



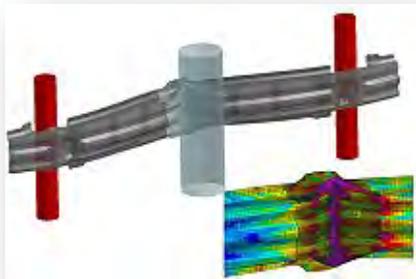
LSTC



CRAY



ESI Group Unleashes Virtual Performance Solution



Thermal Coupling Method Between SPH Particles and Solid Elements in LS-DYNA

Jingxiao Xu, Jason Wang
LSTC

FEA Information Inc.

A publishing company founded April 2000 – published monthly since October 2000.

The publication's focus is engineering technical solutions/information.

FEA Information Inc. publishes:

FEA Information Engineering Solutions

FEA Information Engineering Journal

FEA Information China Engineering Solutions

Livermore Software Technology, Corp. (LSTC) Developer of LS-DYNA One Code Methodology.

LS-DYNA provides fully integrated, strongly coupled, solvers for extensive multiphysics capabilities. Integrated, at no additional cost. Optimized for shared and distributed memory for Unix, Linux, & Windows Based platforms.

DYNAmore GmbH – LSTC's Master Distributor in the EU

DYNAmore is dedicated to sales, support, training engineers with LS-DYNA to solve non-linear mechanical problems numerically. Employs 85 engineers in Europe.

Co-develops the LSTC software and provide engineering services.



FEA Information
Platinum Participants

logo courtesy - Lancemore





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Participant Solutions

Distribution/Consulting

Cloud/On Demand/ Subscription

Models - THUMS - ADT - Barrier

LS-DYNA Recent Developments, Features, Updates – Editor – Yanhua Zhao

Thermal Coupling Method Between SPH Particles and Solid Elements in LS-DYNA

Jingxiao Xu, Jason Wang - LSTC

Announcements

Start 2017 with courtesy LSTC CA and MI location discounted training

Write to Aleta for pricing & availability aleta@lstc.com

January			
23	MI	Intro to LS-PrePost	P. Ho / Q. Yan
24-27	MI	Intro to LS-DYNA	A. Nair
February			
13-15	CA	ALE/Eulerian & Fluid/Structure Interaction	M. Souli
16-17	CA	Smoothed Particle Hydrodynamics (SPH)	M. Souli

TWITTER! LSTC/DYNAmore has just opened a twitter account. Please sign up for notices on classes, webinars, events from LSTC/

<https://twitter.com/LSTCandDYNAmore>

LSTC is offering two training classes on line – February

16-17	ONLINE	Contact in LS-DYNA	A. Tabiei	\$1,000
23-24	ONLINE	Implicit LS-DYNA	A. Tabiei	\$1,000

Participation is open January and February 2017 –

For an annual quote please contact Anthony at agiacc99@aol.com

Sincerely,

Marsha Victory Trent Eggleston

Marnie Azadian Suri Bala Dilip Bhalsod Yanhua Zhao Aleta Hays



ESI Visual-Environment continuously expands its collection of tools supporting Computer-Aided Engineering (CAE)

ESI Visual-Environment continuously expands its collection of tools supporting Computer-Aided Engineering (CAE) across multiple CAE domains in meshing, pre/post processing, reporting, automating CAE processes, customizing workflows, efficient handling of simulation data and content management as well as graphical support for Modelica based systems modeling. Visual-Environment enables customers to work with many ESI solvers of different physics as well as solvers including LS-DYNA, MADYMO, RADIOSS and NASTRAN. Visual- Environment provides multi-domain simulation facility within one single simulation environment.



Release Highlights across the platform

- **Evolution of the environment** in line with updates in the various solvers supported by Visual-Environment
- **Template** updates across the board to support ever increasing requests from customers
- **Performance** updates to keep abreast, if not surpass competition
- **Geometry and meshing** updates to effectively support the various trades in Visual-Environment
- **Materials Database support** and updates for various trades
- **Visualization** improvements for an enhanced user experience and productivity.

· Visual-Viewer

- esiCORA rating which is a curve comparison technique to evaluate the time-history signals used in injury studies. Enhancements are coming for section cut follower clip, complex result transformation, complex stress/strain averaging, vector settings.
- BEM post-processing and comes with enhancements to support ESI PAM-STAMP ERF output.
- Increasing support for Sheet Metal Forming and CFD

- **Visual-Mesh** improved CAD and STL File import, Node Move, Surface creation, Tetra Mesh, Element Quality
 - **Visual-Process Executive**
 - Updated the ESI PAM-CRASH based Pedestrian head impact process enabling the identification of the head form grid points (impact locations) and set up the simulation model as per EuroNCAP protocol
- Welding/Assembly, Casting, Composites, Stamping (Virtual Manufacturing)
- **Visual-Assembly**
 - Solid Contact Management: With this new version, user can define the mechanical contact automatically between components on shell, solid or shell-solid mesh based model.
 - Gravity activation in Joining Advisor: Effect of the gravity is now taken in to account during the joining simulation.
 - Material DB Unit System Management: The material database is automatically converted to US units though the original database is in metric system.
 - **Visual-Cast** introduces specific workflow for HPDC casting processes.
 - **Visual-DIEMAKER**
 - Running DieStarter inverse solver and optimization for any die face is introduced. It enables the modification of DieStarter geometry by assigning the DieStarter binder and profiles to the corresponding custom commands and then modify them.
 - Creation of the 3D representation of the draw bead with a section based approach and to design flanging and bending tools through flanging tool functionality is now available
 - **Visual-Quoting**
 - Creation of one-page reports (pdf or ppt) and providing indicators for nesting solutions taking into account four-sided shapes (quadrilateral, trapeze, and parallelogram)
 - **Visual-Stamp** allows export material according to ESI PAM-STAMP format (*.psm).

- **Visual-Distortion, Visual-Form and Visual-RTM**

- All modules provide guided step-by-step approach through a process-oriented menu dedicated to forming modeling (Visual-FORM), injection/infusion modeling (Visual-RTM), distortion modeling (Visual-Distortion)

- **Visual-Weld and Visual-Heat Treatment**

- Automatic Inter Welding Pass Temperature Control: User can define the interpass temperature on specific locations to control the phase proportion and stresses
- User-Defined Result Storage During Computation: For large industrial models, user is able to choose the required results before to start the computation in order to reduce the results file size
- Spot Weld Advisor Using Spacer: The Spot Weld Advisor has been updated to take into account the spacer between sheets. The finite element model is created automatically

Electromagnetics, Fluid Dynamics,
Multiphysics (Virtual Environment)

- **Visual-CEM**

- New Material Database feature allowing to specify, save and recover your own material properties
- New Parametric Analysis capabilities to investigate in straightforward manner the effect of user-selected variables within a given range
- Introduction of dedicated wizard (workflow) aimed at assembling several wind turbines within a given “farm” with the objective of evaluating its electromagnetic impact on radio navigation systems operating in the neighborhood.

- **Visual-CFD**

- Modeling of Mesh Rotation with Heat Transfer and Modeling of Multiphase Flows using various methods
- Remote Machine Support for OpenFOAM Utilities and Residual Plotting for Transient Simulations

- **Visual-SYSTUS** supports creation of special elements and alignment of cross section along cut section

Crash/Safety, NVH&Dynamics

(Virtual Performance)

- **Visual-Crash PAM**
 - Missing VPS 2016 options and provides Controls Templates is now supported
 - Modular Input Support and Conversion Utilities (NASTRAN and LS-DYNA) improved
 - Part Orientation and improved Convert Rigids to Tieds and NVH-IA Cavity/Wrapper has been redesigned
 - Acoustic Coupling Visualization and Lookup Visualization is improved
- **Visual-Crash DYNA**
 - Improved its Seat Belt Tool and implemented solver-based model check.

Seat/Comfort (Virtual Seat)

- **Visual-Seat**
 - Process to manage crash and comfort frame modelling. It provides capability of chaining between foaming and single

core model and improved H-Point optimization.

- Visual-Seat for Aero introduces a function to duplicate seat models meshes and enables model comparison between components. Another enhancement related to Comfort & Living Space in Aero seats is the Positioner Motion Preview wizard.

Systems Modeling

(Virtual Systems & Controls)

- **Visual-Systems** provides a properties dialog which is posted with component properties and the existing parameters listed. It also enables to propagate parameter.

ESI's customer portal [is available for all ESI customers](#)

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

ESI Group – Media Relations

Céline Gallerne- +33 1 41 73 58 46

LSTC December Announcement



- **New classes instructed by LSTC development and support engineers**
- **new LS-DYNA cloud available,**
- **For Small System customer new job pricing.**

New LSTC Classes - Please register - for questions contact class@lstc.com

The complete 2017 LSTC schedule is on the www.lstc.com website - link Training

A few of the classes/instructors. Full Class listing is in the training section.

P. Ho and Q. Yan	Intro to LS-PrePost	January 23 -
A. Nair	Intro to LS-DYNA	January 24 - 27
I. Gandikota	Intro to LS-OPT	April 6-7
R. Chivukula	Airbag Folding	April 10-11
I. Do and H. Chen	Advanced ALE Applications	April 11-13
Y. Huang	NVH and Frequency Domain	April 12-13
S. Bala	LS-DYNA Advanced	April 17-18
S. Bala	Material Characteristics for Metals Plastics and Polymers	
L. Zhang & Q. Yan	Introduction to Metal Forming -	
S. Guha	Occupant Simulation -	

LSTC Twitter Account - <https://twitter.com/LSTCandDYNAmore>

LS-DYNA cloud service - <http://www.ls-dynacloud.com/>

LSTC Job Pricing - Price List information contact Noi Sims noi@lstc.com

New pricing option For Small Systems up to 36 cores –

US, Canada, Mexico, EU, Japan, Australia, S. America

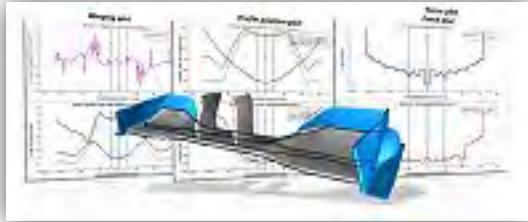
Per Job with Added Core The Per Jobs with core licenses allows flexibility for systems with up to 36 cores.

- The cores per CPU are increasing on newer hardware and becoming more affordable.
- The ability to add more core licenses allows the use of more cores per job.
- The new per job pricing for small systems, with core licenses reduces job turn around

BETA CAE Systems announces the release of the v16.2.4 of its software suite

December 8, 2016

For complete information. www.beta-cae.com/news/20161208_announcement_suite_v16.2.4.htm



About this release: BETA CAE Systems announces the release of the new ANSA / Epsilon / μ ETA v16.2.4 suite.

This maintenance release is focused on the correction of identified issues and is addressed to those who wish to continue to use the v16.2x branch with its issues resolved and not upgrade to v17x.

The most important fixes implemented in v16.2.4 are listed below.

