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LSTC Livermore Software Technology Corp.

Volume 8, Issue 1, January 2019

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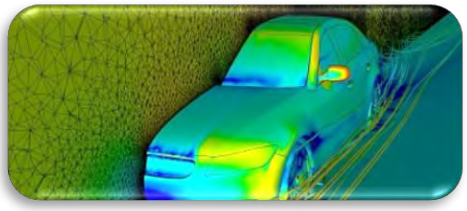
BETA CAE

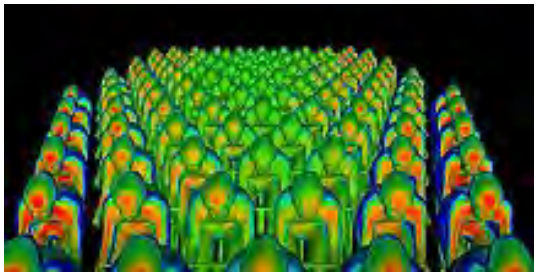


ESI Group

Dynamore

European LS-DYNA Conference 2019

FEANTM



New Platinum Participant: Shanghai Fangkun Software Technology Ltd

仿坤软件 LS-DYNA China

FEA Information Engineering Solutions

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The focus is engineering technical solutions/information.

FEA Information China Engineering Solutions

www.feainformation.com.cn

Simplified and Traditional Chinese

The focus is engineering technical solutions/information.

LSTC - Livermore Software Technology Corp.

Development of LS-DYNA, LS-PrePost, LS-OPT,
LS-TaSC (Topology), and LSTC's Dummy &
Barrier models for use in various industries.

www.lstc.com

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If you have any questions, suggestions or recommended changes, please contact us.

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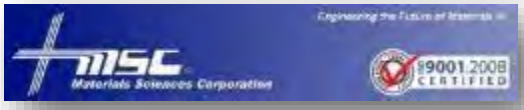
Platinum Particpants



Platinum Particpants

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Announcements

12th European LS-DYNA Conference May 14 - 16 2019, Koblenz, Germany

Announcement and Call for Papers:

We kindly invite all users of LS-DYNA, LS-OPT, and LS-TaSC to take advantage of this fantastic opportunity to showcase their work. The conference is your chance to talk with industry experts, catch up with colleagues and enjoy time exploring new ideas. In addition, attendees can meet with exhibitors to learn about the latest hardware and software trends as well as additional services relating to the finite element solver LS-DYNA, the optimization codes LS-OPT and LS-TaSC, and the pre- and postprocessor LS-PrePost. Training courses and workshops will take place in the week before, during and after the conference.

Conference Website: www.dynamore.de/conf2019

New Platinum Participants:

Shanghai Fangkun Software Technology Ltd.

LS-DYNA China, as the master distributor in China authorized by LSTC, is fully responsible for the sales, marketing, technical support and engineering consulting services of LS-DYNA in China.

Website: http://www.lsdyna-china.com/

UK Oasys LS-DYNA 16th Annual Users Meeting March 12, 2019

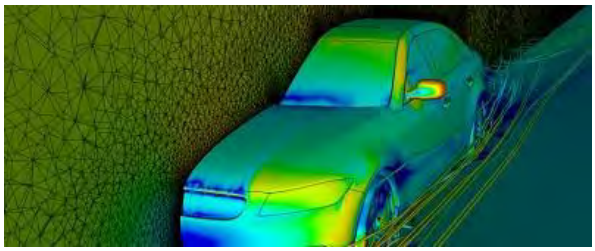
UK Oasys announces that they will be hosting the 16th Annual UK Oasys LS-DYNA Users' Meeting on Tuesday, 12th March 2019 at Ashorne Hill Conference Centre, Warwickshire, UK.

Be sure to hold this date in your diary for our conference which brings together over 100 UK users of the Oasys and LS-DYNA software.

2019 Journals – Q1 ***FEA Information Engineering Journal (FEAIEJ™)***

FEA Information Engineering Journal (FEAIEJ™) is a quarterly on line publication focusing on specific disciplines within Finite Element Analysis.

Developing CAE software systems for all simulation disciplines. Products: ANSA pre-processor/ EPILYSIS solver and META post-processor suite, and SPDRM, the simulation-process-data-and-resources manager, for a range of industries, incl. the automotive, railway vehicles, aerospace, motorsports, chemical processes engineering, energy, electronics…



December 21, 2018:

BETA CAE Systems announces the release of the v19.1.0 of its software suite

This first-point release of v19x provides noteworthy enhancements in the lately introduced functionality of v19x series, with the addition of significant new features.

Progressive Composite Damage Modeling in LS-DYNA (MAT162 & Others)

Bazle Z. (Gama) Haque, Ph.D.
Senior Scientist, University of Delaware Center for Composite Materials (UD-CCM)
Assistant Professor of Mechanical Engineering, University of Delaware, Newark, DE 19716
P: (302) 690-4741 | E: bzhaque@udel.edu

2019 Workshops:
Webinar Course Dates
March 12, 2019 | 9am-5pm
July 16, 2019 | 9am-5pm
November 19, 2019 | 9am-5pm

In House Course Dates
March 13, 2019 | 9am-5pm
July 17, 2019 | 9am-5pm
November 20, 2019 | 9am-5pm

Cost:
In-House Class: $695 per person
Includes: Coffee, Lunch, Parking, CD with Course Content for Composite Materials

Web Conference: $695 per person
Includes: CD with Course Content

Description

Progressive damage modeling of composites under low velocity impact, and high velocity impact is of interest to many applications including car crash, impact on pressure vessels, perforation and penetration of thin and thick section composites. This course will provide a comparison between available composite models in LS-DYNA for shell and solid elements, e.g., MAT2, MAT54, MAT59, & MAT162. Among these material models, rate dependent progressive composite damage model MAT162 is considered as the state of the art. This short course will include the theory and practice of MAT162 composite damage model with applications to low and intermediate impact velocities, understanding the LS-DYNA programming parameters related to impact-contact, damage evolution, perforation and penetration of thin- and thick-section composites. Printed copies of all lecture notes will be provided along with a CD containing all example LS-DYNA keyword input decks used in this short course.

Topics Covered in this Short Course:
Impact and Damage Modeling of Composites
Application of MAT162 in Engineering and Research Problems

Introduction to Composite Mechanics
Introduction to Continuum Mechanics and Composite Mechanics

Composite Material Models in LS-DYNA for Shell and Solid Elements
Discussion on MAT2, MAT54, MAT59, & MAT162

Theory and Practice in MAT162 Progressive Composite Damage Model for Unidirectional and Woven Fabric Composites
MAT162 User Manual – Version 15A 2015
Progressive Damage Modeling of Plain-Weave Composites using LS-Dyna Composite Damage Model

MAT162
Unit Single Element Analysis

Comparison between Different LS-DYNA Composite Models
Sphere Impact on Composite SHELL & SOLID Plates

Low Velocity Impact and Compression after Impact Applications
Modeling the Low Velocity Impact and Compression after Impact Experiments on Composites Using MAT162 in LS-DYNA

Perforation Mechanics of 2-D Membrane and Thin Composites

Penetration Mechanics of Composites and Soft-Laminates

Introduction to LS-DYNA (Document Only)

To register, email Robin Mack your full name, and if you're attending in house or web conference.

d3VIEW is a data to decision platform that provides out-of-the box data extraction, transformation and interactive visualizations. Using d3VIEW, you can visualize, mine and analyze the data quickly to enable faster and better decisions.

d3VIEW is a data to decision platform that provides out-of-the box data extraction, transformation and interactive visualizations.

Using d3VIEW, you can visualize, mine and analyze the data quickly to enable faster and better decisions.

Overview - d3View can integrate with any High Performance Computing (HPC) systems to submit and track jobs, perform complex data transformations using a rich library of templates that can help turn data to information, help visualize thousands of data using rich powerful visualizations, export to reports to share and collaborate.

HPC Interactions - Using the HPC application, you can submit and track simulation or non-simulation jobs that require compute resources…

Visualize your Data - View your data using extensive library of visualizations to understand your information and to help you make decisions quickly….

Introducing Peacock beta - View your 3D data using our native Multi-threaded GPU-Powered Visualizer….

Track Key Performance Targets and Indexes
Define and track key performance targets across simulations and tests to help you identify your design performance…

Design of Experiments (DOE) Data Visualizer - Viewing data from your DOE runs can be challenging when running simulations on the cloud or on-premise HPC system..

Experimental Data - d3VIEW's data to decision framework supports storing, organizing and visualization of experimental data…

Author: Christian Frech christian.frech@dynamore.de

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Call for Papers
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Venue
The Upper Middle Rhine Valley is one of the largest and oldest cultural landscapes in Europe and is the epitome of Rhine Romanticism. UNESCO acknowledged the wide variety and beauty of the Middle Rhine by making it a world heritage site in 2002.

Koblenz can be reached easily via Frankfurt and Düsseldorf International Airport.

Address:
Koblenz Kongress - Rhein-Mosel-Halle
Julius-Wegeler-Straße 4
56068 Koblenz, Germany
www.koblenz-kongress.de/

Abstract submission
Please submit your abstract (maximum length 2,500 characters) by E-Mail to conf@dynamore.de or online at:
https://www.dynamore.de/conf2019

Important Dates *Extended*
Abstract submission: 18 February 2019
Author notification: 27 February 2019
Final paper deadline: 27 March 2019

Participant fees

Industry speaker:	420 Euro
Academic speaker:	360 Euro
Industry:	640 Euro[1] / 690 Euro
Academic:	490 Euro[1] / 540 Euro

[1] Registration before 1 April 2019. All plus VAT.

Exhibiting and sponsoring
Please request further information.

Contact
DYNAmore GmbH
Industriestr. 2, D-70565 Stuttgart, Germany
Tel. +49 (0) 7 11 - 45 96 00 - 0
E-Mail:conference@dynamore.de
www.dynamore.de/conf2019

A leading innovator in Virtual Prototyping software and services. Specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtual prototypes, allowing them to virtually manufacture, assemble, test and pre-certify their future products.

ESI Visual-Environment v14.5 Updates for LS-DYNA Simulation

ESI Visual-Environment is an open CAE platform that addresses the simulation needs of multiple domains across major industries. It includes a comprehensive modeling tool to generate quality meshes on complex geometries for various engineering problems from Virtual Manufacturing to Virtual Performance: Heat Treatment, Welding, Casting, Flow, Crash, Safety, NVH (Noise, Vibration & Harshness), Electromagnetics, Fluid Dynamics (CFD), and more. An interactive post-processing module caters to the requirements of the CAE community through its multi-page / multi-plot environment.
Furthermore, a software development toolkit integrated inside Visual-Environment allows user to customize and extend this open architecture through process templates and macros. Visual-Environment incorporates the finest engineering knowledge & best practices with a process-oriented approach suited to the needs of a shop-floor user or a savvy software user alike.

Meshing

CAD Import

- CAD formats supported: UG NX: NX12, CATIA V5: V5R8–V5–6R2018, CATIA V6: Up to V6 R2018x, Inventor: V2019

Improved Import

- Import of coordinate systems available in the native CAD file is supported

CAD Export

- Support of version 1.7 for 3D pdf format

Tolerance Handling as Model Units

- Tolerance system is now computed based on unit of a CAD file.

Surface Boolean

- Boolean detection is improved to not to detect an assembly problem as a T-section.

Fe-Surface from 2D Elements

- Fe Surface patch identification from 2D elements is improved

2D > Remesh GUI.

- Option to display source mesh is supported.
- Patch boundaries are drawn with thick lines to clearly distinguish it from the mesh.

3D Split

- New pattern of splitting Hexa to 4 Hexa is supported

Element Orientation

- Visualization of 1D Element orientation and correction is supported

Curve Offset

- Offset surface edges and curves on surfaces. Option to offset with constant or variable widths.

Blend GUI

- Option to select only boundary edges of mesh, for quicker filling of holes and snap final mesh onto nearby
  CAD Node Creation on Curve. Option to set desired number of seeds on holes, made up of multiple edges.
  Gen count/size is assigned to holes, which are automatically detected from selected set of edges

Node Move

- Option to move nodes out of boundary and option for internal nodes to move them away from element is provided

Node Replace

- Displays the distance moved with its x,y,z components

Extract Curves from 1D Elements

- Option to extract curves from 1D elements and option to create smooth or linear curves

2D Mesh

- Option to display the resulting size of mesh on surface edges

Remesh

- Automatic detection of circular holes in the given mesh and placing new seeds on the circle

Crash/Safe/Impact

Info: In addition to providing a crash module dedicated to ESI Virtual Performance Solution, Visual-Environment also supports LS-DYNA, MADYMO and RADIOSS users.

Seat Belt Enhancements

- The seat belt is one of the most important and integral parts of occupant safety during a crash. Hence, it is important to model the seat belt accurately and realistically, to simulate the actual behavior when the impact occurs. To simplify and create better quality belts, the seat belt tool is enhanced by providing with belt preview plane handles support to translate/rotate the plane in all three directions and option to pick nodes for belt points.

Enhancements in Read/Write of User Comments

- Visual-Environment is enhanced to retain the location of comments as they are on import and export of LS-DYNA keyword file.

Post-Processing

Trajectory Import and Export

- Import and export of trajectories in *.xyn, *. iges and *.csv formats are supported. Comparison of trajectories from test and simulation can be done.

