LS-DYNA® Advanced FEM, Meshfree & Particle Methods
Material Design & Manufacturing

Mechanical performance of material:

- Composite material modeling in multiple scales
- Bottom-up material data processing

Features:
- – Representative volume element (RVE)
- – Reduced-order homogenization
- – Deep material network (machine learning)

Manufacturing analysis:

- Bulk forming: forging, extrusion
- Machining: cutting, shearing, polishing
- Jointing: riveting, welding, drilling
- Brittle, ductile and rubber-like materials
- 3D printing process and performance test

Features:
- – Multiple advanced numerical tools
  Element free Galerkin (EFG)
  Meshfree-enriched FEM (ME-FEM)
  Smoothed particle Galerkin (SPG)
  Smoothed particle hydrodynamics (SPH)
  Peridynamics
  eXtended FEM (X-FEM)
- – 2D and 3D (shell & solid)
- – Particle immerse
- – Explicit and Implicit analysis
- – Coupled thermal mechanical analysis
- – Adaptive re-meshing
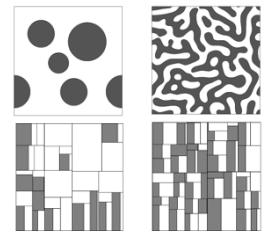- – Physics-based failure model

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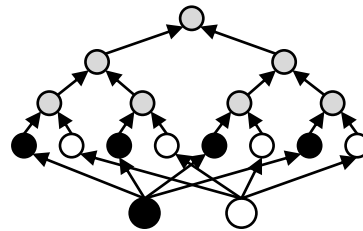Technology Corp.

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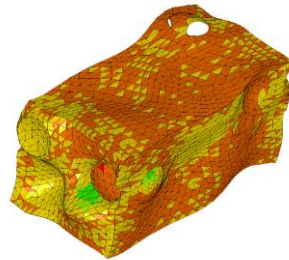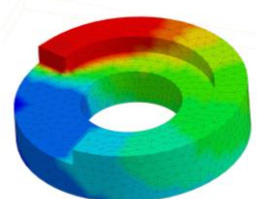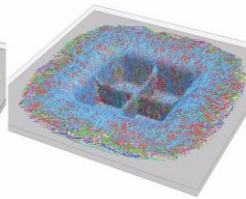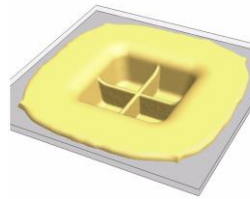

Nano-particle
reinforced rubber
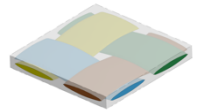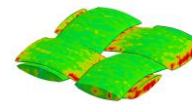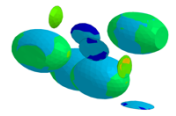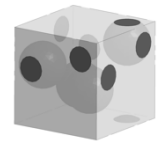
RVE package

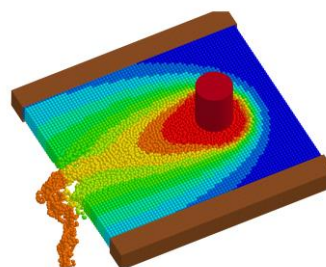*RVE analysis (Virtual material test module)*

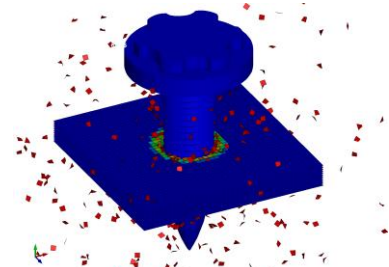*Homogenization (Model reduction & deep material network)*

Composite compression molding

3D printing (PBF)

Coupled thermal-mechanical analysis (EFG adaptivity)
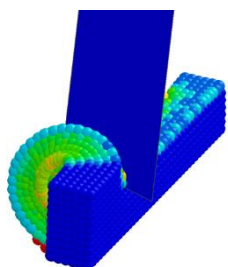

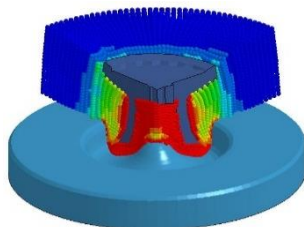Friction stir welding (SPH)

CFRP drilling (Peridynamics)
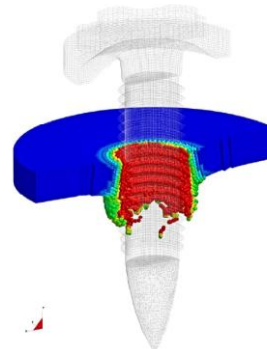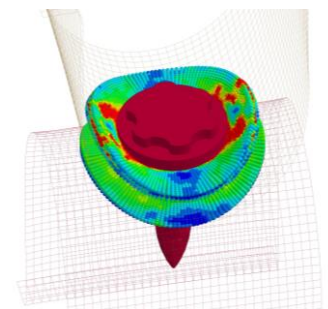