Known Issues Resolved in ANSA

General: Applying the Focus Near function with the "Dense search" option active might cause unexpected termination when 2nd order SHELLS/SOLIDS existed.

SGRAPH: The "Show Only" option on color bar would not display the correct entities.

PLM/CAD data input

- The CAD translator's GUI would not pass the arguments of the "Extra options" field to the translator.
- A new option called 'Read plmxml structure' has been added to read the plmxml structure either through the 'ProductDef' or through the 'ProductView' sections of a plmxml file.
- Compare Report: Parts would not be colored according to the settings that define differences.

Meshing

- Volume Mesh: Meshing a volume that contained interior spots in great proximity with the TetraRapid generator would cause unresponsiveness.
- Mesh Checks: The Negative Volume function has been enhanced to fix

negative, due to erroneous orientation, elements.

Supported Interfaces

- LS-DYNA: Since v16.2.0, when the paths defined in *INCLUDE_PATH ended with "/", an erroneous include file name would be written out, missing its first character.
- LS-DYNA: Value "0" can now be defined in the parameter IHYPER of MAT41 card. A related case of ANSA erroneously replacing value "0" by "-1" of IHYPER, during output, has been also corrected.

Pre-processing tools

- Laminates Drapes: The Draping algorithm would occasionally produce improper material orientation in corners.
- In certain cases, during Abaqus output, the data of the Rosette might be lost.
- Deck Info: The algorithm for the Mass calculation related to NSM has been Improved, eliminating cases of wrong mass calculation due to the definition of NSM on a "Range of Ids".
- Input Renumber: Special Numbering rules per type would be lost if assigned on an include, when reading this include as a separate (main) file.

Known issues resolved in μ ETA

General

- When the Linux version of μ ETA terminated unexpectedly, the license would not be released by the license server.
- The graphics performance was not optimal on the new AMD WX-series graphics cards.
- Stress Linearization would not be performed on certain cases of Full Tensor results.
- Linearly combining Medina Nodal Stress results could lead to unexpected termination.
- The size of an image which was inserted in an excel table was not drawn correctly when saved in .pdf format by the Report Composer.

Supported Interfaces

- Stress results on TRIA3 elements would not be read from NX Nastran 11 files.
- Unexpected termination might occur when reading PAMCRASH files with CDATA comment blocks of 82 characters or more.
- Unexpected termination when reading multiple Radioss Extra Variables results simultaneously.

- Transparent shells would not be drawn correctly in cases of Enight adaptive mesh analyses.
- Star CCM+ VolumeFractionResults would not be read.

Scripting

- The script function `models.DeleteModel` would delete models from all windows instead of the specified ones.
- The script function `elements.DistanceElementToGroup` would not calculate Total Elongation correctly.

Compatibility and Supported Platforms

- ANSA files saved by all the first and second point releases of a major version are compatible to each other. New major versions can read files saved by previous ones but not vice versa.
- μ ETA Project files saved from version 16.2.4 are compatible and can be opened by μ ETA version 16.0.0 or later. To be readable by μ ETA versions earlier than v16.0.0, they have to be saved selecting the option "Version <16.0.0".
- Support for 32-bit platform has been discontinued for all operating systems.

For Download and Release Note Documents Please Visit the website

LS-DYNA - Your Heart and the Season

Aleta Hays



The LS-DYNA® ICFD solver can be used to solve complex multi-physic problems that include behavior of a heart valve.

LS-DYNA R7 : Strong FSI coupling - Heart Valve
Opening and closing

<https://www.youtube.com/watch?v=rKGpu-3vLIQ>

This hemodynamics example highlights the state of the art strong FSI capabilities of the ICFD solver. Due to the pressure difference, the heart valve leaflets open to allow the blood flow. Then, a strong counter-pressure forces them shut again and the blood flow decreases. Courtesy of Mohammad Hossein of McGill University, Quebec.

www.youtube.com/watch?v=kWV2zASaeJU

Fluid-structure interaction simulation of a bioprosthetic heart valve
Ming-Chen Hsu

Among the uses of LS-DYNA in the medical field is heart valve analysis. A number of publications can be found on www.dynalook.com including the following:

- The use of LS-DYNA fluid-structure interaction to simulate fluid-driven deformation in the aortic valve
- Simulating the Motion of Heart Valves Under Fluid Flows Induced by Cardiac Contraction

According to the British Heart Foundation cold weather can affect your heart by:

- Increasing your heart rate and blood pressure.
- Making your heart work much harder to keep your body warm.
- Causing changes to your blood that can increase the risk of developing blood clots and lead to heart attack and stroke.

I feel that during this holiday time of stress and possible overeating that we need to think about what we are doing to our own heart valves – Therefore I hope we can all eat right, exercise but also enjoy this time of year. I wish everyone a Happy Holiday – Aleta.

December Showcase: ICFD Gallery

The ICFD solver may run as a stand alone solver or be fully coupled with the the solid mechanics and thermal solvers of LS-DYNA to solve complex multi-physic problems such as flaps oscillating in the wind, drag around vehicles or any type of bluff body, with pitching movement or static, behavior of a heart valve, wave impacts, slamming cases and so forth.

www.lstc.com/applications/icfd/gallery

Among the videos that can be found on the LSTC ICFD Gallery are:

LS-DYNA R7 : Flow around vehicle

Description: The "Turek" problem is a challenging Fluid Structure Interaction (FSI) Benchmark application. The Von Karman vortex street that develops behind the cylinder interacts with the flexible flag. At steady state, periodic oscillations are observed .Large deformations of the flag in the channel occur which results in frequent automatic re-meshing of the fluid domain. It is also a case where the solid density and the fluid density may be equal which usually generates heavy instabilities in FSI cases. It is therefore a good problem for validating the strong FSI coupling available in LS-DYNA.

flexible flag. At steady state, periodic oscillations are observed .Large deformations of the flag in the channel occur which results in frequent automatic re-meshing of the fluid domain. It is also a case where the solid density and the fluid density may be equal which usually generates heavy instabilities in FSI cases. It is therefore a good problem for validating the strong FSI coupling available in LS-DYNA.

LS-DYNA R7 Strong FSI Coupling - Heart Valve

Description: This hemodynamics example highlights the state of the art strong FSI capabilities of the ICFD solver. Due to the pressure difference, the heart valve leaflets open to allow the blood flow. Then, a strong counter-pressure forces them shut again and the blood flow decreases. Courtesy of Mohammad Hossein of McGill University, Quebec.

LS-DYNA CFD: Turek and Hron FS12 Benchmark application

Description: The "Turek" problem is a challenging Fluid Structure Interaction (FSI) Benchmark application. The Von Karman vortex street that develops behind the cylinder interacts with the

Rescale Brings New HPC and AI Capabilities to Market via the IBM Cloud

Rescale - November 16, 2016



Rescale selects IBM as a preferred cloud provider, helping customers achieve unprecedented performance, scale and flexibility

Salt Lake City, Utah — Rescale, a global leader in cloud high performance computing (HPC), announced today that it has selected IBM Cloud as a preferred cloud computing provider, expanding its global HPC infrastructure network. By running Rescale’s simulation and deep learning platform on the IBM Cloud, engineers, data scientists, CIOs, and IT professionals gain greater global reach, flexibility, and performance for their data and graphics-intensive workloads.

Rescale’s platform provides a software library of over 180+ simulation and machine learning applications that tackle the world’s toughest big data and big compute IT challenges. Now companies can deploy Rescale’s turn-key SaaS platform in any IBM Cloud Data Center worldwide. This also includes running popular

deep learning and AI software packages by providing unlimited, pay-as-you-go access to the latest GPUs, enabling organizations to stay on the cutting edge of R&D. Rescale on IBM Cloud enables seamless access and utilization of HPC resources in the cloud, enabling engineers and data scientists to increase efficiency and time to market and providing IT executives increased visibility and control over the full-stack environment.

“IBM Cloud is democratizing HPC. We are not just breaking down the financial barriers to entry; now, with Rescale, we are also making this raw compute power accessible and easy to use,” said Marc Jones, Distinguished Engineer, IBM Cloud Infrastructure.

Rescale Brings New HPC and AI Capabilities to Market via the IBM Cloud

Companies can now select IBM's bare metal cloud servers enabled with the latest NVIDIA® GPU capabilities to meet the technical and performance requirements of applications in data mining, machine learning and simulation. IBM's GPU-enabled servers can be spun up on an hourly basis, giving companies granular control and scalability over their private, public or hybrid cloud environments. In addition to the latest x86 processors, NVIDIA GPU accelerators, Rescale plans to extend its support to IBM POWER-based server capabilities in 2017.

The Rescale solution running on the IBM Cloud is key for companies running HPC workloads in a broad range of sectors such as life sciences and genomics, computer-aided engineering and manufacturing, electronic design automation and semiconductors, and financial services.

By running their simulation and HPC workloads on the Rescale platform, customers benefit from:

Faster product time to market by shortening design cycles and improved software development.

Reduced IT capex spend and improved TCO and ROI from a cloud-based pay-as-you-go model—customers use only what's needed.

Transformed IT agility by enabling global collaboration and access to HPC infrastructure.

Integrated solutions including hybrid, on-premises, private and public cloud, and IoT networks.

“Most of the IT innovation that is happening today is with a cloud-first model,” said Joris Poort, co-founder and CEO of Rescale. “We’re building a platform that can satisfy and accelerate the ideas of the world’s top scientists and thinkers. From automotive design to drug discovery and even actual rocket science, we’re empowering our customers as leaders in their respective fields, to accomplish more and innovation faster.”

About Rescale: Rescale is the global leader for high-performance computing simulations and deep learning in the cloud. Trusted by the Global Fortune 500, Rescale empowers the world’s top scientists and engineers to develop the most innovative new products and perform groundbreaking research and development faster and at lower cost. Rescale’s platform transforms traditional fixed IT resources into flexible, hybrid, private, and public cloud resources – built on the largest and most powerful high-performance computing network in the world. For more information on Rescale products and services, visit www.rescale.com.

Press Contact: Mika Pegors, Product Marketing
Mgr. - Rescale
855-737-2253 (1-855-RESCALE)
mika@rescale.com

Cray Works With Industry Leaders to Reach New Performance Milestone for Deep Learning at Scale

Courtesy and Copyright to CRAY



A team of experts from Cray, Microsoft, and CSCS have scaled the Microsoft Cognitive Toolkit to more than 1,000 NVIDIA® Tesla® P100 GPU accelerators on the Cray XC50 supercomputer at CSCS.

SEATTLE and BARCELONA, Spain , Dec. 07, 2016 (GLOBE NEWSWIRE) -- At the 2016 Neural Information Processing Systems (NIPS) Conference in Barcelona, Spain, global supercomputer leader Cray Inc. (Nasdaq:CRAY) today announced the results of a deep learning collaboration between Cray, Microsoft, and the Swiss National Supercomputing Centre (CSCS) that expands the horizons of running deep learning algorithms at scale using the power of Cray supercomputers.