Axis Level Zoom In and Out

- Zoom in and out supported at axis level along the selected axis.

File I/O

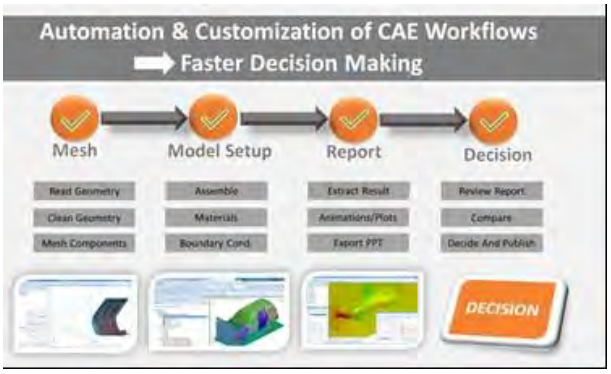
- Image file loading as a video file with only one frame is supported for PNG, JPEG, BMP, TIFF and GIF

Video Settings Enhancements

- Imported image file can be calibrated and aligned on the simulation model by picking three points
- Transparency of the video/image model can be set from 0 to 100 (0 being opaque)

Process Automation

Visual-Process Executive refers to CAE Process Automation. Automate repetitive and cumbersome CAE tasks in virtual product development. Engineers can capitalize, share and deploy their organization's best practices within their extended ecosystem, thanks to this versatile module. It is commonly used for regulatory test simulation such as FMVSS, IIHS, EURO NCAP, etc… Simulation setups are captured and automated in Visual-Environment and can be coupled with Simulation Data Management.
There are several process templates delivered by standard Visual-Environment distribution which help to achieve high productivity for standard regulation. Visual-Environment provides also a software development environment (Visual-SDK) which enables user to integrate their best practices.



Software Development Toolkit

Visual-SDK is the software development toolkit available on demand. This module provides a complete tool set required for authoring, debugging and execution of process templates. Visual-SDK toolbox gives user a comprehensive tool to design graphical user interface, integrate Python scripting and access to Visual API's online documentation.

Visual-SDK Batch is a Python interface to APIs that facilitates access to Visual-Environment's Core Data-Model. This interface allows you to import the APIs as a Python module namely VistaDb in the Python scripts. The scripts can be run directly from console without launching VE.

VistaDb Python module provides access to around 2,000 APIs using which files can be imported, required operations can be performed on any entity and finally, the data can be exported back into a file.

Simulation Lifecyle Management

Visual-Composer refers to the Multi-Domain Compute Model Management and is a Simulation Lifecycle Management tool that aims at providing end-to-end decision-making support for simulations. Engineers can smartly build and maintain the two-directional link between CAD data stored in PLM systems and simulation domains. Visual-Composer allows propagation of design and engineering changes across the virtual tests, while maintaining traceability of data throughout the virtual product development process.
It further provides a local data management, called "Simulation Content Manager (SCM)", which manages the simulation content locally.

System Modeling

Visual-Systems focuses on the collaboration between System Modeling (0D/1D) and FEM (3D), provides the Modelica Standard Libraries and the CosimVPS library but is able also to load non-commercial third-party Modelica

libraries and access to SimulationX models through FMI. Visual-Systems enables a direct access to Virtual Performance Solution 3D models through the common Visual-Environment platform and the post-processing for results from both solutions.

Computational Fluid Dynamics

Visual-CFD is a state-of-the-art multi-window / multi-model environment for carrying out CFD simulations by coupling OpenFOAM solver into Visual-CFD. The current release targets CFD applications for External Aerodynamics, Flows with Heat Transfer, Conjugate Heat Transfer modeling, Gravity-driven flows, modeling moving meshes, multi-phase flow modeling with VoF and Eulerian methods and Overset modeling.

Additive Manufacturing

ESI Additive Manufacturing is an Integrated Computational Material Engineering Platform (ICME) for metallic additive manufacturing process modeling and optimization. Several modules interact to provide a comprehensive understanding of how process parameters affect material quality and component manufacturability. The different modules will be released successively. In Version 14.0 of the Visual-AM module two solvers are supported, namely Distortion and Prescan, which are mainly dedicated to manufacturability of a material and a component. In later versions, additional solvers will be implemented like powder coating, melt pool simulation, thermal model for scanning strategies and many more. The research prototype already includes these modules and could be provided upon request. For both, Distortion and Prescan, you are neither requested to do any meshing nor to type any complex commands to launch different scripts or solvers. All set-up steps are organized in a very simple procedure that you can go through from top to bottom.

ESI is continuously expanding the capabilities of Visual-Environment to support new physics in CAE, enabling customers to work with different physics in a single simulation environment, with the ability to virtually build and test a full Virtual Prototype, all around a single core model, delivering tremendous gains in productivity and accuracy.

ESI will be at CES 2019

Accelerating Manufacturing & Engineering Developments for the Future of E-mobility

San Jose, California, USA – December 20, 2018

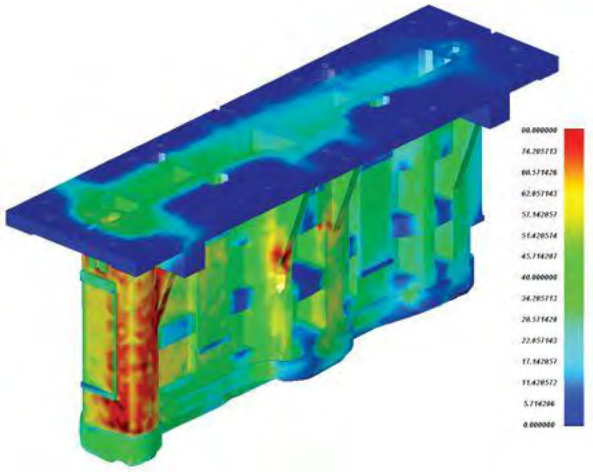
ESI's customer portal myESI is available for all ESI customers to access updated product information, tips & tricks, training information, and selected software downloads.

For additional product information, please feel free to visit our website, contact any of the local ESI subsidiaries or contact Andrea Gittens, Product Marketing Manager for ESI Visual-Environment.

For more ESI news, visit www.esi-group.com/press

ETA has impacted the design and development of numerous products - autos, trains, aircraft, household appliances, and consumer electronics. By enabling engineers to simulate the behavior of these products during manufacture or during their use, ETA has been involved in making these products safer, more durable, lighter weight, and less expensive to develop.

Dynaform Modules - Die System Analysis



The Finite Element Analysis approach to die system design is an efficient way to predict and resolve many stamping related concerns within the die production line. Die System Analysis (DSA) simulations streamline die system design through the analysis of scrap shedding/removal, structural integrity and sheet metal transferring/handling. DSA's process guidance approach allows engineers to use simple graphic interfaces to execute complicated preparation and simulation processes.

Scrap Shedding & Removal (SHR)

The number one cause of stamping line shutdown is the failure of scrap to exit the workstation. This problem can be predicted and corrected in the trim die design stage to avoid troubleshooting in the stamping plant. SHR streamlines model generation for scrap, trim dies, chutes and trim steel. Trimming operations and shedding simulations can be easily setup in the scrap shedding graphic interface.

Die Structural Integrity (DSI)

DSI simulates operational loads to analyze the design integrity of the die. DSI can generate FEA models of the die structure, define operational/stamping loads and evaluate the die structure strength and durability by using implicit and explicit solutions.

Sheet Metal Transferring & Handling (SMTH)

SMTH simulates the transfer of metal as it progresses through the manufacturing process. It simulates the transfer of the work-piece to the initial die station, movement between stations, pick-up of the finished part and placement on the shipping rack. Part deformation generated in the simulation is used to predict interference between the work-piece and tools. The stress/strain results can be used to prevent damage during transportation, as well as loading and unloading operations.

FEA Not To Miss, is a weekly internet blog on helpful videos, tutorials and other important internet postings. Plus, a monthly email blog.

Welcome to Monday - grab a cup of coffee, tea or protein drink and join me for FEA Not To Miss Monday

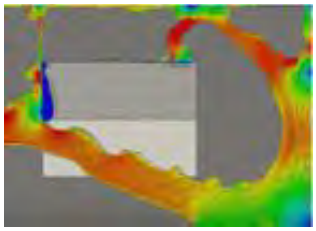
Postings every Monday on what you have missed

www.feantm.com

01/14/2019 We are pleased to announce our addition of International Coffee/Treats. So, climb aboard the FEANTM bus as we ride to YouTube, serving Kaffe Marko, a Knoppers Wafer AND you get a set of leggo's! See below and you will find your reason for the leggos! But the coffee/wafer? New menu item!

Marko Thiele - LEGO car crash
against 25% offset barrier with 17km/h

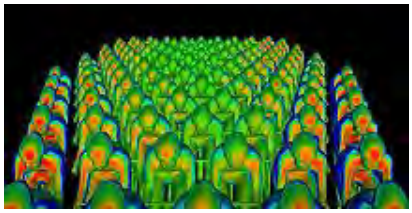
01/07/2019 Swirling Coffee flavors! Hmmm Red Cherry, dash of lime, lemon, blueberry - Anyway it is really a simulation, but to me it looks like the simulation of a flow through of a coffee cup - Cafe Au Color Flavors!



LS-DYNA CFD: Flow through multi-highly-anisotropic media.

Generalized flow through 3 different porous media with strong discontinuities in the permeability tensor

12/31/2018 - HAPPY New Year and of course my resolution is diet, and biking AND speaking of biking, do you know how many Mocha Au Collins I had to make for a Peloton simulation? A LOT! And all had no spill lids - SO this weeks special is "No Spill, Mocha Au Collins" - a chocolate flavored, no spill, ready for simulation to go cup of coffee!



The Largest CFD Simulation Reveals the Complex Aerodynamic Interactions in a Peloton

Running ANSYS Fluent computational fluid dynamics (CFD) software.

Shanghai Hengstar & Enhu Technology sells and supports LSTC's suite of products and other software solutions. These provide the Chinese automotive industry a simulation environment designed and ready multidisciplinary engineering needs, and provide a CAD/CAE/CAM service platform to enhance and optimize the product design and therefore the product quality and manufacture.

Shanghai Hengstar & Enhu Technology

Sub-distributor and CAD/CAE/CAM consulting in China, especially for FEA needs for engineers, professors, students, consultants.

Contact us for our LS-DYNA training courses and CAD/CAE/CAM consulting service, such as

- Crashworthiness Simulation with LS-DYNA
- Restraint System Design with Using LS-DYNA
- LS-DYNA MPP
- Airbag Simulation with CPM
- LS-OPT with LS-DYNA

Our classes are given by experts from LSTC USA, domestic OEMs, Germany, Japan, etc. These courses help CAE engineers to effectively use CAE tools such as LS-DYNA to improve car safety and quality, and therefore to enhance the capability of product design and innovation.

Consulting - Besides solver specific software sales, distribution and support activities, we offer associated CAD/CAE/CAM consulting services to the Chinese automotive market.

Solutions - Our software solutions provide the Chinese automotive industry, educational institutions, and other companies a mature suite of tools - powerful and expandable simulation environment designed and ready for future multidisciplinary CAE engineering needs.

Shanghai Hengstar provides engineering CAD/CAE/CAM services, consulting and training that combine analysis and simulation using Finite Element Methods such as LS-DYNA.

Shanghai Hengstar Technology Co., Ltd

hongsheng@hengstar.com

http://www.hengstar.com

Shanghai Enhu Technology Co., Ltd

http://www.enhu.com

JSOL supports industries with the simulation technology of state-of-the-art. Supporting customers with providing a variety of solutions from software development to technical support, consulting, in CAE (Computer Aided Engineering) field. Sales, Support, Training.

JSOL Corporation

Engineering Business Division

Product : J-OCTA

http://www.j-octa.com/?cd=mail

J-OCTA Feature enhancement: Finite Element Method (FEM) simulation

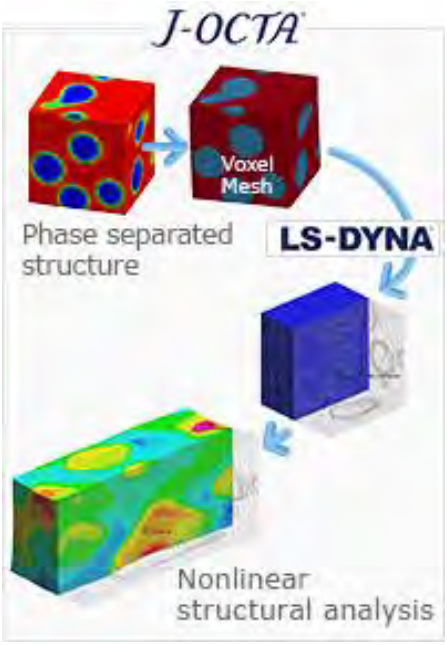
Interface for LS-DYNA supports large-deformation simulation

Recently, it is in high demand to estimate and evaluate the behavior during large deformation of micro-structured composites which contain phase separation and filler, by performing simulations. Existing FEM engine of J-OCTA, "MUFFIN-Elastica" is for elastic simulation and is specialized for the behavior during a small deformation.