Metal cutting

Riveting

Flow drill screw: metal drilling process & tearing

Material failure analysis (SPG and particle immerse)

LS-DYNA® Advanced FEM, Meshfree & Particle Methods
Structural Analysis and Impact/Penetration

Structural Analysis:

- Virtual mechanical testing
- Manufacturing-induced structural response
- Material failure characterization

Features:
- Model building and showing by LS-Pre/Post
- Failure analysis in base materials including brittle, semi-brittle and ductile fracture
- Failure analysis in CFRP including delamination, in-plane failure and their interaction
- Failure analysis in various joints including spot weld, bolt, screw, FDS, SPR

Impact/penetration:

- High strain rate and high momentum
- Large and extreme deformation
- Material failure, separation and fragmentation
- Secondary damage induced by debris

Features:
- Galerkin particle formulation with Lagrangian kernel for convergence and stability
- Bond failure mechanism for material failure without material deletion
- Bond failure criteria calculated by phenomenological material laws
- Self-contact algorithm to deal with interaction of failed particles
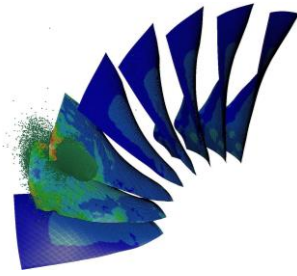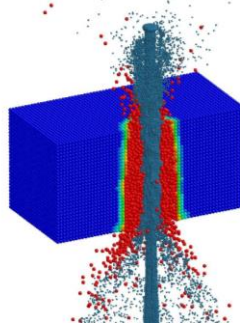
Bird striking engine blades (SPH)
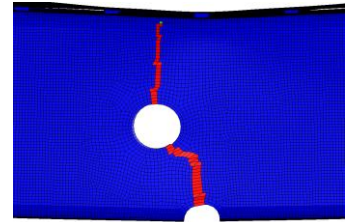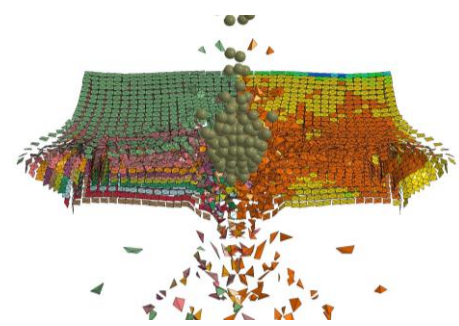
Metal 3-point bending (X-FEM shell)
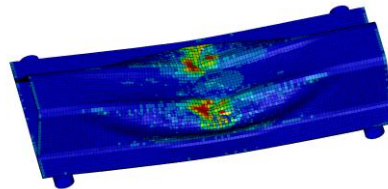
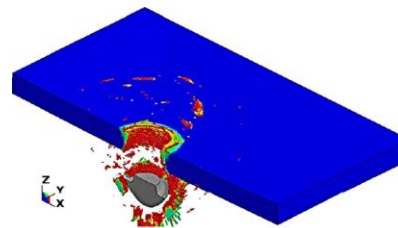CFRP 3-point bending (Peridynamics)

Ball impact on CFRP (Peridynamics)

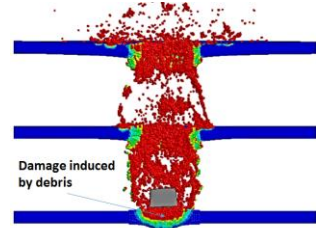Water jet impacting concrete block (SPH-SPG)

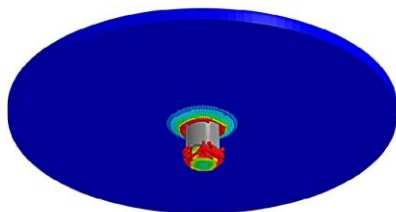Bird striking CFRP laminate (SPH-Peridynamics)

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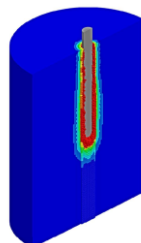
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Perforation of aluminum slab
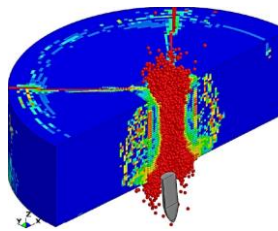
Damage induced by debris

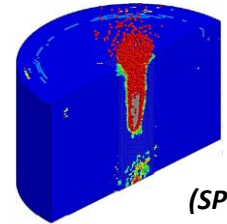Perforation of steel plates

Impact plugging

Penetration of steel cylinder

Perforation of thin concrete cylinder

(SPG)

Penetration of thick concrete cylinder

For information about 30-day LS-DYNA demo license email: sales@lstc.com