Running larger deep learning models is a path to new scientific possibilities, but conventional systems and architectures limit the problems that can be addressed, as models take too long to train. Cray worked with Microsoft and CSCS, a world-class scientific computing center, to leverage their decades of high performance computing expertise to profoundly scale the Microsoft Cognitive Toolkit (formerly CNTK) on a Cray® XC50™ supercomputer at CSCS nicknamed “Piz Daint”.

By accelerating the training process, instead of waiting weeks or months for results, data scientists can obtain results within hours or even minutes. With the introduction of supercomputing architectures and technologies to deep learning frameworks, customers now have the ability to solve a whole new class of problems, such as moving from image recognition to video recognition, and from simple speech recognition to natural language processing with context.

Deep learning problems share algorithmic similarities with applications traditionally run on a massively parallel supercomputer. By optimizing inter-node communication using the Cray® XC™ Aries network and a high performance MPI library, each training job can leverage significantly more compute resources – reducing the time required to train an individual model.

Cray Works With Industry Leaders to Reach New Performance Milestone for Deep Learning at Scale

Courtesy and Copyright to CRAY

“Cray’s proficiency in performance analysis and profiling, combined with the unique architecture of the XC systems, allowed us to bring deep learning problems to our Piz Daint system and scale them in a way that nobody else has,” said Prof. Dr. Thomas C. Schulthess, director of the Swiss National Supercomputing Centre (CSCS). “What is most exciting is that our researchers and scientists will now be able to use our existing Cray XC supercomputer to take on a new class of deep learning problems that were previously infeasible.”

“Applying a supercomputing approach to optimize deep learning workloads represents a powerful breakthrough for training and evaluating deep learning algorithms at scale,” said Dr. Xuedong Huang, distinguished engineer, Microsoft AI and Research. “Our collaboration with Cray and CSCS has demonstrated how the Microsoft Cognitive Toolkit can be used to push the boundaries of deep learning.”

A team of experts from Cray, Microsoft, and CSCS have scaled the Microsoft Cognitive Toolkit to more than 1,000 NVIDIA® Tesla® P100 GPU accelerators on the Cray XC50 supercomputer at CSCS. The result of this deep learning collaboration opens the door for

researchers to run larger, more complex, and multi-layered deep learning workloads at scale, harnessing the performance of a Cray supercomputer.

To simplify the building and deploying of deep learning environments in supercomputing, Cray is supporting its Cray XC customers with deep learning toolkits, such as the Microsoft Cognitive Toolkit, that allow customers to run deep learning applications at their fullest potential – at scale on a Cray supercomputer. Fusing high performance computing capability with deep learning is another step forward in Cray’s vision of the convergence of supercomputing and big data.

“Only Cray can bring the combination of supercomputing technologies, supercomputing best practices, and expertise in performance optimization to scale deep learning problems,” said Dr. Mark S. Staveley, Cray’s director of deep learning and machine learning. “We are working to unlock possibilities around new approaches and model sizes, turning the dreams and theories of scientists into something real that they can explore. Our collaboration with Microsoft and CSCS is a game changer for what can be accomplished using deep learning.”

Cray Works With Industry Leaders to Reach New Performance Milestone for Deep Learning at Scale

Courtesy and Copyright to CRAY

For more information on Cray's machine learning and deep learning solutions and the Cray XC series of supercomputers, and please visit the Cray website at www.cray.com.

About Cray Inc.

Global supercomputing leader Cray Inc. (Nasdaq:CRAY) provides innovative systems and solutions enabling scientists and engineers in industry, academia and government to meet existing and future simulation and analytics challenges. Leveraging more than 40 years of experience in developing and servicing the world's most advanced supercomputers, Cray offers a comprehensive portfolio of supercomputers and big data storage and analytics solutions delivering unrivaled performance, efficiency and scalability. Cray's Adaptive Supercomputing vision is focused on delivering innovative next-generation products that integrate diverse processing technologies

into a unified architecture, allowing customers to meet the market's continued demand for realized performance. Go to www.cray.com for more information.

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Announcement & Call for Papers

11th European LS-DYNA[®] Conference

May 9 - 11 2017, Salzburg, Austria

Conference Website: www.dynamore.de/conf2017

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.

Venue

Salzburg Congress is located in the center of Salzburg. Salzburg can be reached easily via freeway, the high speed train ICE, and the international airports of Salzburg or Munich.

www.salzburgcongress.at

Review of the 2015 Conference

Get an impression of the 10th European LS-DYNA Conference 2015 in our review on YouTube:

<https://youtu.be/Mw5Dm-SXcWo>

Abstract submission

Please submit your abstract (maximum length 2,500 characters) by E-Mail to conference@dynamore.de or online at www.dynamore.de/conf2017-submit

Important dates

Abstract submission:	27 January 2017
Author notification:	27 February 2017
Final paper deadline:	27 March 2017

Participant fees

Industry speaker:	400 Euro
Academic speaker:	340 Euro
Industry:	590 Euro ¹⁾ / 640 Euro
Academic:	440 Euro ¹⁾ / 490 Euro

¹⁾ Registration before 1 April 2017. 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/conf2017

LS-DYNA Implicit: Workshop on the nonlinear solver

A. Gromer, T. Erhart (DYNAmore); T. Borrvall (DYNAmore Nordic)

Download workshop slides: www.dynamore.de/implicit_workshop_2017

Download input decks: www.dynaexamples.com/implicit

Motivation: Why implicit?

There are several scenarios where an implicit solution scheme will assist you in saving valuable computation time. Typically, these scenarios involve applications with gravity loading or other types of static pre-loading where dynamic effects are vanishing. Thus, instead of trying to calm down a fully dynamic simulation using dynamic relaxation or the application of a critical damping, one can directly compute the “steady-state solution” using the implicit nonlinear solver of LS-DYNA. Other scenarios include long duration analyses beyond five seconds of real time (i.e. dummy positioning) or local parts with much finer meshes that would lead to a very small explicit time step. Besides the dynamic explicit time stepping scheme, the one-code strategy of LS-DYNA also provides implicit time integration schemes which can be applied for static as well as dynamic problems. This enables the engineer to use one input deck for all time integration schemes and thus, guarantees greatest flexibility in choice and application of the “right” method.

The CCSA (former NCAC) Toyota Yaris model

The model provided by CCSA has a typical model setup suitable for crashworthiness analysis. The basic idea was to do as little modifications as necessary to make the model “implicit ready” but keeping the explicit model structure/philosophy. The detailed steps on how this was achieved can be read in the workshop slides. In total, the model consists of about 1.2 million nodes, ~ 1.2 million elements (mostly shells), 1 global contact between parts and 1 global tied contact to capture spotwelds.

**Available Load Cases**

- Dynamic Shock Absorber Loading
- Static Shock Absorber Loading
- Dynamic Roof Crush
- Static Door Sag

These examples were presented within a workshop on the 14th German LS-DYNA Forum 2016 in Bamberg by Alexander Gromer of DYNAmore. Other recent examples of this section are published by Satish Pathy of LSTC. Download input decks:

www.dynaexamples.com/implicit

Features of LS-DYNA R9.0.1

- Newmark methods with consistent mass matrix

- Newton, Quasi-Newton, arclength methods
- Direct and iterative linear solvers
- Automatic step size adjustment
- High scalability using MPP
- Switching between implicit and explicit
- Fringe plot of residual (out-of-balance) forces
- Mortar contact
- Highly for implicit analyses

Download workshop slides: www.dynamore.de/implicit_workshop_2017

Download input decks: www.dynaexamples.com/implicit

42 New Examples Available for the Incompressible Fluid Solver (ICFD)

Iñaki Çaldichoury (LSTC) and Marcus Timgren (DYNAmore Nordic)

Download input decks: www.dynaexamples.com/icfd

Introduction

The incompressible fluid solver ICFD is one of the most rapidly progressing solvers in LS-DYNA. For more and more LS-DYNA users, the ICFD solver is the method of choice when it comes to solving standard problems in computational fluid dynamics (CFD) as well as more sophisticated problems such as fluid-structure interaction (FSI) and conjugate heat transfer. Moreover, the ICFD solver exhibits also a good parallel scalability which leads to short turnaround times for the user.

The ICFD Solver at a glance

- Automatic volumetric mesh generation based on the surface mesh of boundary surfaces
- Automatic mesh adaptivity and refinement
- No finite volume code. Runs on Tetrahedrons using stabilized finite elements
- 9 Turbulence models and 4 laws of the wall that are gold standard in the CFD world
- Divergence-free turbulent inflow conditions
- Non-inertial reference frame
- Free surface flows and wave generator
- Newtonian and non-Newtonian fluids
- Porous media flows (Ergun, Darcy-Forcheimer)
- FSI (strong and weak coupling)
- Conjugate heat transfer (strong coupling)
- Discrete Element Coupling (weak)



Available Examples

- *The Basic Examples* contain simple tutorial examples to gain a basic understanding of the ICFD and MESH keywords. Each example usually focuses on one or two particular aspects of the solver and often uses coarse meshes to keep the runtimes low. Perfect for exploring, testing and gaining experience before moving on to more complex problems
- *The Intermediate Examples* contain keyword configurations that are not necessarily more complex than the basic examples but often, the geometry, mesh or physics involved are. This results in longer run times and requires higher computational resources such that switching to MPP is highly recommended.
- *The Advanced Examples* contain challenging examples that couple with other LS-DYNA solvers or exhibit complex CFD cases. Access to heavy computational resources is required.
- *The Beta Examples* contains problems with features that have not yet made it to an official release version. To run these problems, a developer version of LS-DYNA is required, which can be obtained through local LS-DYNA distributors.