To extend its applicability to FEM simulation, the updated J-OCTA 4.1 version will provide the interface for a multi-purpose nonlinear structural analysis engine "LS-DYNA".

The phase-separated structure computed by "COGNAC or "SUSHI" can be output as a mesh data for LS-DYNA simulation. After the user specifies the material properties for each component and deformation (boundary) condition, LS-DYNA simulation can be started from J-OCTA directly. As a material model being appropriate for nonlinear structural simulation, materials including elastoplastic, viscoelastic, and hyperplastic such as rubber are available for use.

From version 4.1, J-OCTA can deal a large-deformation FEM calculation of a multi-phase structure which contains phase separation and filler dispersed structure.



Example Case Study: Nonlinear Mechanical Properties of Composites

The phase-separated structure of a resin material (e.g., polypropylene) which is popular in the automobile industry varies depending on the type and the content ratio of the additive substance. It results in the different material properties. In this case study, you can find an example of the J-OCTA and LS-DYNA coupling analysis of mesoscale simulation that considers the phase-separated structure of a polymer.

KAIZENAT

https://www.kaizenat.com/

KAIZENAT Technologies Pvt Ltd is the leading solution provider for complex engineering applications and is founded on Feb 2012 by Dr. Ramesh Venkatesan, who carries 19 years of LS-DYNA expertise. KAIZENAT sells, supports, trains LS-DYNA customers in India. We currently have office in Bangalore, Chennai, Pune and Coimbatore

Technologies Pvt. Ltd.

GROWING and MOVING!

Kaizenat had a humble beginning and started with a simple set-up in 2012. Now, we are excited to announce that we have grown big in terms of customer count, team size and revenue, which have led us to move our Bangalore office to a new premise.

Kaizenat's New Office:

The new location provides unmatched connectivity to three points of much commercial significance in Bangalore - Whitefield, MG Road, and the Airport thus reducing the long commute to the office and ensuring work-life balance.

The greatest benefits of moving:

- Dedicated in-house support team
- Sophisticated training /conference room set-up with AI Display
- Quick connect to customer location
- Dedicated automation team
- Focused and unified working environment

New Address:

Kaizenat Technologies Pvt Ltd
B-1112, Signature Tower,
Brigade Golden Triangle,
Old Madras Road,
Kattamnallur Gate,
Bangalore -560049

Contact us:

support@kaizenat.com **for more information.**

A team of engineers, mathematicians, & computer scientists develop LS-DYNA, LS-PrePost, LS-OPT, LS-TaSC, and LSTC's Dummy & Barrier models.

LS-DYNA® Advanced FEM, Meshfree & Particle Methods

Intelligent Manufacturing, Advanced Material Design & Integrated Structural Analysis

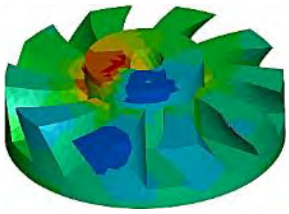
LS-DYNA® integrates the finite element, meshfree, and particle methods for solving some of the most challenging problems in manufacturing processes, material design, and structural analysis. Such problems typically involve large deformations, material failure, crack propagation, and composite materials. Some of these methods are coupled with the thermal, fluids, and electro-magnetic solvers in LS-DYNA to perform multi-physics analysis as needed.

Applications

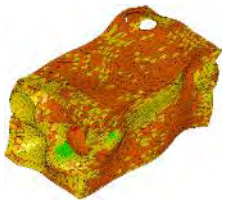
- Nondestructive manufacturing: forging, extrusion, 3D printing, compression molding
- Destructive manufacturing: cutting, drilling, grinding, machining, self-piercing riveting, flow drill screwing
- Material design: Representative Volume Element (RVE), reduced – order modeling
- Structural analysis: lap-shear, tearing, crack propagation, bird strike, impact penetration, fluid-structure interaction

Features

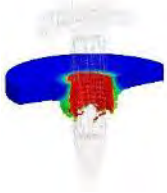
- Meshfree-enriched FEM, eXtended FEM (XFEM), adaptive FEM
- Element Free Galerkin (EFG), Peridynamics, adaptive EFG
- Smoothed Particle Hydrodynamics (SPH), Smoothed Particle Galerkin (SPG)
- Immersed particle algorithm for composites
- Particle contact for impact problems
- Brittle, semi-brittle, ductile, rubber type materials, composites
- Shell and solid applications
- Explicit and implicit solvers
- Multi-physics analysis
- Multi-scale composite modeling
- Material data processing for material design
- Physics-based failure mechanism
- Material failure and separation



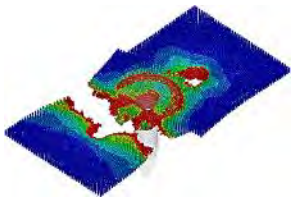
3D printing



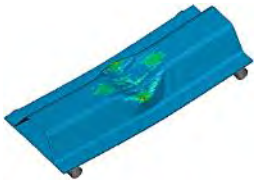
RVE for nano-particle reinforced rubber



Flow drill screwing (FDS)

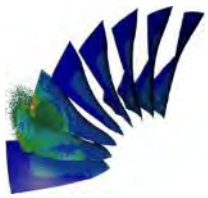


Lap-shear after FDS

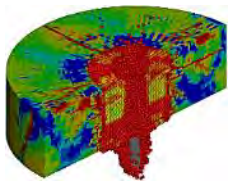


Carbon fiber reinforced polymer

Ductile cracking in shell



Bird strike



Perforation of concrete

Group Website: **www.lstc-cmmg.org**

LS-PrePost® an Advanced Pre- and Post-processor

LS-PrePost® is an advanced pre- and post-processor developed for LS-DYNA®. It is fully multi-platform with support for Windows, Linux and Mac OSX. LS-PrePost is based on the OpenGL rendering engine with a design that is both efficient and intuitive. It is delivered with LS-DYNA without additional cost and may be installed on multiple platforms. License keys are not needed.

Geometry and Meshing Includes

- A geometry engine which allows the creation and modification of curves, surfaces, and solid objects. Also included are tools to heal and simplify the geometry model
- An automatic surface meshing tool
- An automatic 3-Dimension(3D) tetrahedron meshing module
- Various methods to create a mesh by dragging, spinning, offsetting, and sweeping
- The construction of middle surface shells from 3D Solids

Pre- and Post-Processing Capabilities

- Complete LS-DYNA Keyword management
- Tools to create and modify LS-DYNA entities
- General model setup for NVH (Noise, Vibration and Harshness), Implicit, and Thermal Analyses
- Tools to measure FEA data like distance, area, angle, volume, etc.
- Section cuts for better visualization in complicated models
- Comprehensive time history plotting for the d3plot, ASCII history, and BINOUT databases
- Time history plotting for user defined data
- Particle and Discrete element visualization
- CFD model and result visualization

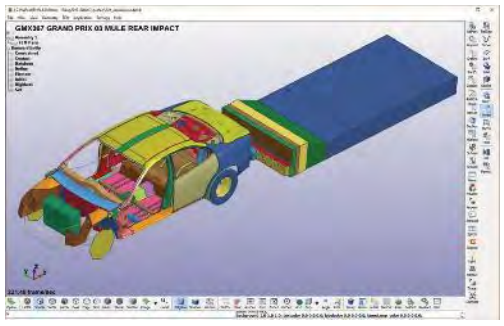
Other General Functions

- Tools to display, reverse, and auto reverse the normal vector directions of Shells, Segments, Thick Shells, and Cohesive Elements
- Printing of High Definition pictures in a choice of formats
- Movie creation for animation sequences
- Commands, Macros and a Scripting Command Language (SCL) for automated Pre- and Post-Processing

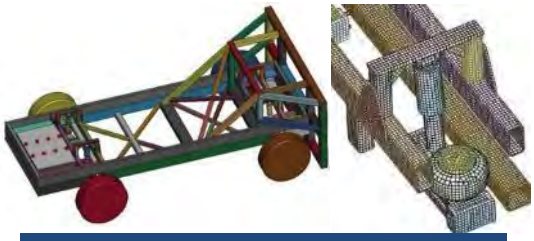
Applications

- Airbag folding
- Comprehensive model checking including contact initial penetration check
- Dummy positioning
- Metal forming process setup
- Seatbelt fitting

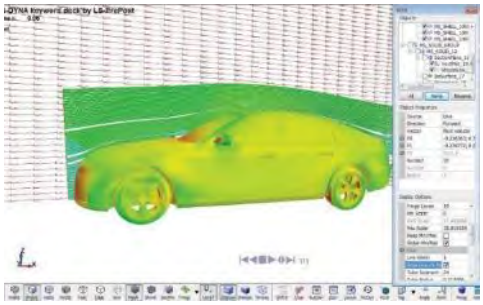
LS-PrePost Pre- and Post-Processig



LS-DYNA Geometry and Meshig



ICFD Post-Processing



Providing engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors.

MAT162 is a material model for use in LS-DYNA that may be used to simulate the onset and progression of damage in unidirectional and orthotropic fabric composite continua due to 3D stress fields. This failure model can be used to effectively simulate fiber dominated failures, matrix damage, and includes a stress-based delamination failure criterion.

Simulation Movie

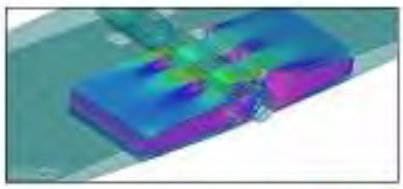
Penetration and Perforation of Moderately Thick Composites

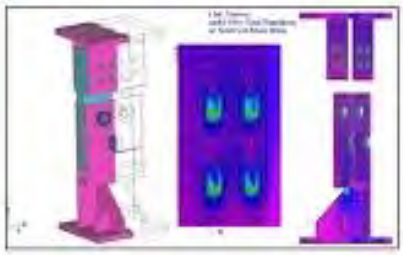
Examples are located at www.ccm.udel.edu/software/mat162/examples/

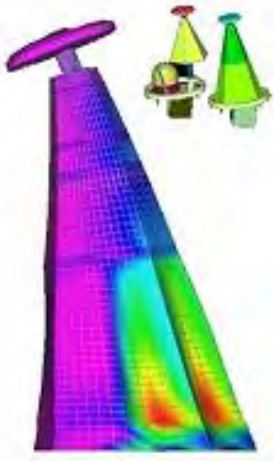
Example 1: Sphere Impact on a Composite Laminate
Example 2: Sphere Impact on a Perfectly Clamped Composite Plate
Example 3: Sphere Impact on Elliptical Carbon/Epoxy Tube

High Velocity Impact of Square Plate using MAT161/162
www.youtube.com/watch?v=NgjncjfLKGw

Engineering Services







MSC brings a long-range perspective to its engineering services clients. We understand the history of our core technologies, and can project likely new developments, and seek to provide innovation. A keen appreciation of the materials and structures state-of-the-art gives us the ability to create a development roadmap that efficiently reaches the clients goal, while taking full advantage of what already exists. We have an unusually broad exposure to materials applications; we have been involved with everything from infrastructure applications to spacecraft. This broad perspective allows us to draw on approaches and trends in one application area, and apply it to another. This helps our clients avoid pitfalls, and make exceptionally rapid technological progress. The same broad reach allows us the opportunity to interact with, and evaluate a wide range of suppliers.

Oasys Ltd is the software house of Arup and distributor of the LS-DYNA software in the UK, India and China. We develop the Oasys Suite of pre- and post-processing software for use with LS-DYNA.

Oasys Post-Processing V15 Update

Jac Cross, Arup Associate and developer of the Oasys Post Processing software presents this free webinar, which describes and demonstrates some of the new and updated features in the latest Oasys D3PLOT, T/HIS, and REPORTER v15.0 release.

Please click below to view the webinar recording:
VIEW RECORDING

Oasys 15 Highlights New features in version 15

The following bullet points summarise the key updates which have been implemented and are now available in each of our Oasys version 15 programs.

This version of Oasys PRIMER includes:

- Support for LS-DYNA R10 keywords
- Improved model read and write speed with about 60% and 70% of the time to read and write respectively compared to V14
- A new link capability is integrated into PRIMER to use the post-processing tools D3PLOT & T/HIS
- A new combined Dummy Positioning and Seatsquash tool to automatically create simulation based LS-DYNA positioning models
- New options for the orientation and alignment of spotwelds created in PRIMER
- A new mechanism type “Coupler” has been added to handle rotation against rotation or rotation against translation or translation against translation
- Improved ability to read more ANSA comments and convert them into PRIMER mechanisms

Introduction to LS-DYNA Implicit Training Course 5 February 2019

The Arup Campus, Blythe Valley Park, Solihull

Course Outline:

The course is an introduction to the use of implicit analysis in LS-DYNA. The main focus is on the different types of linear and non-linear static analysis. The required input cards for each one of them are discussed.

Predictive Engineering provides FEA and CFD consulting services, software, training and support to a broad range of companies.

FINITE ELEMENT ANALYSIS
Predictive Engineering

Who We Are

We are experienced simulation engineers that have successfully analyzed and validated hundreds and hundreds of finite element analysis (FEA) projects. With decades of experience in FEA and CFD, we know how to optimize your design to deliver every last bit of performance and to ensure that it will meet your service requirements whether in Aerospace, Marine, Energy, Automotive, Medical or in Consumer Products.

