH has been applied extensively to problems involving incompressible flows, heat conduction, high explosives and high velocity impacts. The SPH method in Ansys LS-DYNA® is coupled with the finite and discrete element methods, extending its range of applications to a variety of complex problems involving multiphysics.

Applications

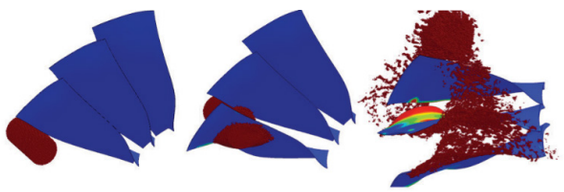
- Forging and extrusion, metal cutting, foam packaging
- High velocity impacts, bird strikes
- Fluid–structure interactions
- Sloshing and splashing
- Explosions, underwater explosions, soil penetration
- Incompressible fluids
- Fragmentation and spallation of solids

Features

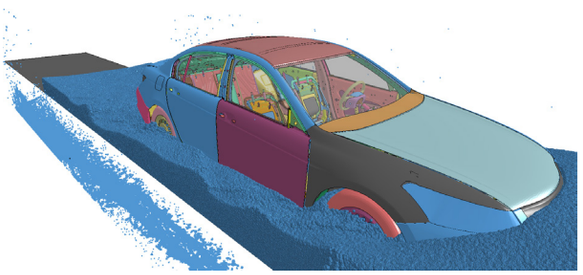
- A Lagrangian framework that can handle very high deformations with moving boundary, moving interface and free surface applications, applied for both solid and fluid parts
- Easy FSI modeling through regular contact options
- 3D, 2D and 2D axisymmetric versions for both shared and distributed memory computations
- SPH thermal solver coupling with structure, as well as pure thermal coupling with solid elements
- Multiple coupling options (interaction methods) between different SPH parts and between SPH particles and solid elements or other particle methods (such as DEM)
- Support for most of the material models implemented in LS-DYNA
- Adaptive convertibility of solid elements into SPH particles to handle severe deformations



High velocity impact through three targets



Bird strike simulation (Courtesy of DynaS+)



Water wading simulation