Try for yourself and download some input decks at www.dynaexamples.com/icfd

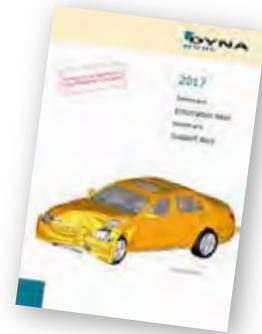
Author: Nils Karajan nik@dynamore.de

DYNAmore Visit the website for complete overview and registration

www.dynamore.de/seminars

New seminar brochure for 2017 published by DYNAmore

Download full seminar brochure (pdf): www.dynamore.de/seminars2017



Selection of trainings from January to March

Hot Forming with LS-DYNA	24-25 Jan.
Forming Simulation with eta/DYNAFORM	26-27 Jan.
Introduction to LS-PrePost	13 Feb. / 13 March
Introduction to LS-DYNA	1-3 Feb (V) / 14-16 Feb. / 14-16 March
Element Types and Nonlinear Aspects	8 Feb.
User Interfaces in LS-DYNA	20 Feb.
Joining Techniques for Crash Analysis	6-7 March
Introduction to Passive Safety Simulation	9-10 March
CPM for Airbag Modeling	17 March
Contact definitions in LS-DYNA	20 March (L)
ALE and Fluid-Structure Interaction	21-22 March (V)
LS-OPT – Optimization and Robustness	22-24 March
Damagae and Failure Modeling of Metallic Materials	23-24 March (T)
Modeling Polymers & Elastomers in LS-DYNA	27-28 March
Crash Analysis with LS-DYNA	28-31 March (L)
Simulation of Short Fiber Reinforced Polymers	29 March
Simulation of Continuous Fiber Reinforced Polymers	30-31 March

Information days or Webinars (free of charge)

Integrated Optimization with ANSA & LS-OPT	20 Feb.
Composites Analysis with LS-DYNA	13 March
Mapping tool ENVYO	13 March
Possibilities with LS-DYNA Implicit	20 March
Cloud Solutions for LS-DYNA	27 March
Optimization/DOE/Robustness with LS-OPT	30 March (V)

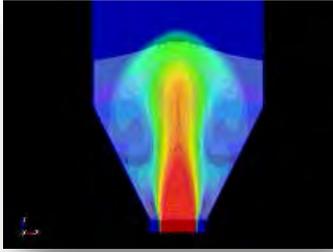
Support days (free of charge)

LS-DYNA	20 Jan. / 17 Feb.
Occupant Safety	17 March

If not otherwise stated, the event location is Stuttgart, Germany. Other event locations are:
 G = Göteborg, Sweden; L = Linköping, Sweden V = Versailles, France; T = Turin, Italy,

If the offered seminars do not fully suit your needs, we are pleased to meet your individual requirements by arranging tailored on-site training courses on your company premises.

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



LS-DYNA Analysis Models

www.lancemore.jp/index_en.html

The sample models have been created and collected for the purposes of letting you know what LS-DYNA can do and demonstrating our knowledge and abilities to create models. We are hoping that our models come in useful for you. If you wish to create a particular model, please contact us. We will offer the best cost-effective solutions. Thank you for your interest in our models!

www.lancemore.jp/index_en.html

Updated on 11-11-2016

No.452

Analysis of powder blending inside fluid bed based on the coupling analysis method(Long Version)

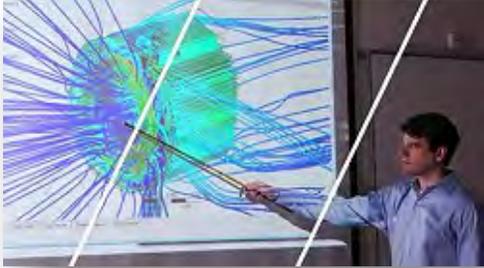
NO. 452

Crash Simulation of the protection system which is constituted of high strength steel ring nets

No 451

Crash Simulation of the protection system which is constituted of ring nets and tecco nets

Improvements in Simulation Training at CAE Associates



Engineering Advantage Blog

<https://caeai.com/blog/improvements-simulation-training-cae-associates>

December 6, 2016 By: Steven Hale

CAE Associates has a long history of providing high-quality engineering simulation training. Direct feedback and surveys from our students show a high regard for the instructors, high satisfaction with the training, and eagerness to apply newly-learned skills. But just because something works well doesn't mean it can't get better. The two main pillars of our training classes have always been lecture and workshops: Lecture relays relevant facts, concepts, and theories; while workshops reinforce these facts and ideas through practice. However, we often get feedback from students that they want more workshops and less lecture. This feedback is understandable because workshops are usually more engaging than lecture, even with a highly animated and interactive instructor at the helm. We've also found that students can get overwhelmed when a lot of information is dumped on them all at once. So we've decided to update our training classes to provide a better learning experience: one that is more engaging and manageable for the students.

How Can We Make Our Training More Engaging and Manageable?

One way to do this would be to remove a lot of lecture material and do more workshops instead, as suggested by many of our students. While this approach seems obvious, it has some drawbacks. The ability to transfer what's learned in a workshop to real-life problems is limited without learning the background information and the theory behind it. Effective learning requires a deeper understanding. It's like following the step-by-step instructions from IKEA about how to build that bookshelf you just bought: If you don't understand the reason for doing each step, it's going to be very hard to build another one without a new set of instructions, let alone something different like a table or chair. And when you get back to your office and have to apply your new knowledge to your own complicated problem, you won't have those step-by-step instructions..

The ultimate goal of the training is to gain the knowledge, experience, and confidence necessary to perform FEA on your applications independently. My colleague, George Bauer, wrote an excellent blog titled “You Call That Training?” that includes a section about the value of the balance between lecture and workshops. Lecture is important and shouldn’t be shortchanged. However, in an effort to make it more manageable and less overwhelming, we will make our lectures shorter and more interactive, and we will precede/follow each lecture with demonstrations or workshops.

How About More Demonstrations?

In recent years, we’ve found that our students learn faster and experience better knowledge retention when we go through interactive demonstration problems. Some students like to follow along, while others prefer to sit back and watch; it’s up to them. This approach falls in line with modern training practices such as M. David Merrill’s “First Principles of Instruction” which includes the steps of demonstration and application. Put simply, these include the following three basic steps: Tell (lecture) >

Show (demonstrations) > Do (workshops). While these steps have always been present in our training, we’ve increased the interactive demonstrations in our courses. The idea is to provide clear, practical analysis examples that the instructor sets up, solves, and evaluates in front of the students. Both the mechanics and the rationale for each step will be explained. More demonstrations should yield more student engagement and a deeper understanding of the analysis steps. Short lectures combined with interactive discussions will be provided both before and after the demonstrations to teach relevant theory and closely-related topics.

As an example, a single assembly component such as a universal joint can be used to demonstrate basic, intermediate, and advanced finite element analysis methods. Each demonstration includes increasing levels of complexity relative to the previous one. Table 1 shows specific concepts and methods included in each demonstration. Students are shown how to progress to a complex model starting with simple methods and incrementally adding more advanced features and tools.

	Geometry	Mesh	Loads and Supports	Material Properties	Contact	Solution	Post-processing
Basic	Basic defeaturing	All Tet with global size controls	Torque, Pressure, and, Temperature	Linear Elastic	None	Linear	Stress, Strain, and Displacement
Intermediate	Defeaturing, Slicing, Blends, Imprints, multi-body parts	Hex and Tet with some local size controls	Bearing loads, Remote forces, Named selections	Linear Elastic	None	Linear with multiple load steps	Scoping results, Reaction forces, Path plots, Validating results
Advanced	Assembly of parts	All-Hex methods (MultiZone) and inflation	Tabular loads, Compression-only support, Import temperatures	Plasticity	Bonded, Frictional, Frictionless	Linked analysis: Thermal > Structural	Contact results, Plastic strain, Plastic work

Pic Table 1: U-Joint Demonstrations with Increasing Complexity

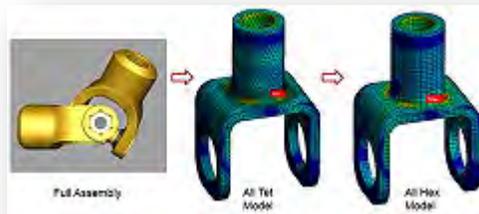


Figure 1: U-Joint Demonstration Model

I'm sure many of you have taken simulation software training. Hopefully you've found it to be valuable and engaging, and you've been able to apply it to your day-to-day work. But maybe you've seen areas where it could be improved. I encourage you to share specific comments about your experiences with simulation software training and some ideas for improvement.

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AUTOMOTIVE NEWS & EVENTS

Dilip Bhalsod

The purpose of this section is to provide a place, for our automotive readers, to share news and events relative to their company and/or products.

The criteria for submitting information is as follows:

- It has to be public information
- Published on the Internet
- Be automotive informational, or human interest.
- We do not accept financial quarterly information

We would welcome the opportunity to share information about your company with our readership.

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use "Automotive News"

Submissions should be received by the 15th of each month, of the month you want your article placed

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Multi-tool on Wheels: 2017 Toyota 4Runner is the Everyday SUV That Lets You Explore When You Want, Where You Want

- Full-capability SUV with Body-on-Frame Construction
- New TRD Off-Road and Off-Road Premium Grades Amp Up Lineup
- Available Seating for up to Seven Passengers
- Potent 270-hp V6 and 5,000-lb. Towing Capacity
- Latest Toyota Entune® Multimedia Systems

The 2017 Toyota 4Runner is the vehicular equivalent of a multi-tool. On one hand, it's a campout waiting to happen. If need be, it's a boat-towing, trail-blazing, hill-climbing sport-utility with room for seven passengers (if so equipped), their tents, tables, barbeques, and supplies. On the other hand, it's a comfortable, capacious, safe, and tech-filled commuter that's right at home atop tight, pothole-riddled city streets. For over three decades, the 4Runner has been a true do-anything, carry-everything, body-on-frame SUV that enables its drivers to explore wherever they want, when they want.

For 2017, the 4Runner's endearing character and impressive ruggedness is massaged by the passionate team at Toyota Racing Development (TRD). Last year's Trail and Trail Premium grades are now known as the TRD Off-Road and TRD Off-Road Premium, and join the ultimate off-roader in the lineup, the 4Runner TRD Pro.

In addition to the a short list of exterior updates that include new badging and color options, within their cabins, the trio of TRD models feature a carbon fiber-patterned center console, with the TRD Off-Road grades getting unique

"TRD Off-Road" floor mats. The TRD Off-Road Premium and TRD Pro add red "TRD" logos to their front seats' headrests. Drivers of all TRD models have the full gamut of Toyota's off-road driving technologies at their disposal.

"Strong, Like Bull"

Whether the destination is a tree-lined trailhead, local boat launch, or hectic school entrance, the 4Runner delivers with everyday comfort, versatility, and proven Toyota reliability. The 4Runner's strength originates at its tough-as-nails body-on-frame construction featuring a 4-link rear axle and coil-spring suspension. The 4Runner offers the choice of 2WD, part-time 4WD with a 2-speed transfer case, or full-time multi-mode 4WD with a 2-speed transfer case and locking center differential. All four-wheel drive models offer 9.6 inches of ground clearance.

In addition to the three TRD models, the 2017 4Runner is available as the popular, well-equipped SR5; the SR5 Premium with additional amenities; and the luxurious Limited.

Looking Good, Clean or Dirty

Blending style and ruggedness is difficult, but not impossible, as exemplified by the 4Runner. Caked in mud or freshly bathed, the 4Runner never fails to look stunning. All 4Runners are equipped with projector beam headlights and LED rear combination lamps. The SR5 and TRD models ride on 17-inch alloy wheels that are available in three designs: 6-spoke (SR5, SR5 Premium), 7-spoke (TRD Off-Road, TRD Off-Road Premium), or a TRD Alloy painted matte black (TRD Pro). All wheels are wrapped in tires sized P265/70R17.

The TRD Off-Road and TRD Off-Road Premium are distinguished by their color-keyed bumpers and overfenders, hood scoop, and silver painted front and rear bumper accents. “TRD Off-Road” badges adorn the exterior of their C-pillars.