Our mission is to be honest brokers of information in our consulting services and the software we represent.

Our History

Since 1995, Predictive Engineering has continually expanded its client base. Our clients include the total spectrum from large Fortune 500 companies to start-ups looking to launch the next generation of satellites. We are also proud of work in the renewable energy fields from wind to solar. Over the years, one of our core strengths is in the vibration analysis of composite structures, aerospace electronic components and large industrial machinery. What has set us apart from the competition is our experience in the successful completion of more than 800 FEA, CFD and LS-DYNA projects.

View our portfolio of:
+ FEA, CFD and LS-DYNA consulting projects

Offering industry-leading software platforms and hardware infrastructure for companies to perform scientific and engineering simulations. Providing simulation platforms that empower engineers, scientists, developers, and CIO and IT professionals to design innovative products, develop robust applications, and transform IT into unified, agile environments.

HPC planning for 2019: Increase your engineering productivity

Thomas Helmonds - December 27, 2018

Engineers face many daily operational inefficiencies that inhibit their time-to-solution. Every day we work with engineers to provide solutions to computing resource limitations and management of HPC. Specifically, we excel at utilizing our platform to accelerate HPC engineering simulations. The impact is real: Rescale users have seen accelerated time-to-solution by 23%, allowing engineering teams to be 12% more productive overall.

In this article, we hope to give you exactly what you need to better plan for HPC in 2019.

(Your) 2019 Engineering Objectives: Measurably Improve Engineering Team Productivity

1. Shorten the turnaround time of your engineering services

2. Eliminate engineering hours spent in HPC queues

3. Increase the individual productivity of your engineers

4. Develop best practices for HPC usage by workflow

Some key issues engineers face when developing a product are simulation constraints due to queue times from lack of computing resources, software availability, architecture diversity, and departmental management. The shortage of these vital resources and tools results longer development cycles of the products that generate revenue.

1. Shorten the turnaround time of your engineering services

By eliminating queue time and enabling engineers with the best HPC hardware and software, you can optimize your research pipeline and push innovations to the market, sooner.

The Proof:

Queues for running simulations can halt the research pipeline and waste valuable engineering time. A queue directly results in a delayed time-to-solution that can be critical to the progression of research.

The days spent without answers can cost a company millions of dollars in engineer idle time. The ability to secure hardware as needed allows engineers to be agile with their computing resources and break the constraints of a static on-premise HPC system that limit their simulation volume and fidelity. These inefficiencies directly impact the company's objective to bring innovations to the market and generate revenue; so, the ramifications of research inefficiencies reverberate throughout the entire organization and externally. By utilizing Rescale, you can run a single simulation on 10,000 cores, or run 10,000 simulations on 10 cores each: the availability of resources means there is no reason not to run a simulation immediately.

3. Increase the individual productivity of your engineers

Remove the constraints of static On-Premise HPC systems and engage a dynamic environment with a the latest HPC hardware and simulation software. Explore new DOE and optimize your research pipeline to achieve the fastest time-to-solutions.

The Proof:

Rescale has over 300 ported and tuned software's incorporated into our platform; many on a pay as you use model such as ANSYS, Siemens, CONVERGE, and LS-DYNA. Utilization of the endless, diverse computing resources allows engineers to use the best software on the best hardware, always. The coupling of the best software and hardware allows engineers to have the best results available, quickly. In addition, engineers are exposed to new software and computing resources that were previously unavailable. Some Rescale customers have seen as high as 80% reduction in time-to-answers. The freedom of architecture choices allows for the exploration of new processes in your design of experiments which can create quicker research pipelines with higher fidelity. Enabling researchers with the best tools HPC tools produces quicker results and increases productivity.

4. Develop best practices for HPC usage by workflow

Gain real time insight into your engineers activities and utilize the information to optimize your engineering departments operations and finances.

The Proof:

Scale X Enterprise allows you to fully manage your engineers by tracking expenses, allocating resources, and budgeting teams. With control of computing and software resources, budgets, projects, and access, you can fully manage how your engineering teams utilize cloud computing. In addition, access to billing summaries and real time spending dashboards allow you to monitor your computing expenses. Rescale doesn't only provide a solution to engineering inefficiencies, it gives management the insight to innovate their own research pipeline.

Rescale is a turn-key platform that enables access to limitless computing resources and over 300 ported and tuned softwares. With ScaleX Enterprise's management dashboard, engineering departments are capable of fully managing and reporting on their HPC usage. Rescale has had significant impact on many of our customers; but to understand the true impact Rescale can have on your organization, it is best to reach out to us. With our confidential tools and industry leading knowledge, we can define the impact of Rescale on your engineering operations.

This article was written by Thomas Helmonds.

仿坤软件
LS-DYNA China

Shanghai Fangkun Software Technology Ltd.

LS-DYNA China, as the master distributor in China authorized by LSTC, is fully responsible for the sales, marketing, technical support and engineering consulting services of LS-DYNA in China.

As LS-DYNA is widely used and recognized in the field of engineering analysis in China, LS-DYNA China is increasing software training to further help LS-DYNA users understand and use the program.

2019 January – June LS-DYNA Public Training Courses Plan		
Time	Content	Place
January	LS-DYNA Basic Training Course	Shanghai
March	LS-DYNA Implicit Analysis Course	Shanghai
April	LS-OPT Optimization Training Course	Shanghai
April	LS-DYNA Basic Training Course	Shanghai
May	LS-DYNA Drop Test Training Course	Shanghai
June	LS-DYNA Material Training Course	Shanghai
June	LS-DYNA Basic Training Course	Beijing

For further training course information, please follow any news and notices published by LS-DYNA China. If you have any questions, please contact the following contact persons:

Yu QinTel.: 15001986675 Email: training@lsdyna-china.com

Fei Xixi Tel.: 13777946225 Tel.: (021) 61261195

Website: http://www.lsdyna-china.com **Sales Email**: sales@lsdyna-china.com
Technical support Email: support@lsdyna-china.com **Phone:** 400 853 3856 021-61261195

CAE software sale & customer support, initial launch-up support, periodic on-site support. Engineering Services. Timely solutions, rapid problem set up, expert analysis, material property test Tension test, compression test, high-speed tension test and viscoelasticitiy test for plastic, rubber or foam materials. We verify the material property by LS-DYNA calculations before delivery.

CAE consulting - Software selection, CAE software sale & customer support , initial launch-up support, periodic on-site support.

Engineering Services - Timely solutions, rapid problem set up, expert analysis - all with our Engineering Services. Terrabyte can provide you with a complete solution to your problem; can provide you all the tools for you to obtain the solution, or offer any intermediate level of support and software.

FE analysis

- LS-DYNA is a general-purpose FE program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing and bioengineering industries.
- ACS SASSI is a state-of-the-art highly specialized finite element computer code for performing 3D nonlinear soil-structure interaction analyses for shallow, embedded, deeply embedded and buried structures under coherent and incoherent earthquake ground motions.

CFD analysis

- AMI CFD software calculates aerodynamics, hydrodynamics, propulsion and aero elasticity which covers from concept design stage of aerocraft to detailed design, test flight and accident analysis.

EM analysis

- JMAG is a comprehensive software suite for electromechanical equipment design and development. Powerful simulation and analysis technologies provide a new standard in performance and quality for product design.

Metal sheet

- JSTAMP is an integrated forming simulation system for virtual tool shop based on IT environment. JSTAMP is widely used in many companies, mainly automobile companies and suppliers, electronics, and steel/iron companies in Japan.

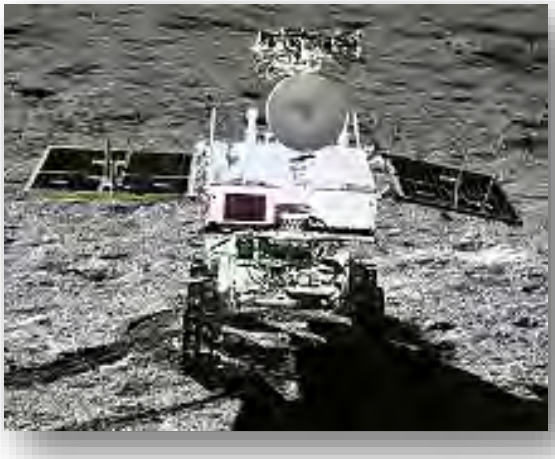
Pre/ Post

- **PreSys** is an engineering simulation solution for FE model development. It offers an intuitive user interface with many streamlined functions, allowing fewer operation steps with a minimum amount of data entry.
- **JVISION** - Multipurpose pre/post-processor for FE solver. It has tight interface with LS-DYNA. Users can obtain both load reduction for analysis work and model quality improvements.

Biomechanics

- **The AnyBody Modeling System™** is a software system for simulating the mechanics of the live human body working in concert with its environment.

Chinese spacecraft on the far side of the moon



Picture provided by China National Space Administration via Xinhua News Agency, the rover Yutu-2 is seen in a photo taken by the lander of the Chang'e-4 probe.

BEIJING — China exchanged data with NASA on its recent mission to land a Chinese spacecraft on the far side of the moon, the Chinese space agency said Monday, in what was reportedly the first such collaboration since an American law banned joint space projects with China that do not have prior congressional approval.

The space agency's deputy director, Wu Yanhua, said NASA shared information about its lunar orbiter satellite in hopes of monitoring the landing of the Chang'e 4 spacecraft, which made China the first country to land on the far side of the moon earlier this month.

China, in turn, shared the time and coordinates of Chang'e 4′s scheduled landing, Wu told reporters during a briefing on the lunar mission. He added that while NASA's satellite did not catch the precise moment of landing, it took photographs of the area afterward.

The state-run China Daily said that was the first such form of cooperation since the 2011 US law was enacted.

NASA has not published any statements on the collaboration and could not immediately be reached for comment.

The lunar mission by Chang'e 4 and its rover, Jade Rabbit 2, was a triumph for China's growing space program, which has been rapidly catching up with those of Russia and the US President Xi Jinping has placed space exploration among the country's national development priorities and the far side mission offered a chance for China to do something not done before by any other country.

The far side of the moon — the side which faces away from Earth — posed a challenge for scientists because it is beyond radio signals' reach. China set up a relay satellite in May to receive communication from Chang'e 4.

Real life safety: the Mercedes-Benz EQC and safety: Proven to be safe

Volkswagen AG and Ford Motor Company Launch Global Alliance

•Alliance leverages the two global automakers' strengths to better compete, innovate and serve customers
•Alliance does not involve cross-ownership between the two companies
•Companies to first deliver medium pickup trucks for global customers, aiming to start in 2022, and intend to follow with commercial vans in Europe
…

Volkswagen chief executive Herbert Diess, pictured right, and his Ford counterpart Jim Hackett, left,

DETROIT, Jan. 15, 2019 – Volkswagen AG and Ford Motor Company today announced the first formal agreements in a broad alliance that positions the companies to boost competitiveness and better serve customers in an era of rapid change in the industry.

Volkswagen CEO Dr. Herbert Diess and Ford CEO Jim Hackett confirmed that the companies intend to develop commercial vans and medium-sized pickups for global markets beginning as early as 2022. The alliance will drive significant scale and efficiencies and enable both companies to share investments in vehicle architectures that deliver distinct capabilities and technologies.

The companies estimate the commercial van and pickup cooperation will yield improved annual pre-tax operating results, starting in 2023.

In addition, Volkswagen and Ford have signed a memorandum of understanding to investigate collaboration on autonomous vehicles, mobility services and electric vehicles and have started to explore opportunities. Both companies also said they were open to considering additional vehicle programs in the future. The teams will continue working through details in the coming months.

"Over time, this alliance will help both companies create value and meet the needs of our customers and society," Hackett said. "It will not only drive significant efficiencies and help both companies improve their fitness, but also gives us the opportunity to collaborate on shaping the next era of mobility."

Diess added: "Volkswagen and Ford will harness our collective resources, innovation capabilities and complementary market positions to even better serve millions of customers around the world. At the same time, the alliance will be a cornerstone for our drive to improve competitiveness."

The alliance, which does not entail cross-ownership between the two companies, will be governed by a joint committee. This committee will be led by Hackett and Diess and will include senior executives from both companies.

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Commercial van and pickup collaboration - Ford and Volkswagen both have strong commercial van and pickup businesses around the globe, with popular nameplates such as the Ford Transit family and Ranger as well as the Volkswagen Transporter, Caddy and Amarok.

The companies' collective light commercial vehicle volumes from 2018 totaled approximately 1.2 million units globally, which could represent the industry's highest-volume collaboration as production scales.

Demand for both medium pickups and commercial vans is expected to grow globally in the next five years. The alliance will enable the companies to share development costs, leverage their respective manufacturing capacity, boost the capability and competitiveness of their vehicles and deliver cost efficiencies, while maintaining distinct brand characteristics.

Through the alliance, Ford will engineer and build medium-sized pickups for both companies which are expected to go to market as early as 2022. For both parties, Ford intends to engineer and build larger commercial vans for European customers, and Volkswagen intends to develop and build a city van.

About Volkswagen Group - The Volkswagen Group with its headquarters in Wolfsburg is one of the world's leading automobile manufacturers and the largest carmaker in Europe. The product spectrum ranges from motorcycles to small cars and luxury vehicles. In the commercial vehicle sector, the products include ranges from pick-ups, buses and heavy trucks. The Group operates 120 production plants in 20 European countries and a further 11 countries in the Americas, Asia and Africa. Every weekday, around 642,292 employees worldwide produce nearly 44,170 vehicles, and work in vehicle-related services or other fields of business. www.volkswagenag.com.