The top-of-line Limited is the only 4Runner with a chrome-plated grille insert and exterior trim; its 20-inch machine-finished wheels and P245/60R20 tires are exclusive to the model. All 4Runner models come with a full-size spare tire.

Engineered to Take What You Dish Out

All 4Runners are powered by a gutsy 270-horsepower 4.0-liter V6 that routes its power through a 5-speed ECT-i automatic transmission with sequential shift mode. The V6 delivers a stout 278 lb.-ft. of torque. Dual Independent Variable Valve Timing with

intelligence (VVT-i) optimizes torque across the engine’s entire operating range. There’s plenty of torque for towing, hence the inclusion of a standard integrated tow-hitch receiver and wiring harness on all grades. The 4Runner can tow a maximum of 5,000 pounds, with a maximum 500-pound tongue weight.

The renowned 4Runner lineup starts at the SR5 2WD model, which offers a standard Automatic Limited Slip Differential (Auto LSD). This function of the traction control (TRAC) system allows some wheel slippage to help the vehicle dig out from sand or snow, for example.

The available part-time 4WD system uses Active Traction Control (A-TRAC) and bolsters off-road capability with a two-speed transfer case with selectable low-range. By distributing drive force to any one wheel in contact with the ground, A-TRAC can make terrain irregularities and slippery patches virtually transparent to the driver.

Exclusive to the 4Runner Limited, the full-time 4WD system uses a Torsen® center differential with locking feature and a three-mode, center console-mounted switch. The system uses a 40:60 torque split in most driving situations and alters that in response to slippage. If the front wheels are slipping while the vehicle is turning, the Torsen® differential changes the split to 30:70. If the rear wheels slip while the vehicle is turning, the differential changes to a 53:47 split.

High Tech Traction Assistants

The 4Runner's high-strength chassis and 4WD get help from a supporting cast of technologies. Standard Hill-start Assist Control (HAC) provides additional control when accelerating from a stop on a steep incline by helping to hold the vehicle stationary while the driver transitions from the brake pedal to the accelerator. Limited and SR5 models equipped with 4WD also feature standard Downhill Assist Control (DAC). This feature augments low-speed descending controllability by helping to maintain a constant slow speed and preventing wheel lockup, allowing the driver to concentrate primarily on steering.

The 4Runner TRD Off-Road, Off-Road Premium, and TRD Pro models add the capability of an electronic-locking rear differential and Toyota's Crawl Control (CRAWL) feature. The latter helps maintain a constant speed, enhancing vehicle control when driving up and over obstacles in challenging off-road situations. With the transfer case shifted into low range, CRAWL regulates engine speed and braking force to propel the vehicle forward or in reverse at one of the five driver-selectable low-speed settings. The driver can focus on steering over obstacles without having to also modulate the throttle or brake pedal.

As conditions on the trail change, the 4Runner TRD Off-Road, TRD Off-Road Premium, and TRD Pro driver can adapt the vehicle with the Multi-Terrain Select system. A dial is used to

select the mode that matches prevailing terrain and conditions, adjusting wheel slip accordingly. For example, on loose terrain such as mud and sand, more-than-normal wheel slip is permitted, allowing wheel-spin to work in the vehicle's favor.

The Mogul setting is for any extremely uneven terrain, such as V-ditches, slopes, and ridges -- uphill or down. In this mode, wheel slip is minimized and the system acts more like a limited slip differential. On 4Runner TRD Off-Road models, an overhead console groups the off-road control switches into one location.

Suspension Upgrades: No Leg Days Skipped

The 4Runner TRD Off-Road models can be outfitted with Toyota's Kinetic Dynamic Suspension System (KDSS) that allows extended wheel travel at slow speeds for greater off-road capability and stability. On pavement, KDSS provides a nimble sporty handling feel by reducing body lean when cornering.

The 4Runner Limited, though certainly off-road capable, places extra focus on everyday comfort and pavement handling with an exclusive X-REAS suspension, which automatically adjusts the damping force of shock absorbers when driving over bumpy surfaces or when cornering. A center control absorber cross-links the shock absorbers on opposite corners of the vehicle, substantially reducing pitch and yaw by offsetting opposing inputs.

TRD Pro Series: Built Ready

Taking the 4Runner's suspension setup a step further is the TRD Pro Series that comes ready to hit the trail with unique TRD-tuned front springs, TRD Bilstein high-performance shocks with rear remote reservoirs, Nitto® Terra Grappler tires, and a TRD front skid plate.

The TRD Pro Series looks the tough part, too, with 17-inch black TRD alloy wheels, unique front grille, black bumper accents, TRD Shift Knob, and special badges. The TRD Pro Series is available in new colors for 2017: Cement, Barcelona Red, and Super White.

Room for Adventure

The Toyota 4Runner is the Sherpa of SUVs. With the second-row seats in use, the cargo area offers up to 47.2 cu. ft. of carrying space. If it's just two people hitting the road or trail for an extended getaway, folding the second row opens up a cavernous 89.7 cu. ft. cargo area. Fold-flat second-row seats provide a level load floor, and it's not necessary to remove the headrests to fold the seats flat. The available pull-out cargo deck can carry up to 440 pounds to make loading and unloading heavy items easier, and it also provides seating for tailgating and campsite relaxation. For power on the go, the 4Runner offers a standard 120V outlet and two 12V outlets.

Third-row seating is available on SR5 and Limited grades, with a split 50/50 seat that folds flat. When so equipped, the 40/20/40 second-row seat has a one-touch walk-in function to provide easy access to the third row. The seats can be folded from the side or at the rear, using separate one-touch levers. Even when "roughing it" there's no need to give up comfort; the second-row seats, which include a

center armrest, individually recline up to 16 degrees in four steps.

Air conditioning with rear seat vents and pollen filter, power-sliding liftgate window, and a backup camera are among the standard features that make the 4Runner SR5 an outstanding value. The standard Optitron® instrument panel adds a touch of high-tech elegance for all grades, and a multi-information display provides readouts for numerous vehicle functions and fuel economy.

The SR5 Premium provides a significant comfort upgrade with SofTex®-trimmed seats, heated front seats, an auto-dimming rear-view mirror and more. The Off-Road Premium receives the same features, and the Limited gets luxurious with leather-trimmed heated and ventilated 8-way power driver's seat (with memory) and 4-way power front passenger seat, dual-zone automatic climate control and the Smart Key system with push button start. The Limited also adds the convenience of a standard front and rear clearance sonar system.

Standard Entune™ Multimedia

Like all 2017 Toyota models, the 4Runner line offers an array of Entune™ Multimedia system choices:

SR5 and TRD Off-Road: Entune™ Audio Plus with Connected Navigation App – includes Entune™ Multimedia Bundle (6.1 in. high resolution touch-screen display, AM/FM CD player, MP3/WMA playback capability, 8 speakers, auxiliary audio jack, USB 2.0 port with iPod® connectivity and control, advanced voice recognition, hands-free phone capability, phone book access

and music streaming via Bluetooth® wireless technology), Connected Navigation Scout® GPS Link App, Siri® Eyes Free, SiriusXM® Satellite Radio with 3-month complimentary All Access Trial, and Gracenote® album cover art, HD Radio™, HD Radio™ traffic and weather in major metro areas, and integrated backup camera display with projected path.

SR5 Premium, TRD Off-Road Premium, and TRD Pro: Entune™ Premium Audio with Integrated Navigation and App Suite - includes Entune Multimedia Bundle (6.1in high resolution touch-screen with split screen display, AM/FM CD player with MP3/WMA playback capability, 8 speakers, auxiliary audio jack, USB 2.0 port with iPod® connectivity and control, advanced voice recognition, hands-free phone capability, phone book access and music streaming via Bluetooth® wireless technology), Siri® Eyes Free, Entune® App Suite, HD Radio™, HD Radio™ predictive traffic and Doppler weather overlay, AM/FM cache radio, SiriusXM® Satellite Radio with 3-month complimentary All Access Trial, and Gracenote® album cover art, HD Radio™, HD Radio™ traffic and weather in major metro areas, and integrated backup camera display with projected path.

Limited: Entune™ Premium JBL® Audio with Integrated Navigation and App Suite - includes Entune Multimedia Bundle (6.1 in high resolution touch-screen with split screen display, AM/FM CD player with MP3/WMA playback capability, 15 JBL® GreenEdge™ speakers in 9 locations including subwoofer amplifier, auxiliary audio jack, USB 2.0 port with iPod® connectivity and control, advanced voice recognition, hands-free phone capability, phone book access and music streaming via Bluetooth® wireless technology), Siri® Eyes Free, Entune® App Suite, HD Radio™, HD Radio™ predictive traffic and Doppler weather overlay, AM/FM cache radio, SiriusXM® Satellite Radio with 3-month complimentary All Access Trial, and Gracenote® album cover art, HD Radio, HD Radio™ traffic and

weather in major metro areas, and integrated backup camera display with projected path.

Entune™ App Suite is a collection of popular mobile apps and data services. Once a smart phone is connected to the vehicle using Bluetooth® or a USB cable, Entune™'s features are operated using the vehicle's controls or, for some services, by voice recognition. Entune offers mobile apps for iHeartRadio, MovieTickets.com, OpenTable®, Pandora® and others. Entune data services include a fuel price guide, sports scores, stocks, traffic and weather.

Star Safety System and Safety Connect - The 4Runner features Toyota's standard Star Safety System™ that includes Vehicle Stability Control (VSC) with traction control (TRAC, or A-TRAC with 4WD), an Anti-lock Brake System (ABS) with Electronic Brake-force Distribution (EBD), Brake Assist (BA), and Smart Stop Technology (SST) brake-override system.

Eight standard airbags include driver and front passenger Advanced Airbag System, TAP (thorax, abdomen, pelvis) front seat-mounted side airbags, driver and front passenger knee airbags and all-row Roll-sensing Side Curtain Airbags (RSCA). The Safety Connect™ system available for the 4Runner Limited (one-year trial subscription included) offers Automatic Collision Notification, Stolen Vehicle Location, Emergency Assistance Button (SOS), and Roadside Assistance.

Limited Warranty and Toyota Care - Toyota's 36-month/36,000 mile basic new-vehicle warranty applies to all components other than normal wear and maintenance items. Additional 60-month warranties cover the powertrain for 60,000 miles and corrosion with no mileage limitation. The 4Runner also comes standard with Toyota Care, a complimentary plan covering normal factory-scheduled maintenance and 24-hour roadside assistance for two years or 25,000 miles, whichever comes first.

AEROSPACE NEWS & EVENTS

Marnie Azadian

The purpose of this section is to provide a place, for our aerospace readers, to share news and events relative to their company and/or products.

The criteria for submitting information is as follows:

- It has to be public information
- An internet URL
- Be technical, informational, or human interest.
- We do not accept financial quarterly information

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Submissions should be received by the 15th of each month, of the month you want your article placed. For example: We would need the title of the news or event by December 15th, 2015 to be featured in the December 2015 FEA newsletter.

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NASA Announces First Geostationary Vegetation, Atmospheric Carbon Mission

Courtesy and Copyright to NASA



Geostationary Carbon Cycle Observatory will monitor plant health and vegetation stress and probe the natural sources.

From an orbit 22,000 miles above the Americas, the Geostationary Carbon Cycle Observatory will monitor plant health and vegetation stress and probe the natural sources, sinks and exchange processes of key greenhouse gases.

Credits: NASA

NASA has selected a first-of-its-kind Earth science mission that will extend our nation's lead in measuring key greenhouse gases and vegetation health from space to advance our understanding of Earth's natural exchanges of carbon between the land, atmosphere and ocean.

The primary goals of the Geostationary Carbon Cycle Observatory (GeoCARB), led by Berrien Moore of the University of Oklahoma in Norman, are to monitor plant health and vegetation stress throughout the Americas, and to probe, in unprecedented detail, the natural sources, sinks and exchange processes that control carbon dioxide, carbon monoxide and methane in the atmosphere.

The investigator-led mission will launch on a commercial communications satellite to make observations over the Americas from an orbit of approximately 22,000 miles (35,400 kilometers) above the equator. The mission was competitively selected from 15 proposals

submitted to the agency's second Earth Venture - Mission announcement of opportunity for small orbital investigations of the Earth system.

"The GeoCARB mission breaks new ground for NASA's Earth science and applications programs," said Michael Freilich, director of the Earth Science Division of NASA's Science Mission Directorate in Washington. "GeoCARB will provide important new measurements related to Earth's global natural carbon cycle, and will allow monitoring of vegetation health throughout North, Central and South America."

GeoCARB will measure daily the total concentration of carbon dioxide, methane and carbon monoxide in the atmosphere with a horizontal ground resolution of 3 to 6 miles (5 to 10 kilometers). GeoCARB also will measure solar-induced fluorescence, a signal related directly to changes in vegetation photosynthesis and plant stress

NASA Announces First Geostationary Vegetation, Atmospheric Carbon Mission

Courtesy and Copyright to NASA

Total NASA funding for the mission over the next five years will be \$166 million, which includes initial development, launch of the mission as a hosted payload on a commercial communications satellite, and data analysis.

The University of Oklahoma-led GeoCARB team will build an advanced payload that will be launched on a commercial communications satellite, employing otherwise unused launch and spacecraft capacity to advance science and provide societal benefit. By demonstrating GeoCARB can be flown as a hosted payload on a commercial satellite, the mission will strengthen NASA's partnerships with the commercial satellite industry and provide a model that can be adopted by NASA's international partners to expand these observations to other parts of the world.

Mission partners include the Lockheed Martin Advanced Technology Center in Palo Alto, California; SES Government Solutions Company in Reston, Virginia; the Colorado State University in Fort Collins; and NASA's Ames Research Center in Moffett Field, California, Goddard Space Flight Center in Greenbelt, Maryland, and Jet Propulsion Laboratory in Pasadena, California.

GeoCARB is the second space-based investigation in the Earth Venture - Mission series of rapidly developed, cost-constrained projects for NASA's Earth Science Division. The Cyclone Global Navigation Satellite System (CYGNSS), selected in 2012, is the first mission in the series and is scheduled to launch from Florida on Monday, Dec. 12.

The Earth Venture missions are part of NASA's Earth System Science Pathfinder (ESSP) program. The Venture Class small, targeted science investigations complement NASA's larger research missions. A National Academies 2007 report, Earth Science and Applications from Space Decadal Survey, recommended NASA undertake these regularly solicited, quick-turnaround projects.

The Earth Venture program selects new investigations, at regular intervals, to accommodate new scientific priorities using cutting-edge instrumentation carried on airborne platforms, small space missions, or as secondary instruments or hosted payloads on larger platforms. NASA's Langley Research Center in Hampton, Virginia, manages the ESSP program for the agency's Science Mission Directorate.

NASA collects data from space, air, land and sea to increase our understanding of our home planet, improve lives and safeguard our future. The agency develops new ways to observe and study Earth's interconnected natural systems with long-term data records. The agency freely shares this unique knowledge and works with institutions around the world to gain new insights into how our planet is changing.

For information about NASA's Earth science programs, visit:

<http://www.nasa.gov/earth>

Steve Cole - Headquarters, Washington
202-358-0918 stephen.e.cole@nasa.gov

Last Updated: Dec. 6, 2016

Editor: Karen Northon



Keep up to date on upcoming

Conferences

Meetings

Events

We will be adding to this section monthly – if you have a new event to be listed please send to aqiac99@aol.com

7th BETA CAE International Conference

30 May - 1 June, 2017

Thessaloniki, Greece

SPONSORED EVENTS: BETA CAE Systems participation



Announcement & Call for Papers

11th European LS-DYNA[®] Conference

May 9 - 11 2017, Salzburg, Austria

Conference Website: www.dynamore.de/conf2017

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.

Venue

Salzburg Congress is located in the center of Salzburg. Salzburg can be reached easily via freeway, the high speed train ICE, and the international airports of Salzburg or Munich.

www.salzburgcongress.at

Review of the 2015 Conference

Get an impression of the 10th European LS-DYNA Conference 2015 in our review on YouTube:

<https://youtu.be/Mw5Dm-SXcWo>

Abstract submission

Please submit your abstract (maximum length 2,500 characters) by E-Mail to conference@dynamore.de or online at www.dynamore.de/conf2017-submit

Important dates

Abstract submission:	27 January 2017
Author notification:	27 February 2017
Final paper deadline:	27 March 2017

Participant fees

Industry speaker:	400 Euro
Academic speaker:	340 Euro
Industry:	590 Euro ¹⁾ / 640 Euro
Academic:	440 Euro ¹⁾ / 490 Euro

¹⁾ Registration before 1 April 2017. 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/conf2017

Training and Social Media Section

Aleta Hays



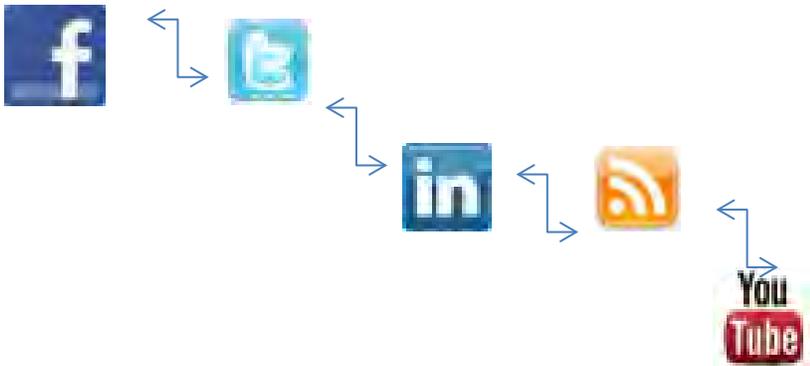
Training

Classes

Webinars

On Site – On Line

We will be adding to this section monthly – if you have a new event to be listed please send to Aleta ayh225@aol.com and cc Anthony agiac99@aol.com





Participant’s Training Classes

Webinars

Info Days

Class Directory

Participant Class Directory

<p>Arup (corporate)</p>	<p>www.oasys-software.com/dyna/en/training</p>
<p>BETA CAE Systems (corporate)</p>	<p>www.beta-cae.com/training.htm</p>
<p>DYNAMore (corporate)</p>	<p>www.dynamore.de/en/training/seminars</p>
<p>ESI-Group (corporate)</p>	<p>https://myesi.esi-group.com/trainings/schedules</p>
<p>ETA (corporate)</p>	<p>www.eta.com/support2/training-calendar</p>
<p>LSTC (corporate)</p>	<p>www.lstc.com/training</p>
<p>LS-DYNA OnLine (Al Tabiei)</p>	<p>www.LSDYNA-ONLINE.COM</p>

ARUP Visit the website for complete listings/changes/locations

www.oasys-software.com/dyna/en/training

Arup offers a wide range of training for new and existing users of the Oasys LS-DYNA Environment software who are seeking to improve their understanding and application of these powerful analysis tools. New users will benefit from our introductory courses and can quickly become effective in other areas of application through the range of courses on offer. The courses will also provide existing users with knowledge of how to use the latest features in Oasys and LS-DYNA.

26-27 January 2016

Paul Du Bois Courses

Polymeric Material Modelling in LS-DYNA

2 days Cost: £1,000

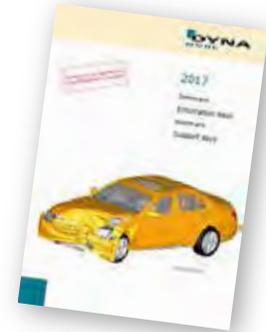
BETA CAE SYSTEMS Visit the website for complete listings/changes/locations
www.beta-cae.com/training.htm

Basic and advanced training courses can be scheduled upon request. A variety of standard or tailored training schedules, per product or per discipline, are being offered to meet customers needs.

A number of recommended training courses offered are described below. The list is not exhaustive and more courses can be designed according to your needs.
Please, contact ansa@beta-cae.com for further details.

Recommended Training Courses (Complete information on website)

- SPDRM
- ANSA / μ ETA Basics
- ANSA / μ ETA for CFD
- ANSA / μ ETA for Crash & Safety simulation
- ANSA / μ ETA for Durability simulation
- ANSA / μ ETA for NVH analyses
- Multi-Body Dynamics
- Laminated Composites
- Morphing and Optimization
- Automation
- Additional special sessions

Author: Nils Karajan nik@dynamore.de**DYNAmore** Visit the website for complete overview and registrationwww.dynamore.de/seminars**New seminar brochure for 2017 published by DYNAmore**Download full seminar brochure (pdf): www.dynamore.de/seminars2017**Selection of trainings from January to March**

Hot Forming with LS-DYNA	24-25 Jan.
Forming Simulation with eta/DYNAFORM	26-27 Jan.
Introduction to LS-PrePost	13 Feb. / 13 March
Introduction to LS-DYNA	1-3 Feb (V) / 14-16 Feb. / 14-16 March
Element Types and Nonlinear Aspects	8 Feb.
User Interfaces in LS-DYNA	20 Feb.
Joining Techniques for Crash Analysis	6-7 March
Introduction to Passive Safety Simulation	9-10 March
CPM for Airbag Modeling	17 March
Contact definitions in LS-DYNA	20 March (L)
ALE and Fluid-Structure Interaction	21-22 March (V)
LS-OPT – Optimization and Robustness	22-24 March
Damagae and Failure Modeling of Metallic Materials	23-24 March (T)
Modeling Polymers & Elastomers in LS-DYNA	27-28 March
Crash Analysis with LS-DYNA	28-31 March (L)
Simulation of Short Fiber Reinforced Polymers	29 March
Simulation of Continuous Fiber Reinforced Polymers	30-31 March

Information days or Webinars (free of charge)

Integrated Optimization with ANSA & LS-OPT	20 Feb.
Composites Analysis with LS-DYNA	13 March
Mapping tool ENVYO	13 March
Possibilities with LS-DYNA Implicit	20 March
Cloud Solutions for LS-DYNA	27 March
Optimization/DOE/Robustness with LS-OPT	30 March (V)

Support days (free of charge)

LS-DYNA	20 Jan. / 17 Feb.
Occupant Safety	17 March

If not otherwise stated, the event location is Stuttgart, Germany. Other event locations are:
 G = Göteborg, Sweden; L = Linköping, Sweden V = Versailles, France; T = Turin, Italy,

If the offered seminars do not fully suit your needs, we are pleased to meet your individual requirements by arranging tailored on-site training courses on your company premises.