About Ford Motor Company - Ford Motor Company is a global company based in Dearborn, Michigan. The company designs, manufactures, markets and services a full line of Ford cars, trucks, SUVs, electrified vehicles and Lincoln luxury vehicles, provides financial services through Ford Motor Credit Company and is pursuing leadership positions in electrification, autonomous vehicles and mobility solutions. Ford employs approximately 200,000 people worldwide. For more information regarding Ford, its products and Ford Motor Credit Company, please visit www.corporate.ford.com.

Forward Looking Statements - Statements included herein may constitute "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are based on expectations, forecasts, and assumptions and involve a number of risks, uncertainties, and other factors that could cause actual results to differ materially from those stated. Forward-looking statements speak only as of the date of their initial issuance.

Resource News – LS-DYNA Examples

mv@feainformation.com

New Design - New Information - www.dynaexamples.com

Sample Introductory Courses:

Intro by Klaus Weimar

The examples in this section are from the introductory class of Klaus Weimar. Dr. Klaus Weimar is responsible for support of LS-DYNA at DYNAmore GmbH. Since 20 years he is giving training classes on various topics for LS-DYNA. You may access the examples separately by the menu on the left. The examples are prepared for LS-DYNA 970 and upwards.

Contact - Different kinds of contact are shown

Spotweld - How to define spotwelds through different methods

Misc - Miscellaneous LS-DYNA models

Class Showcase - Implicit Analysis using LS-DYNA

mv@feainformation.com

Mar 20 & Mar 21 - Wed & Thurs - Michigan Location

Instructor: Dr. Nils Karajan
2 Days - $400, Students $200 w/student ID
Includes on-site continental breakfasts, lunches, breaks, class notes, class dinner
Includes 30-day LS-DYNA® demo license to practice

Prerequisite: Attendees should have a basic knowledge of LS-DYNA®

Objective: The aim of the seminar is to give attendees an overview of the possibilities and limits of implicit simulations using LS-DYNA®.

Description:

In recent years, the simulation possibilities in LS-DYNA® using implicit time integration have been enhanced extensively. Some areas of application for implicit analyses include linear and non-linear static and transient dynamic computations, natural frequency analyses, springback and initialization of systems with preload. Good scalability is observed on many CPU cores, which allows for the treatment of large scale problems with millions of unknown degrees of freedom.

The course is recommended for all intending to use LS-DYNA® to carry out implicit simulations. Examples will be given during the seminar to illustrate the functionality of the implicit options.

Contents:

- Introduction to the implicit solver
  - Theory and differences to explicit time integration
  - Overview on implicit analysis types, applications and involved implicit control keywords
- Linear static analysis
  - Options, linear elements, boundary constraints, direct/iterative solver settings, memory, accuracy
- Dynamic implicit analysis
  - Available time integration schemes (Newmark, Bathe, Hilber-Hughes-Taylor)
  - Switching between dynamic and static analysis, Input parameters, lumped/consistent mass matrix
- Nonlinear implicit static and dynamic analysis
  - Origins of nonlinearity and differences to linear analysis
  - Nonlinear solution procedure: Newton based schemes, BFGS
  - Convergence, tolerances, output, automatic and manual time step control

- Eigenvalue analysis: options, modeling aspects, intermittent output
- Modal analysis, linear buckling
- Nonlinear buckling with arclength solvers
- Frequency response function
- Switching time integration scheme: implicit/explicit, explicit/implicit
- Element types for linear and nonlinear analysis
- Material models for implicit analyses
- Contact types for implicit: options, tied contacts, sliding contacts with Mortar option
- Troubleshooting convergence problems, Tips and tricks
- Miscellaneous: Pre-stress, thermal load, performance, etc.
- Final guidelines with checklist of most important settings for implicit calculations

General Information

- Class locations: Livermore CA and Troy MI.
- Duration: Classes start at 9 a.m. and end at 5:00 p.m.
- Some classes are half-day on the last day, ending about noon.
- Class Contact: Aleta Hays (aleta@lstc.com)
- Registration Form: PDF can be found here.

General Description of an LSTC Class

- Once registered you will receive a confirmation with additional information about the class.
- What's included: ◦ Access to computer for workshop exercises
    - Daily breakfast and lunch
    - For classes that are two days or longer a welcome dinner on first night of class
    - 30-day demo LS-DYNA license

- Payment: ◦ Students with valid student ID or university email address qualify for 50% discount
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LS-DYNA ONLINE SHORT COURSES

Website: http://lsdyna-online.com/

Online and custom design LS-DYNA courses world-wide, by Dr. Al Tabiei. Dr. Tabiei teaches many of the courses onsite at LSTC, since the start of the training labs in 1996. Additionally, he is consultant to more than 75 companies worldwide, on many aspects of using Multi-physics LS-DYNA, Dr. Tabiei does code developments as well having developed several material models and other developments that due to his implementation are in LS-DYNA.

A list of courses by his company offered online:

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3. Advance Impact and Crashworthiness using LS-DYNA
4. Contacts in LS-DYNA
5. Implicit and Multi-Step Analysis For Crashworthiness and Durability
6. Fluid-Structures Interaction
7. Advance Fluid-Structures Interaction
8. Composite Materials for Impact and Crashworthiness
9. Blast using LS-DYNA
10. Penetration Using LS-DYNA
11. Material Models From Testing to Simulation
12. User Defined Material in LS-DYNA
13. Failure and Fracture Using LSDYNA
14. Dummies and Occupant Safety Using LS-DYNA
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17. Plasticity, Plastics, and Visco-plastics in LS-DYNA

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2-we will send you the notes few days before the class date in PDF format.

3-we will send go-to-meeting invitation 2 days before the course date.

4-you login to go to meeting few minutes before the class time.

5-class starts and you attend the interactive lectures (live, not a recorded course).

6-these training courses are the same ones given at LSTC by the same instructor.

7-taking the lectures and workshops would be the same courses taken at LSTC.

LS-DYNA - Resource Links

mv@feainformation.com

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LS-DYNA Support Site

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Author: Christian Frech christian.frech@dynamore.de

Seminars 2019

Visit the website for complete overview and registration www.dynamore.de/seminars

Selection of trainings for February/March

Introduction	
Introduction to LS-DYNA	12-14 February 26-28 March (Z)
Introduction to Simulation Technology	21 February
Introduction to LS-PrePost	11 February
Nonlinear Implicit Analyses	29 March (Z)
Basics/Theory	
User Interfaces	4 February
Crash	
Crash Analysis	5-8 March (G)
Failure of Fiber-Reinforced Polymers	14 February
Joining Techniques in LS-DYNA	25 February
Passive Safety	
Dummy/Pedestrian Impactor Modeling	5 February
Introduction to Passive Safety	14 March
CMP Airbag Modeling	22. March
Material	
Parameter Identification with LS-OPT	14 March (V)
Material Failure	18 March (T)
Particle Methods	
Smoothed Particle Hydrodynamics	26-27 February
Multiphysics	
ALE and FSI	28 February

Information days (free of charge)

Process Automation/SDM	25 February
New Features in LS-DYNA	13 March (V)
Certification of human models according to EuroNCAP TB024	29 March

We hope that our offer will meet your needs and are looking forward to welcoming you at one of the events.

If not otherwise stated, the event location is Stuttgart, Germany. Other event locations are:
A = Aachen, Germany, Ba = Bamberg, Germany, G = Gothenburg, Sweden; L = Linköping, Sweden,
V = Versailles, France; T = Turin, Italy, Tr = Traboch, Austria, Z = Zurich, Switzerland

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LSTC Livermore Software Technology Corp.

February 2019

Date		Location	Course Title	Days	Instructor(s)
Feb 20	Wed	***MI***	Introduction to LS-PrePost	1	P. Ho, Q. Yan
Feb 25	Mon	***MI***	Overview of Contacts in LS-DYNA®	1	S. Bala
Feb 26	Tu	***MI***	Material Characterization for Metals, Polymers, and Foams	1	S. Bala

March 2019

Date				Location	Course Title	Days	Instructor(s)
Mar 5	Mar 8	Tu	Fri	***MI***	Introduction to LS-DYNA®	4	H. Devaraj
Mar 14	Mar 15	Th	Fri	***MI***	Occupant Simulation	2	H. Devaraj
Mar 19	Mar 22	Tu	Fri	CA	Introduction to LS-DYNA®	4	A. Tabiei
Mar 20	Mar 21	Wed	Th	***MI***	Implicit Analysis using LS-DYNA®	2	N. Karajan
Mar 25		Mon		***MI***	EM: Eddy Current Applications	1	I. Caldichoury
Mar 26		Tu		***MI***	EM: Battery Modeling, Spot Welding, and Resistive Heating Applications	1	I. Caldichoury
Mar 27	Mar 28	Wed	Th	***MI***	Introduction to ICFD	2	I. Caldichoury
Mar 27	Mar 28	Wed	Th	CA	Introduction to LS-OPT	2	I. Gandikota
Mar 29		Fri		CA	Introduction to LS-TaSC	1	I. Gandikota

DynaS+

Complementary tools

LSTC Livermore Software Technology Corp.

OUT-06

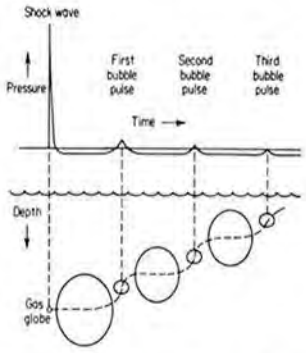
Underwater Shock Analysis with USA/LS-DYNA

Goal

Be able to run underwater explosions analysis with USA software and understand the underlying theory

Contents

1. Introduction
2. Doubly Asymptotic Approximation (DAA) Field Solver
3. Nonreflecting Boundary (NRB) Solver
4. Miscellaneous Topics
5. Optional - Cavitating Acoustic Fluid Element (CAFÉ and CASE) Field Solver



The key points of the training will be illustrated with practical exercises.

Audience

CAE Engineers / Researchers

Prerequisites

Operationnal knowledge of LS-DYNA *(Preliminary follow-up of the course **BASE-01** or **BASE-03** advised)*

Specific registration conditions submitted to the agreement of American Defence Department for USA software use

Duration

3 days

Trainers

External expert
(Tom LITTLEWOOD –LSTC)

The training being provided by an external expert, DynaS+ reserves right to cancel within the 2 weeks notice if there is not enough attendees.

Training provided in English, English course material

DynaS+ Catalogue Formation 2018 v2.0 - Réf : T/DIV/CMI/DYNAT/17/0238/2.0

Contact information:

Training Manager: **Charlotte MICHEL** E-mail: c.michel@dynasplus.com

Tel: +33 5 61 44 54 98 / Fax: +33 5 61 44 74 88 Website: www.dynasplus.com

Address: 5, avenue Didier Daurat - 31 400 TOULOUSE

The Immersed Smoothed Particle Galerkin Method for Material Failure Analysis of Fiber-Reinforced Solid Structures

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Shinya Hayashi
JSOL Corporation, 2-5-24 Harumi, Chuo-ku, Tokyo 104-0053, Japan

Abstract

This paper presents a novel immersed meshfree approach [1-3] for modeling and failure analysis of fiber-reinforced composite solids. The fiber and solid parts are discretized by finite element truss/beam and solid element formulations respectively and independently. This modeling process does not require a conforming mesh. In other words, the fiber elements, e.g. truss or beam elements, are embedded into FEM mesh for immerse computation. The Smoothed Particle Galerkin (SPG) method [4] is employed for the immerse computation. Both fiber inclusion and base material are allowed to fail correspondingly in the nonlinear analysis. Since the base material is modeled by SPG method, a bond-based failure criterion is utilized to model the failure in base material. In contrast, the failure in trust/beam element is modelled by finite element erosion.

Several numerical benchmark tests are conducted and presented. Both non-failure and failure analyses are considered to study the convergence and mesh sensitivity using the proposed method. The results are compared to the existing approaches based on finite element method. The numerical results suggest that the immersed SPG method can effectively model the fiber-reinforced solid in large material deformation and failure analysis.

Introduction

The fiber-reinforced materials have been widely applied to major industrial fields in recent years. In the automotive industry, the use of Carbon fiber-reinforced plastics (CFRP), for example, is expected to increase rapidly in the next two decades to help meet the regulation target of reducing the CO2 emission per unit distance through the novel light-weight design [5]. In order to model the composite structures, the conventional finite element analysis (FEM) requires a matching (conforming) mesh so that the kinematic constraints between fibers and base materials can be imposed through sharing nodes of conforming mesh. However, generating matching meshes suitable for FEM is difficult and time-consuming in most of industrial applications where the geometries are usually irregular and complex. Therefore from users' point of view, it is advantageous to use non-conforming discretization at the interfaces of fibers and base materials.

Number of numerical methods have been developed to couple mismatching meshes across the interfaces. The interface constraints can be either explicitly imposed by introducing Lagrange multiplier or penalizing the jump conditions, or implicitly satisfied by modifying and enriching the conventional approximation space through partition of unity method (PUM) or immerse finite element methods. However, there are limitations and computational complexity for these methods to be effectively applied to three-dimensional analysis in real industrial applications, especially when dealing with large deformation and material failure.