<https://myesi.esi-group.com/trainings/schedules>

Please visit the website for complete information on all the classes and locations

<https://myesi.esi-group.com/trainings/schedules>

Introduction to QuikCAST**7 Feb 2017 to 9 Feb 2017****Casting****VA One: Coupled FEA/SEA Training****16 Mar 2017 to 17 Mar 2017****Vibro-Acoustics****Basic PAM-STAMP****15 Feb 2017 to 16 Feb 2017****Sheet Metal Forming****Basic PAM-STAMP****22 Mar 2017 to 23 Mar 2017****Sheet Metal Forming****Introduction to ProCAST****7 Mar 2017 to 9 Mar 2017****Casting****Basic PAM-STAMP****26 Apr 2017 to 27 Apr 2017****Sheet Metal Forming****VA One: FE/BEM Training****14 Mar 2017 to 15 Mar 2017****Vibro-Acoustics****Basic PAM-STAMP****17 May 2017 to 18 May 2017****21 Jun 2017 to 22 Jun 2017****Sheet Metal Forming**

LSTC 2017 Training

Date	Location	Class	Instructor(s)	Price
January				Students 50%
23	MI	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
24-27	MI	Intro to LS-DYNA	A. Nair	\$750
February				
13-15	CA	ALE/Eulerian & Fluid/Structure Interaction	M. Souli	\$750
16-17	CA	Smoothed Particle Hydrodynamics (SPH)	M. Souli	\$400
16-17	ONLINE	Contact in LS-DYNA	A. Tabiei	\$1,000
23-24	ONLINE	Implicit LS-DYNA	A. Tabiei	\$1,000
March				
13	CA	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
14-17	CA	Intro to LS-DYNA	J. Reid	\$750
20	MI	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
21-24	MI	Intro to LS-DYNA	A. Nair	\$750
April				
6-7	MI	Intro to LS-OPT	I. Gandikota	\$750
10-11	MI	Airbag Folding	R. Chivukula	\$750
11-13	CA	Advanced ALE Applications	I. Do / H.Chen	\$600
12-13	MI	NVH and Frequency Domain Analysis	Y. Huang	\$400
17-18	MI	LS-DYNA Advanced Class	S. Bala	\$750
19	MI	Electromagnetics	I. Caldichoury	\$100
20-21	MI	ICFD	I. Caldichoury	\$200
May				
2-3	MI	Composite LS-DYNA	A. Tabiei	\$1,250
4-5	MI	Rubber, Foam, & Viscoelastic Materials	A. Tabiei	\$1,250
8-9	MI	Fracture, Failure & Damage	A. Tabiei	\$1,250
10-11	MI	Plasticity, Plastics, Visco-plastic Materials	A. Tabiei	\$1,250
15	CA	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
16-19	CA	Intro to LS-DYNA	A. Nair	\$750
16-18	MI	Advanced ALE Applications	I. Do / H. Chen	\$600
22-23	CA	Blast in LS-DYNA	A. Tabiei	\$1,000
24-25	CA	Penetration Using LS-DYNA	A. Tabiei	\$1,000

LSTC 2017 Training

June				
1-2	CA	User Materials in LS-DYNA (UMAT)	A. Tabiei	\$1,250
1-2	MI	Contact	S. Bala	\$200
9	MI	Material Characteristics for Metals Plastics and Polymers - Test Data to Material Model	S. Bala	\$200
15-16	MI	Introduction to Metal Forming	L. Zhang / Q Yan	\$400
19	MI	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
20-23	MI	Intro to LS-DYNA	J. Reid	\$750
July				
10-11	MI	Occupant Simulation	S. Guha	\$400
24	MI	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
25-29	MI	Intro to LS-DYNA	A. Tabiei	\$750
August				
1-2	CA	Rubber, Foam & Viscoelastic Materials	A. Tabiei	\$1,250
3-4	CA	Plasticity, Plastics, Visco-plastic Materials	A. Tabiei	\$1,250
8-9	CA	Fracture, Failure, Damage	A. Tabiei	\$1,250
10-11	CA	Composite LS-DYNA	A. Tabiei	\$1,250
14-15	CA	Implicit LS-DYNA	A. Tabiei	\$750
21-23	CA	ALE/Eulerian & FSI Interaction in LS- DYNA	M. Souli	\$750
24-25	CA	Smoothed Particle Hydrodynamics (SPH)	M. Souli	\$400
28	CA	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
Aug29-Sep1	CA	Intro to LS-DYNA	A. Nair	\$750
September				
12-13	MI	Airbag Modeling	A. Nair	\$400
13	CA	Material Characteristics for Metals, Plastics, and Polymers - Test Data to Material Model	S. Bala	\$200
14-15	CA	Contact	S. Bala	\$200

LSTC 2017 Training

October				
11-13	MI	Optimization and Probabilistic Analysis using LS-OPT	A. Basudhar	\$750
16	MI	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
17-20	MI	Intro to LS-DYNA	A. Nair	\$750
23-24	CA	NVH and Frequency Domain Analysis	Y. Huang	\$400
November				
6	CA	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
7-10	CA	Intro to LS-DYNA	A. Nair	\$750
13-14	CA	LS-DYNA Advanced	S. Bala	\$400
Nov 30-Dec 1	CA	Advanced Metal Forming	L. Zhang / X.Zhu	\$400
December				
11	MI	Intro to LS-PrePost	P. Ho / Q. Yan	\$100
12-15	MI	Intro to LS-DYNA	A. Nair	\$750

LS-DYNA Visit the website for complete listings/changes/locations
On Line www.LSDYNA-ONLINE.COM

For Information contact: courses@lsdyna-online.com or 513-3319139

Composite Materials In LS-DYNA

This course will allow first time LS-DYNA users to use composite materials. The most important elements to start using all the composite material models in LS-DYNA will be presented in the 8 hours.

Foam & Viscoelastic Materials in LS-DYNA

Objective of the course: Learn about several foam material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures

Plasticity, Plastics, and Viscoplastics Materials in LS-DYNA

Objective of the course: Learn about several plasticity based material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures.

Rubber Materials in LS-DYNA

Objective of the course: Learn about several rubber material models in LS-DYNA to solve engineering problems. Detailed descriptions are given of the data required to use such material in analysis. Examples are used to illustrate the points made in the lectures.



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YOUTUBE Channel	WebSite URL
BETA CAE Systems	www.beta-cae.com
CADFEM	www.cadfem.de
Cray Inc.	www.cray.com
ESI Group	www.esi-group.com
ETA	www.eta.com
Lancemore	www.lancemore.jp/index_en.html
Lenovo	

GOOGLE+

BETA CAE Systems	

LS-DYNA Resource Links

LS-DYNA Multiphysics YouTube Facundo Del Pin

<https://www.youtube.com/user/980LsDyna>

FAQ LSTC Jim Day

<ftp.lstc.com/outgoing/support/FAQ>

LS-DYNA Support Site

www.dynasupport.com

LS-OPT & LS-TaSC

www.lsopstsupport.com

LS-DYNA EXAMPLES

www.dynaexamples.com

LS-DYNA CONFERENCE PUBLICATIONS

www.dynalook.com

ATD –DUMMY MODELS

www.dummymodels.com

LSTC ATD MODELS

www.lstc.com/models www.lstc.com/products/models/maillinglist

AEROSPACE WORKING GROUP

<http://awg.lstc.com/tiki/tiki-index.php>



BETA CAE Systems.

www.beta-cae.com

BETA CAE Systems - ANSA

An advanced multidisciplinary CAE pre-processing tool that provides all the necessary functionality for full-model build up, from CAD data to ready-to-run solver input file, in a single integrated environment. ANSA is a full product modeler for LS-DYNA, with integrated Data Management and Process Automation. ANSA can also be directly coupled with LS-OPT or LSTC to provide an integrated solution in the field of optimization.

Solutions for:

Process Automation - Data Management – Meshing – Durability - Crash & Safety NVH - CFD - Thermal analysis - Optimization - Powertrain
Products made of composite materials - Analysis Tools -
Maritime and Offshore Design - Aerospace engineering - Biomechanics

BETA CAE Systems μETA

Is a multi-purpose post-processor meeting diverging needs from various CAE disciplines. It owes its success to its impressive performance, innovative features and capabilities of interaction between animations, plots, videos, reports and other objects. It offers extensive support and handling of LS-DYNA 2D and 3D results, including those compressed with SCAI's FEMZIP software

**CRAY****www.cray.com****THE CRAY® XC™ SERIES: ADAPTIVE SUPERCOMPUTING ARCHITECTURE**

The Cray® XC™ series delivers on Cray's commitment to an adaptive supercomputing architecture that provides both extreme scalability and sustained performance. The flexibility of the Cray XC platform ensures that users can precisely configure the machines that will meet their specific requirements today, and remain confident they can upgrade and enhance their systems to address the demands of the future.

Cray® XC40™ and XC40-AC™ supercomputers are enabled by a robust Intel® Xeon® processor road map, Aries high performance interconnect and flexible Dragonfly network topology, providing low latency and scalable global bandwidth to satisfy the most challenging multi-petaflops applications.

While the extreme-scaling Cray XC40 supercomputer is a transverse air-flow liquid-cooled architecture, the Cray XC40-AC air-cooled model provides slightly smaller and less dense supercomputing cabinets with no requirement for liquid coolants or extra blower cabinets. A reduced network topology lowers costs, and the system is compatible with the compute technology, OS, ISV and software stack support of high-end XC40 systems.

MAXIMIZE PRODUCTIVITY WITH CRAY CS SERIES SUPERCOMPUTERS

Understanding the need for nimble, reliable and cost-effective high performance computing (HPC), we developed the Cray® CS™ cluster supercomputer series. These systems are industry-standards-based, highly customizable, and expressly designed to handle the broadest range of medium- to large-scale simulation and data analytics workloads.

All CS components have been carefully selected, optimized and integrated to create a powerful HPC environment. Flexible node configurations featuring the latest processor and interconnect technologies mean you can tailor a system to your specific need — from an all-purpose cluster to one suited for shared memory, large memory or accelerator-based tasks.

Innovations in packaging, power, cooling and density translate to superior energy efficiency and compelling price/performance. Expertly engineered system management software instantly boosts your productivity by simplifying system administration and maintenance.

Maximize your productivity with flexible, high-performing Cray CS series cluster supercomputers.