The smoothed particle Galerkin (SPG) method [4, 6] was recently developed for modeling large deformation and material failure in ductile and semi-brittle materials. SPG is a purely particle method which relies on discrete nodes to construct approximation and spatial domain integration. A special smoothing scheme in displacement field is introduced to stabilize the numerical solution. For large material deformation in explicit analysis, SPG is able to minimize tensile instability and maintain the time step size by combining the smoothing scheme with kernel update,

which helps to improve the overall computational performance. SPG uses a phenomenological bond based failure mechanism to fail and separate material, and the failure criterion can be easily defined in phenomenological material constitutive laws. The SPG formulation has been uniquely implemented into LS-DYNA®. To impose coupling between FEM beam elements of fiber material and SPG solid through non-conforming discretization, the FEM nodes of beam elements are immersed into SPG discretization through immerse meshfree method [1-3], which is equivalent to add extra nodes in SPG discretization and make them the sharing nodes with beam elements. It is very straightforward to involve these immersed nodes in constructing displacement approximation and performing domain integration since SPG is truly particle based meshfree method. This paper presents the current implementation of immersed SPG method in LS-DYNA and demonstrates its capability in modeling large deformation and material failure for fiber-reinforced solids.

LS-DYNA Keywords of Immersed Smoothed Particle Galerkin (SPG)

SPG is currently implemented for 3D solid explicit analysis with element formation ELFORM=47 in the keyword *SECTION_SOLID_SPG. The SPG nodes are automatically generated from the nodes of the users' input FEM solid elements (4/6/8-noded solid element), which makes it very convenient for users to switch to SPG formulation using the same FEM model and couple SPG with FEM parts through either sharing nodes or existing contact algorithms. The following is a snapshot of *SECTION_SOLID_SPG cards 2 and 3：

Card 2	**DX**	**DY**	**DZ**	ISPLINE	**KERNEL**	LSCALE	SMSTE	SUKTIME
Default	1.5	1.5	1.5	0	0	0	15	0
Card 3	**IDAM**	**FS**	STRETCH	ITB				
Default	0	0.0	1.2	1				

(1) Nodal support size： DX, DY, DZ

Like many other meshless method, the approximation function in SPG is constructed based on discrete nodes, which, by default, are from FEM model. The support size of a given node is determined by the size of surrounding element edges with the scaling parameters DX, DY and DZ. For non-uniform mesh, the absolute nodal support sizes vary across the computational domain due to the variation of element size. The recommended range of scaling parameters in SPG is 1.4~1.8, and the default value, 1.5, is good for most of applications.

(2) Kernel types： KERNEL

SPG currently has three different kernels: KERNEL=0 updated Lagrangian (UL) kernel, KERNEL=1 Eulerian (E) kernel, and KERNEL=2 pseudo-Lagrangian (PL) kernel. The UL-kernel is suitable for tension dominant problems. The E-kernel can be widely used in the application involving large and extreme deformation and material failure where the material response is more global, while the PL-kernel works for the cases where material deformation and failure is more local. The typical applications of E-kernel include jointing (riveting, drilling, etc.), metal shearing and cutting. PL-kernel can be applied in machining (metal grinding, etc.) and high-velocity impact problems.

(3) Bond-based material failure model： IDAM & FS

IDAM=1 defined bond-based failure model, where the average effective plastic strain (EPS) of paired nodes in support zone is examined and compared to the user input value FS. It is known that using the conventional element erosion to fail material often leads to underestimate of reaction forces and nonphysical failure pattern. The SPG bond failure mechanism preserves the mass and momentum, which provides the potential to predict more accurate force and more physical failure modes.

To immerse the FEM beam elements into SPG solid, the keyword *CONSTRAINED_IMMERSED_IN_SPG is developed to define the coupling between slave beam parts and master SPG part as follows

Card 1	SPGPID	IPID1	IPID2	IPID3	IPID4	IPID5	IPID6	IPID7
Default	0	0	0	0	0	0	0	0

Each keyword card supports up to seven slave beam parts (IPID1-IPID7) to be immersed into master SPG part (SPGPID). For each immersed node from beam parts, the support size is automatically calculated by averaging the support size of neighboring SPG nodes. Since the immersed nodes are shared by beams and solid, their total mass consists of the mass from beams and that from solid. The immersed nodal solid mass is calculated by redistributing the mass locally among the neighboring SPG nodes. The schematic plot of immerse coupling is shown in Fig. 1.

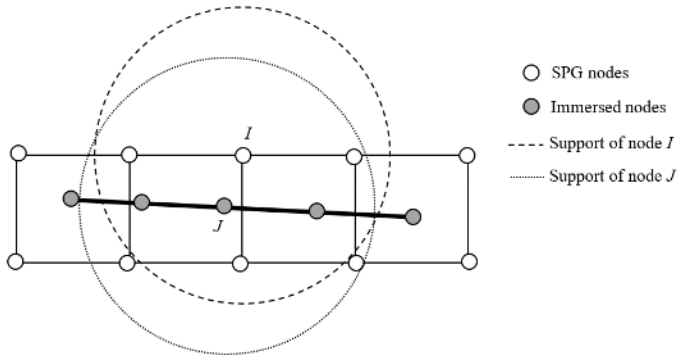

Figure 1. Schematic plot of immerse coupling between FEM beam and SPG solid.

Numerical Examples

Three point bending with fiber-reinforced plastic plate is considered as shown in Fig 2. The dimension of plate is $84 \times 12 \times 2$ modeled by solid (FEM ELFORM= 2, SPG ELFORM= 47). There are 12×2 long fibers with length 83 modeled by FEM beam (ELFORM= 1). The impactor and support are modeled by rigid shell elements, and the impactor has prescribed z-velocity as shown in Fig 2. In order to compared with FEM solid formulation and perform convergence study, the plate is discretized by two sets of uniform 8-noded solid elements with mesh size 0.5 and 0.25, respectively. The beam elements have the same uniform mesh size. In this case, the beam nodes are shared with solid mesh. The non-forming mesh between beams and solid is also created by shifting the solid mesh in x direction so that there is no sharing node. In this case, only immersed SPG method is used to perform the analysis. Both fiber and solid are using the same material type *MAT_PLASTIC_KINEMATIC: Young's modulus $E_{fiber} = 2380.0$, $E_{solid} = 300.0$; Yielding stress $\sigma_{y_{fiber}} = 4.0$, $\sigma_{y_{solid}} = 0.4$; Tangent modulus $E_{t_{fiber}} = 4.0$, $E_{t_{solid}} = 0.4$; Effective plastic strain for eroding elements $FS_{fiber} = 0.1$, $FS_{solid} = 0.2$. Note that the bond based failure model (IDAM= 1) is used in SPG formulation so that, when using SPG ELFORM=47 for the solid part, the "FS" in material card should be 0.0 and the "FS" in the card 3 of *SECTION_SOLID_SPG is set as 0.2.

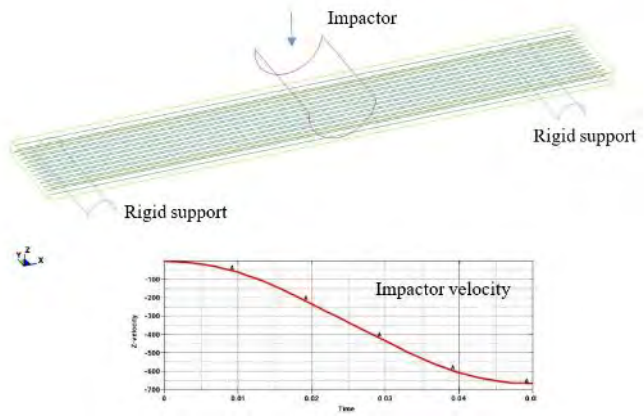

Figure 2. Three point bending with fiber-reinforced plastic plate.

Fig.3 shows the effective plastic strain contour and deformation profiles obtained by FEM with conforming mesh. A large number of solid elements are eroded when EPS reaches 0.2, which leads to loss of mass and

momentum conservation and part of contact surface between the plate and the impactor. Meanwhile, some beam elements lose the coupling with solid elements due to erosion and directly contacting with impactor, which leads to severe local deformation.

Effective plastic strain plot of solid plate

Deformation profile of fibers

Figure 3. FEM (conforming mesh) results.

Fig.4 shows the results obtained by SPG with conforming mesh. Since the material failure is modeled by breaking individual bonds between pairs of SPG nodes, there is not loss of mass and momentum conservation. The coupling between beams and SPG solid are preserved throughout the analysis, which gives better results in terms of deformation profile and failure pattern of beam elements.

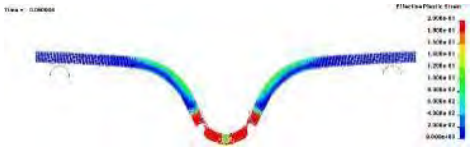

Figure 4. SPG (conforming mesh) results.

Fig.5 shows the results obtained by SPG with non-conforming mesh, which is very similar to that of SPG with conforming mesh. The slightly un-symmetry in results is due to non-uniform discretization of beam and solid.

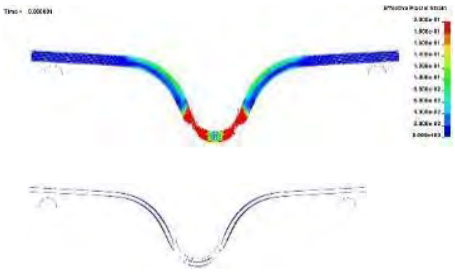

Figure 5. SPG (non-conforming mesh) results.

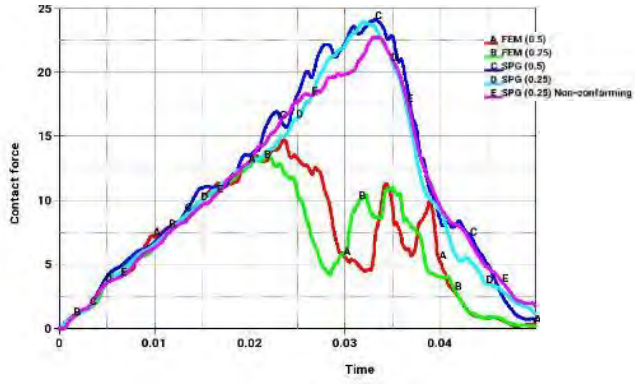

Figure 6. Convergence study on contact force.

Fig.6 shows the convergence study on contact resultant force. The FEM results fail to capture the peak force, and the undesired force response results from the direct contact between fibers and impactor after element erosion. The contact force obtained by FEM is not well converged from mesh size $h = 0.5$ to h= 0.25. SPG results are pretty consistent when using different mesh size and non-conforming mesh.

Conclusion

This paper presents the immersed smoothed particle Galerkin method for large deformation and material failure analysis in fiber-reinforced solid. The SPG with bon-based failure model conserve mass and momentum during material failure, which leads to stable and convergent results with minimized sensitivity to the discretization. Immersed SPG is implemented to impose the kinematic constraints between FEM beams and SPG solid for non-conforming mesh, which provides users a cost-effective tool to model fiber-reinforced material. The numerical demonstration shows a promising result obtained by immersed SPG compared to the conventional FEM with element erosion.

References

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Visual-Environment is an integrative simulation platform for simulation tools operating either concurrently or standalone for various solver. Comprehensive and integrated solutions for meshing, pre/post processing, process automation and simulation data management are available within same environment enabling seamless execution and automation of tedious workflows. This very open and versatile environment simplifies the work of CAE engineers across the enterprise by facilitating collaboration and data sharing leading to increase of productivity.

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As an integrated press forming simulation system for virtual tool shop the JSTAMP/NV meets the various industrial needs from the areas of automobile, electronics, iron and steel, etc. The JSTAMP/NV gives satisfaction to engineers, reliability to products, and robustness to tool shop via the advanced technology of the JSOL Corporation.

JMAG

JMAG uses the latest techniques to accurately model complex geometries, material properties, and thermal and structural phenomena associated with electromagnetic fields. With its excellent analysis capabilities, JMAG assists your manufacturing process

Livermore Software Technology Corp. **www.lstc.com**

LS-DYNA

A general-purpose finite element program capable of simulating complex real world problems. It is used by the automobile, aerospace, construction, military, manufacturing, and bioengineering industries. LS-DYNA is optimized for shared and distributed memory Unix, Linux, and Windows based, platforms, and it is fully QA'd by LSTC. The code's origins lie in highly nonlinear, transient dynamic finite element analysis using explicit time integration.

LS-PrePost: An advanced pre and post-processor that is delivered free with LS-DYNA. The user interface is designed to be both efficient and intuitive. LS-PrePost runs on Windows, Linux, and Macs utilizing OpenGL graphics to achieve fast rendering and XY plotting.

LS-OPT: LS-OPT is a standalone Design Optimization and Probabilistic Analysis package with an interface to LS-DYNA. The graphical preprocessor LS-OPTui facilitates definition of the design input and the creation of a command file while the postprocessor provides output such as approximation accuracy, optimization convergence, tradeoff curves, anthill plots and the relative importance of design variables.

LS-TaSC: A Topology and Shape Computation tool. Developed for engineering analysts who need to optimize structures, LS-TaSC works with both the implicit and explicit solvers of LS-DYNA. LS-TaSC handles topology optimization of large non-linear problems, involving dynamic loads and contact conditions.

LSTC Dummy Models:

Anthropomorphic Test Devices (ATDs), as known as "crash test dummies", are life-size mannequins equipped with sensors that measure forces, moments, displacements, and accelerations.

LSTC Barrier Models: LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) model.

Material Sciences Corporation www.materials-sciences.com

Materials Sciences Corporation has provided engineering services to the composites industry since 1970. During this time, we have participated in numerous programs that demonstrate our ability to: perform advanced composite design, analysis and testing; provide overall program management; work in a team environment; and transition new product development to the military and commercial sectors. MSC's corporate mission has expanded beyond basic research and development now to include transitioning its proprietary technologies from the research lab into innovative new products. This commitment is demonstrated through increased staffing and a more than 3-fold expansion of facilities to allow in-house manufacturing and testing of advanced composite materials and structures

Materials Sciences Corporation (MSC) MAT161/162 - enhanced features have been added to the Dynamic Composite Simulator module of LS-DYNA.

This enhancement to LS-DYNA, known as MAT161/162, enables the most effective and accurate dynamic progressive failure modeling of composite structures to enable the most effective and accurate dynamic progressive failure modeling of composite structures currently available.

MSC/LS-DYNA Composite Software and Database -

Fact Sheet: http://www.materials-sciences.com/dyna-factsheet.pdf

- MSC and LSTC have joined forces in developing this powerful composite dynamic analysis code.
- For the first time, users will have the enhanced ability to simulate explicit dynamic engineering problems for composite structures.
- The integration of this module, known as 'MAT 161', into LS-DYNA allows users to account for progressive damage of various fiber, matrix and interply delamination failure modes.
- Implementing this code will result in the ability to optimize the design of composite structures, with significantly improved survivability under various blast and ballistic threats.

MSC's LS-DYNA module can be used to characterize a variety of composite structures in numerous applications—such as this composite hull under blast

Oasys Ltd. LS-DYNA Environment www.oasys-software.com/dyna

The Oasys Suite of software is exclusively written for LS-DYNA® and is used worldwide by many of the largest LS-DYNA® customers. The suite comprises of:

Oasys PRIMER

Key benefits:

- Pre-Processor created specifically for LS-DYNA®
- Compatible with the latest version of LS-DYNA®
- Maintains the integrity of data
- Over 6000 checks and warnings – many auto-fixable
- Specialist tools for occupant positioning, seatbelt fitting and seat squashing (including setting up pre-simulations)
- Many features for model modification, such as part replace
- Ability to position and depenetrate impactors at multiple locations and produce many input decks automatically (e.g. pedestrian impact, interior head impact)
- Contact penetration checking and fixing
- Connection feature for creation and management of connection entities.
- Support for Volume III keywords and large format/long labels
- Powerful scripting capabilities allowing the user to create custom features and processes

www.oasys-software.com/dyna

Oasys D3PLOT

Key benefits:

- Powerful 3D visualization post-processor created specifically for LS-DYNA®
- Fast, high quality graphics
- Easy, in-depth access to LS-DYNA® results
- Scripting capabilities allowing the user to speed up post-processing, as well as creating user defined data components

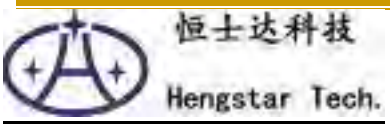
www.predictiveengineering.com

Predictive Engineering provides finite element analysis consulting services, software, training and support to a broad range of engineering companies across North America. We strive to exceed client expectations for accuracy, timeliness and knowledge transfer. Our process is both cost-effective and collaborative, ensuring all clients are reference clients.

Our mission is to be honest brokers of information in our consulting services and the software we represent.

Our History

Since 1995, Predictive Engineering has continually expanded its client base. Our clients include many large organizations and industry leaders such as SpaceX, Nike, General Electric, Navistar, FLIR Systems, Sierra Nevada Corp, Georgia-Pacific, Intel, Messier-Dowty and more. Over the years, Predictive Engineering has successfully completed more than 800 projects, and has set itself apart on its strong FEA, CFD and LS-DYNA consulting services.



Shanghai Hengstar www.hengstar.com

Center of Excellence: Hengstar Technology is the first LS-DYNA training center of excellence in China. As part of its expanding commitment to helping CAE engineers in China, Hengstar Technology will continue to organize high level training courses, seminars, workshops, forums etc., and will also continue to support CAE events such as: China CAE Annual Conference; China Conference of Automotive Safety Technology; International Forum of Automotive Traffic Safety in China; LS-DYNA China users conference etc.

On Site Training: Hengstar Technology also provides customer customized training programs on-site at the company facility. Training is tailored for customer needs using LS-DYNA such as material test and input keyword preparing; CAE process automation with customized script program; Simulation result correlation with the test result; Special topics with new LS-DYNA features etc..

Distribution & Support: Hengstar distributes and supports LS-DYNA, LS-OPT, LS-Prepost, LS-TaSC, LSTC FEA Models; Hongsheng Lu, previously was directly employed by LSTC before opening his distributorship in China for LSTC software. Hongsheng visits LSTC often to keep update on the latest software features.

Hengstar also distributes and supports d3View; Genesis, Visual DOC, ELSDYNA; Visual-Crash Dyna, Visual-Process, Visual-Environment; EnkiBonnet; and DynaX & MadyX etc.

Consulting

As a consulting company, Hengstar focuses on LS-DYNA applications such as crash and safety, durability, bird strike, stamping, forging, concrete structures, drop analysis, blast response, penetration etc with using LS-DYNA's advanced methods: FEA, ALE, SPH, EFG, DEM, ICFD, EM, CSEC..

www.lenovo.com

Lenovo is a USD 39 billion personal and enterprise technology company, serving customers in more than 160 countries.

Dedicated to building exceptionally engineered PCs, mobile Internet devices and servers spanning entry through supercomputers, Lenovo has built its business on product innovation, a highly efficient global supply chain and strong strategic execution. The company develops, manufactures and markets reliable, high-quality, secure and easy-to-use technology products and services.

Lenovo acquired IBM's x86 server business in 2014. With this acquisition, Lenovo added award-winning System x enterprise server ortfolio along with HPC and CAE expertise.

Cloud - HPC Services - Subscription JSOL

Contact: JSOL Corporation Engineering Technology Division cae-info@sci.jsol.co.jp

Cloud computing services
for
JSOL Corporation LS-DYNA users in Japan

JSOL Corporation is cooperating with chosen cloud computing services

JSOL Corporation, a Japanese LS-DYNA distributor for Japanese LS-DYNA customers.

LS-DYNA customers in industries / academia / consultancies are facing increased needs for additional LS-DYNA cores

In calculations of optimization, robustness, statistical analysis, we find that an increase in cores of LS-DYNA are needed, for short term extra projects or cores.

JSOL Corporation is cooperating with some cloud computing services for JSOL's LS-DYNA users and willing to provide short term license.

This service is offered to customers using Cloud License fee schedule, the additional fee is less expensive than purchasing yearly license.

The following services are available (only in Japanese). HPC OnLine:

NEC Solution Innovators, Ltd. - http://jpn.nec.com/manufacture/machinery/hpc_online/

Focus - Foundation for Computational Science
http://www.j-focus.or.jp

Platform Computation Cloud - CreDist.Inc.

PLEXUS CAE
Information Services International-Dentsu, Ltd. (ISID) https://portal.plexusplm.com/plexus-cae/

SCSK Corporation - http://www.scsk.jp/product/keyword/keyword07.html

www.rescale.com

Rescale: Cloud Simulation Platform

The Power of Simulation Innovation

We believe in the power of innovation. Engineering and science designs and ideas are limitless. So why should your hardware and software be limited? You shouldn't have to choose between expanding your simulations or saving time and budget.

Using the power of cloud technology combined with LS-DYNA allows you to:

- Accelerate complex simulations and fully explore the design space
- Optimize the analysis process with hourly software and hardware resources
- Leverage agile IT resources to provide flexibility and scalability

True On-Demand, Global Infrastructure

Teams are no longer in one location, country, or even continent. However, company data centers are often in one place, and everyone must connect in, regardless of office. For engineers across different regions, this can cause connection issues, wasted time, and product delays.

Rescale has strategic/technology partnerships with infrastructure and software providers to offer the following:

- Largest global hardware footprint – GPUs, Xeon Phi, InfiniBand
- Customizable configurations to meet every simulation demand
- Worldwide resource access provides industry-leading tools to every team
- Pay-per-use business model means you only pay for the resources you use
- True on-demand resources – no more queues

ScaleX Enterprise: Transform IT, Empower Engineers, Unleash Innovation

The ScaleX Enterprise simulation platform provides scalability and flexibility to companies while offering enterprise IT and management teams the opportunity to expand and empower their organizations.

Rescale Cloud Simulation Platform www.rescale.com

ScaleX Enterprise allows enterprise companies to stay at the leading edge of computing technology while maximizing product design and accelerating the time to market by providing:

- Collaboration tools
- Administrative control
- API/Scheduler integration
- On-premise HPC integration

Industry-Leading Security

Rescale has built proprietary, industry-leading security solutions into the platform, meeting the needs of customers in the most demanding and competitive industries and markets.

- Manage engineering teams with user authentication and administrative controls
- Data is secure every step of the way with end-to-end data encryption
- Jobs run on isolated, kernel-encrypted, private clusters
- Data centers include biometric entry authentication
- Platforms routinely submit to independent external security audits

Rescale maintains key relationships to provide LS-DYNA on demand on a global scale. If you have a need to accelerate the simulation process and be an innovative leader, contact Rescale or the following partners to begin running LS-DYNA on Rescale's industry-leading cloud simulation platform.

LSTC - DYNAmore GmbH JSOL Corporation

Rescale, Inc. - 1-855-737-2253 (1-855-RESCALE) - info@rescale.com

944 Market St. #300, San Francisco, CA 94102 USA

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com

ESI Cloud offers designers and engineers cloud-based computer aided engineering (CAE) solutions across physics and engineering disciplines.

ESI Cloud combines ESI's industry tested virtual engineering solutions integrated onto ESI's Cloud Platform with browser based modeling,

With ESI Cloud users can choose from two basic usage models:

- An end-to-end SaaS model: Where modeling, multi-physics solving, results visualization and collaboration are conducted in the cloud through a web browser.
- A Hybrid model: Where modeling is done on desktop with solve, visualization and collaboration done in the cloud through a web browser.

Virtual Performance Solution:

ESI Cloud offers ESI's flagship Virtual Performance Solution (VPS) for multi-domain performance simulation as a hybrid offering on its cloud platform. With this offering, users can harness the power of Virtual Performance Solution, leading multi-domain CAE solution for virtual engineering of crash, safety, comfort, NVH (noise, vibration and harshness), acoustics, stiffness and durability.

In this hybrid model, users utilize VPS on their desktop for modeling including geometry, meshing and simulation set up. ESI Cloud is then used for high performance computing with an integrated visualization and real time collaboration offering through a web browser.

The benefits of VPS hybrid on ESI Cloud include:

- Running large concurrent simulations on demand
- On demand access to scalable and secured cloud HPC resources
- Three tiered security strategy for your data
- Visualization of large simulation data sets
- Real-time browser based visualization and collaboration
- Time and cost reduction for data transfer between cloud and desktop environments
- Support, consulting and training services with ESI's engineering teams

VPS On Demand

ESI Cloud features the Virtual Performance Solution (VPS) enabling engineers to analyze and test products, components, parts or material used in different engineering domains including crash and high velocity impact, occupant safety, NVH and interior acoustics, static and dynamic load cases. The solution enables VPS users to overcome hardware limitations and to drastically reduce their simulation time by running on demand very large concurrent simulations that take advantage of the flexible nature of cloud computing.

Key solution capabilities:

- Access to various physics for multi-domain optimization
- Flexible hybrid model from desktop to cloud computing
- On demand provisioning of hardware resources
- Distributed parallel processing using MPI (Message Passing Interface) protocol
- Distributed parallel computing with 10 Gb/s high speed interconnects

Result visualization

ESI Cloud deploys both client-side and server-side rendering technologies. This enables the full interactivity needed during the simulation workflow along with the ability to handle large data generated for 3D result visualization in the browser, removing the need for time consuming data transfers. Additionally ESI Cloud visualization engine enables the comparisons of different results through a multiple window user interface design.

Key result visualization capabilities:

- CPU or GPU based client and server side rendering
- Mobility with desktop like performance through the browser
- 2D/3D VPS contour plots and animations
- Custom multi-window system for 2D plots and 3D contours
- Zooming, panning, rotating, and sectioning of multiple windows

Collaboration

To enable real time multi-user and multi company collaboration, ESI Cloud offers extensive synchronous and asynchronous collaboration capabilities. Several users can view the same project, interact with the same model results, pass control from one to another. Any markups, discussions or annotations can be archived for future reference or be assigned as tasks to other members of the team.

Key collaboration capabilities:

- Data, workflow or project asynchronous collaboration
- Multi-user, browser based collaboration for CAD, geometry, mesh and results models
- Real-time design review with notes, annotations and images archiving and retrieval
- Email invite to non ESI Cloud users for real time collaboration

Distribution, Consulting

Canada	**Metal Forming Analysis Corp MFAC** galb@mfac.com www.mfac.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	
	eta/DYNAFORM	INVENTIUM/PreSys		
Mexico	**COMPLX** Armando Toledo			
	www.complx.com.mx / armando.toledo@complx.com.mx			
	LS-DYNA LS-OPT		LS-PrePost	
			LS-TAsc Barrier/Dummy Models	
United States	**DYNAMAX** sales@dynamax-inc.com			
	www.dynamax-inc.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models		LSTC Barrier Models	
United States	**Livermore Software Technology Corp** sales@lstc.com			
	LSTC www.lstc.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	TOYOTA THUMS	
United States	**ESI Group N.A** **info@esi-group.com**			
	www.esi-group.com			
	PAM-STAMP			
	QuikCAST	SYSWELD	PAM-COMPOSITES	CEM One
	VA One	CFD-ACE+	ProCAST	
		Weld Planner	Visual-Environment	IC.IDO
United States	**Engineering Technology Associates – ETA** etainfo@eta.com			
	www.eta.com			
	INVENTIUM/PreSy	NISA	VPG	LS-DYNA
	LS-OPT	DYNAform		

United States	**Predictive Engineering**		info@predictiveengineering.com	
	www.predictiveengineering.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Barrier Models		LSTC Dummy Models	
	Distributor for Siemens PLM Software at www.AppliedCAx.com (FEMAP, NX Nastran, STAR CCM+, NX CAD/CAM/CAE)			
France	**DynaS+**		v.lapoujade@dynasplus.com	
	www.dynasplus.com		Oasys Suite	
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	DYNAFORM	VPG	MEDINA	
	LSTC Dummy Models		LSTC Barrier Models	
France	**DYNAmore France SAS**		sales@dynamore.eu	
	www.dynamore.eu			
	LS-DYNA, LS-PrePost	LS-OPT	Primer	DYNAFORM
	DSDM Products		LSTC Dummy Models	FEMZIP
	LSTC Barrier Models		DIGIMAT	
Germany	**CADFEM GmbH**		lsdyna@cadfem.de	
	www.cadfem.de			
	ANSYS	LS-DYNA	optiSLang	
		AnyBody		
	ANSYS/LS-DYNA			
Germany	**DYNAmore GmbH**		uli.franz@dynamore.de	
	www.dynamore.de			
	PRIMER	LS-DYNA	FTSS	VisualDoc
	LS-OPT	LS-PrePost	LS-TaSC	DYNAFORM
	Primer	FEMZIP	GENESIS	Oasys Suite
	TOYOTA THUMS		LSTC Dummy & Barrier Models	

Netherlands	**Infinite Simulation Systems B.V**		j.mathijssen@infinite.nl	
	www.infinite.nl			
	ANSYS Products	CivilFem	CFX	Fluent
	LS-DYNA	LS-PrePost	LS-OPT	LS-TaSC
Russia	**Limited Liability DynaRu**		office@lsdyna.ru	
	http://lsdyna.ru/			
	LS-DYNA	LS-TaSC	LS-OPT	LS-PrePost
	LSTC Dummy Models		LSTC Barrier Models	
Spain	**DYNAmore France SAS**		sales@dynamore.eu	
	www.dynamore.eu			
	LS-DYNA, LS-OPT	LS-PrePost	Primer	DYNAFORM
	DSDM Products		LSTC Dummy Models	FEMZIP
	LSTC Barrier Models		DIGIMAT	
Sweden	**DYNAmore Nordic**		marcus.redhe@dynamore.se	
	www.dynamore.se		Oasys Suite	
	ANSA	µETA	LS-DYNA	LS-OPT
	LS-PrePost	LS-TaSC	FastFORM	DYNAform
	FormingSuite		LSTC Dummy Models	
			LSTC Barrier Models	
Switzerland	**DYNAmoreSwiss GmbH**		info@dynamore.ch	
	www.dynamore.ch			
	LS-DYNA		LS-OPT	LS-PrePost
	LS-TaSC		LSTC Dummy Models &	Barrier Models

UK	**ARUP**	dyna.sales@arup.com		
	www.oasys-software.com/dyna		TOYOTA THUMS	
	LS-DYNA		LS-OPT	LS-PrePost
	LS-TaSC		PRIMER	D3PLOT
	REPORTER	SHELL	FEMZIP	HYCRASH
	DIGIMAT	Simpleware	LSTC Dummy Models	
			LSTC Barrier Models	

China	**Shanghai Fangkun Software Technology Ltd.**		
	www.lsdyna-china.com		
	LS-DYNA	LS-TaSC	LSTC Barrier Models
	LS-PrePOST	LS-OPT	
	LSTC Dummy Models		

India	**Oasys Ltd. India**		lavendra.singh@arup.com	
	www.oasys-software.com/dyna			
	PRIMER D3PLOT	T/HIS		
		LS-OPT	LSTC Dummy Models	LS-PrePost
		LS-DYNA	LSTC Barrier Models	LS-TaSC

India	**CADFEM India**		info@cadfem.in	
	www.cadfem.in			
	ANSYS	VPS	optiSLang	
	LS-DYNA	LS-OPT	LS-PrePost	

India	**Kaizenat Technologies Pvt. Ltd**		support@kaizenat.com	
	http://kaizenat.com /			
	LS-DYNA	LS-OPT	LSTC Dummy Models	LS-PrePost
	Complete LS-DYNA suite of products		LSTC Barrier Models	LS-TaSC

Distribution, Consulting

Japan	**CTC**	LS-dyna@ctc-g.co.jp		
	www.engineering-eye.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	CmWAVE	

Japan	**JSOL**			
	www.jsol.co.jp/english/cae		Oasys Suite	
	JSTAMP	HYCRASH	JMAG	
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	TOYOTA THUMS	

Japan	**FUJITSU**			
	http://www.fujitsu.com/jp/solutions/business-technology/tc/sol/			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	CLOUD Services	
	Inventium PreSys	ETA/DYNAFORM	Digimat	

Japan	**LANCEMORE**	info@lancemore.jp		
	www.lancemore.jp/index_en.html			
	Consulting			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models		

Japan	**Terrabyte**	**English:**		
	www.terrabyte.co.jp	www.terrabyte.co.jp/english/index.htm		
	Consulting			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	AnyBody	

Korea	**THEME**	wschung7@gmail.com		
	www.lsdyna.co.kr		Oasys Suite	
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	Planets
	eta/DYNAFORM	FormingSuite	Simblow	TrueGRID
	JSTAMP/NV	Scan IP	Scan FE	Scan CAD
	FEMZIP			

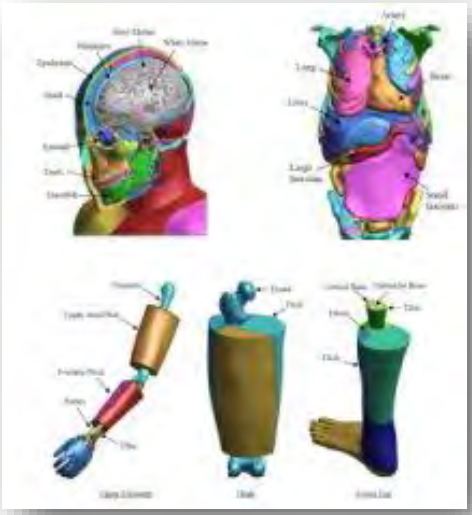
Korea	**KOSTECH**	young@kostech.co.kr		
	www.kostech.co.kr			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM
	eta/DYNAFORM	DIGIMAT	Simuform	Simpack
	AxStream	TrueGrid	FEMZIP	

Taiwan	**AgileSim Technology Corp.**			
	http://www.agilesim.com.tw			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

Taiwan	**Flotrend**			
	www.flotrend.com.tw			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

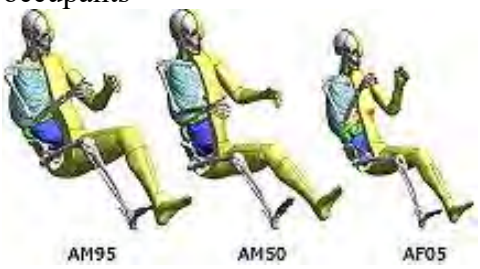
Taiwan	**SiMWARE Inc..**			
	www.simware.com.tw			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

TOYOTA - Total Human Model for Safety – THUMS

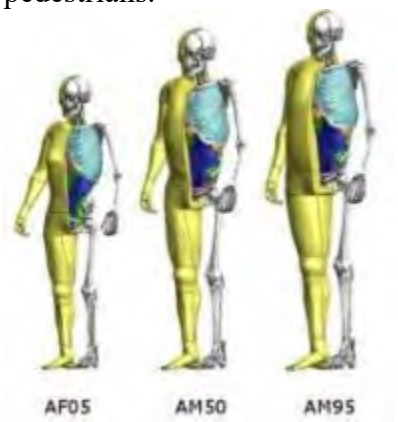


The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons, and internal organs. Therefore, THUMS can be used in automotive crash simulations to identify safety problems and find their solutions.

Each of the different sized models is available as sitting model to represent vehicle occupants



and as standing model to represent pedestrians.



The internal organs were modeled based on high resolution CT-scans.

THUMS is limited to civilian use and may under no circumstances be used in military applications.

LSTC is the US distributor for THUMS. Commercial and academic licenses are available.

For information please contact: THUMS@lstc.com

THUMS®, is a registered trademark of Toyota Central R&D Labs.

LSTC – Dummy Models

LSTC Crash Test Dummies (ATD)

Meeting the need of their LS-DYNA users for an affordable crash test dummy (ATD), LSTC offers the LSTC developed dummies at no cost to LS-DYNA users.

LSTC continues development on the LSTC Dummy models with the help and support of their customers. Some of the models are joint developments with their partners.

e-mail to: atds@lstc.com

Models completed and available (in at least an alpha version)

- Hybrid III Rigid-FE Adults
- Hybrid III 50th percentile FAST
- Hybrid III 5th percentile detailed
- Hybrid III 50th percentile detailed
- Hybrid III 50th percentile standing
- EuroSID 2
- EuroSID 2re
- SID-IIs Revision D
- USSID
- Free Motion Headform
- Pedestrian Legform Impactors

Models In Development

- Hybrid III 95th percentile detailed
- Hybrid III 3-year-old
- Hybrid II
- WorldSID 50th percentile
- THOR NT FAST
- Ejection Mitigation Headform

Planned Models

- FAA Hybrid III
- FAST version of THOR NT
- FAST version of EuroSID 2
- FAST version of EuroSID 2re
- Pedestrian Headforms
- Q-Series Child Dummies
- FLEX-PLI

LSTC – Barrier Models

Meeting the need of their LS-DYNA users for affordable barrier models, LSTC offers the LSTC developed barrier models at no cost to LS-DYNA users.

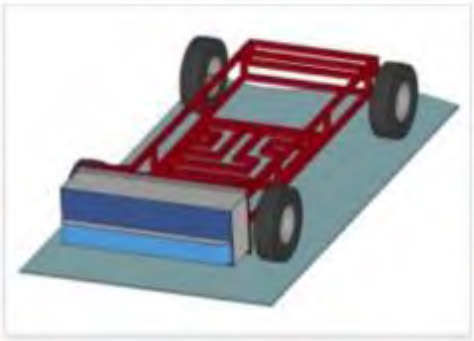
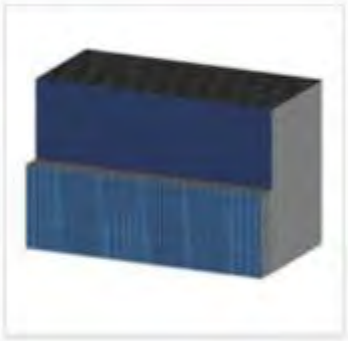
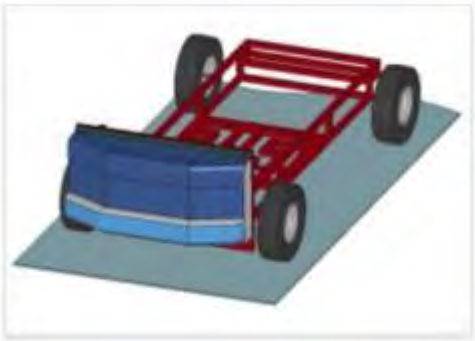
LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) models:

- ODB modeled with shell elements
- ODB modeled with solid elements
- ODB modeled with a combination of shell and solid elements
- MDB according to FMVSS 214 modeled with shell elements
- MDB according to FMVSS 214 modeled with solid elements
- MDB according to ECE R-95 modeled with shell elements
- AE-MDB modeled with shell elements
- IIHS MDB modeled with shell elements
- IIHS MDB modeled with solid elements
- RCAR bumper barrier
- RMDB modeled with shell and solid elements

LSTC ODB and MDB models are developed to correlate to several tests provided by our customers. These tests are proprietary data and are not currently available to the public.

All current models can be obtained through our webpage in the LSTC Models download section or through your LS-DYNA distributor.

To submit questions, suggestions, or feedback about LSTC's models, please send an e-mail to: atds@lstc.com. Also, please contact us if you would like to help improve these models by sharing test data.

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