CRAY

www.cray.com**CRAY® SONEXION® SCALE-OUT LUSTRE® STORAGE SYSTEM**

Brought to you by Cray, the world's leading experts in parallel storage solutions for HPC and technical enterprise, the Cray® Sonexion® 2000 system provides a Lustre®-ready solution for popular x86 Linux® clusters and supercomputers through Cray Cluster Connect™. As a leader in open systems and parallel file systems, Cray builds on open source Lustre to unlock any industry-standard x86 Linux compute cluster using InfiniBand™ or 10/40 GbE utilizing proven Cray storage architectures.

The Cray Sonexion 2000 system provides 50 percent more performance and capacity than the Sonexion 1600 system in the same footprint.

Simplify

- Through its fully-integrated and pre-configured design, Cray Sonexion storage gets customers deployed faster and reduces the total number of components to manage.
- The Sonexion system's compact design reduces the total hardware footprint of petascale systems by 50 percent over component-based solutions.

Scale

- Performance scales from 7.5 GB/s to 1.7 TB/s in a single file system.
- Capacity scales in modular increments; the Sonexion 2000 system stores over two usable petabytes in a single rack. Fewer drives and components reduce capital costs as capacity grows.

Protect

- New software-based GridRAID offers higher levels of data protection and up to 3.5 times faster rebuild times than traditional RAID6 and MD-RAID storage.
- Cray ensures quality, reliability and stability at scale through exhaustive thermal and real-world stress testing, system hardening and availability, and tight hardware and software integration.

OPEN ARCHIVE AND TIERED STORAGE SYSTEM FOR BIG DATA AND SUPERCOMPUTING

Cray Tiered Adaptive Storage (TAS), powered by Varsity, is designed to meet the expansive data preservation and access needs driven by big data, where data needs to migrate fluidly from high performance storage to deep tape archives, while always being accessible to users.

With Cray TAS you can:

- Deploy tiered storage and archives faster
- Feel confident preserving and protecting data into the future, using Linux®
- Simplify managing data using familiar tools for years to come

CRAY® URIKA-XA™ EXTREME ANALYTICS PLATFORM

Pre-integrated, open platform for high performance analytics delivers valuable business insights now and into the future

The flexible, multi-use Cray® Urika-XA™ extreme analytics platform addresses perhaps the most critical obstacle in data analytics today — limitation. Analytics problems are getting more varied and complex but the available solution technologies have significant constraints. Traditional analytics appliances lock you into a single approach and building a custom solution in-house is so difficult and time consuming that the business value derived from analytics fails to materialize.

In contrast, the Urika-XA platform is open, high performing and cost effective, serving a

wide range of analytics tools with varying computing demands in a single environment. Pre-integrated with the Apache Hadoop® and Apache Spark™ frameworks, the Urika-XA system combines the benefits of a turnkey analytics appliance with a flexible, open platform that you can modify for future analytics workloads. This single-platform consolidation of workloads reduces your analytics footprint and total cost of ownership.

Based on pioneering work combining high-performance analytics and supercomputing technologies, the Urika-XA platform features next-generation capabilities. Optimized for compute-heavy, memory-centric analytics, it incorporates innovative use of memory-storage hierarchies and fast interconnects, which translates to excellent performance at scale on current as well as emerging analytics applications.

Additionally, the enterprise-ready Urika-XA platform eases the system management burden with a single point of support, standards-based software stack and compliance with enterprise standards so you can focus on extracting valuable business insights, not on managing your environment.

CRAY

www.cray.com

THE URIKA-GD™ GRAPH DISCOVERY APPLIANCE IS A PURPOSE-BUILT SOLUTION FOR BIG DATA RELATIONSHIP ANALYTICS.

The Urika-GD™ appliance enables enterprises to:

- Discover unknown and hidden relationships and patterns in big data
- Build a relationship warehouse, supporting inferencing/deduction, pattern-based queries and intuitive visualization
- Perform real-time analytics on the largest and most complex graph problems

The Urika-GD system is a high performance graph appliance with a large shared memory and massively multithreaded custom processor designed for graph processing and scalable I/O.

With its industry-standard, open-source software stack enabling reuse of existing skill sets and no lock in, the Urika-GD appliance is easy to adopt.

The Urika-GD appliance complements an existing data warehouse or Hadoop® cluster by offloading graph workloads and interoperating within the existing enterprise analytics workflow.

Realize rapid time to powerful new insights.



DatapointLabs

www.datapointlabs.com

Testing over 1000 materials per year for a wide range of physical properties, DatapointLabs is a center of excellence providing global support to industries engaged in new product development and R&D.

The company meets the material property needs of CAE/FEA analysts, with a specialized product line, TestPaks®, which allow CAE analysts to easily order material testing for the calibration of over 100 different material models.

DatapointLabs maintains a world-class testing facility with expertise in physical properties of plastics, rubber, food, ceramics, and metals.

Core competencies include mechanical, thermal and flow properties of materials with a focus on precision properties for use in product development and R&D.

Engineering Design Data including material model calibrations for CAE Research Support Services, your personal expert testing laboratory Lab Facilities gives you a glimpse of our extensive test facilities Test Catalog gets you instant quotes for over 200 physical properties.



ETA – Engineering Technology Associates

etainfo@eta.com

www.eta.com

Inventium Suite™

Inventium Suite™ is an enterprise-level CAE software solution, enabling concept to product. Inventium's first set of tools will be released soon, in the form of an advanced Pre & Post processor, called PreSys.

Inventium's unified and streamlined product architecture will provide users access to all of the suite's software tools. By design, its products will offer a high performance modeling and post-processing system, while providing a robust path for the integration of new tools and third party applications.

PreSys

Inventium's core FE modeling toolset. It is the successor to ETA's VPG/PrePost and FEMB products. PreSys offers an easy to use interface, with drop-down menus and toolbars,

increased graphics speed and detailed graphics capabilities. These types of capabilities are combined with powerful, robust and accurate modeling functions.

VPG

Advanced systems analysis package. VPG delivers a unique set of tools which allow engineers to create and visualize, through its modules--structure, safety, drop test, and blast analyses.

DYNAFORM

Complete Die System Simulation Solution. The most accurate die analysis solution available today. Its formability simulation creates a "virtual tryout", predicting forming problems such as cracking, wrinkling, thinning and spring-back before any physical tooling is produced



Latest Release is ESI Visual-Environment 12.0

ESI Group

www.esi-group.com

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.

Visual-Crash DYNA provides advanced preprocessing functionality for LS-DYNA users, e.g. fast iteration and rapid model revision processes, from data input to visualization for crashworthiness simulation and design. It ensures quick model browsing, advanced mesh editing capabilities and rapid graphical assembly of system models. Visual-Crash DYNA allows graphical creation, modification and deletion of LS-DYNA entities. It comprises tools for checking model quality and simulation parameters prior to launching calculations with the solver. These

tools help in correcting errors and fine-tuning the model and simulation before submitting it to the solver, thus saving time and resources.

Several high productivity tools such as advanced dummy positioning, seat morphing, belt fitting and airbag folder are provided in **Visual-Safe**, a dedicated application to safety utilities.

Visual-Mesh is a complete meshing tool supporting CAD import, 1D/2D/3D meshing and editing for linear and quadratic meshes. It supports all meshing capabilities, like shell and solid automesh, batch meshing, topo mesh, layer mesh, etc. A convenient Meshing Process guides you to mesh the given CAD component or full vehicle automatically.

Visual-Viewer built on a multi-page/multi-plot environment, enables data grouping into pages and plots. The application allows creation of any number of pages with up to 16 windows on a single page. These windows can be plot, animation, video, model or drawing block windows. Visual-Viewer performs automated tasks and generates customized reports and thereby increasing engineers' productivity.



Latest Release is ESI Visual-Environment 12.0

ESI Group

www.esi-group.com

Visual-Process provides a whole suite of generic templates based on LS-DYNA solver (et altera). It enables seamless and interactive process automation through customizable LS-DYNA based templates for automated CAE workflows.

All generic process templates are easily accessible within the unique framework of Visual-Environment and can be customized upon request and based on customer's needs.

VisualDSS is a framework for Simulation Data and Process Management which connects with Visual-Environment and supports product

engineering teams, irrespective of their geographic location, to make correct and realistic decisions throughout the virtual prototyping phase. *VisualDSS* supports seamless connection with various CAD/PLM systems to extract the data required for building virtual tests as well as building and chaining several virtual tests upstream and downstream to achieve an integrated process. It enables the capture, storage and reuse of enterprise knowledge and best practices, as well as the automation of repetitive and cumbersome tasks in a virtual prototyping process, the propagation of engineering changes or design changes from one domain to another.

**JSOL Corporation**

www.jsol.co.jp/english/cae/

HYCRASH

Easy-to-use one step solver, for Stamping-Crash Coupled Analysis. HYCRASH only requires the panels' geometry to calculate manufacturing process effect, geometry of die are not necessary. Additionally, as this is target to usage of crash/strength analysis, even forming analysis data is not needed. If only crash/strength analysis data exists and panel ids is defined. HYCRASH extract panels to calculate it's strain, thickness, and map them to the original data.

JSTAMP/NV

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.



Oasys Ltd. LS-DYNA Environment

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 de-penetrate impactors at multiple locations and produce many input decks

www.oasys-software.com/dyna

- 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



Oasys T/HIS

Key benefits:

- Graphical post-processor created specifically for LS-DYNA®
- Automatically reads all LS-DYNA® results
- Wide range of functions and injury criteria
- Easy handling of data from multiple models
- Scripting capabilities for fast post-processing

Oasys REPORTER

Key benefits:

- Automatic report generation tool created specifically for LS-DYNA®
- Automatically post-process and summarize multiple analyses
- Built-in report templates for easy automatic post-processing of many standard impact tests



Shanghai Hengstar

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..

www.hengstar.com

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 focus 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..

**Lenovo**www.lenovo.com

Lenovo is a USD39 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 portfolio along with HPC and CAE expertise.

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 **CAE Associates Inc.** info@caeai.com
www.caeai.com

ANSYS Products CivilFem Consulting ANSYS
 Consulting LS-DYNA

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

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

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

Predictive Engineering george.laird@predictiveengineering.com

www.predictiveengineering.com

FEMAP

NX Nastran

LS-DYNA

LS-OPT

LS-PrePost

LS-TaSC

LSTC Dummy Models

LSTC Barrier Models

France	DynaS+		v.lapoujade@dynasplus.com	
	www.dynasplus.com			Oasys Suite
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	DYNAFORM	VPG	MEDINA	
	LSTC Dummy Models		LSTC Barrier Models	

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	www.dynamore.eu			
	LS-DYNA, LS-PrePost	LS-OPT	Primer	DYNAFORM
	DSDM Products		LSTC Dummy Models	FEMZIP
LSTC Models	Barrier	DIGIMAT		

Germany	CADFEM GmbH		lsdyna@cadfem.de	
	www.cadfem.de			
	ANSYS	LS-DYNA	optiSLang	
	ESAComp	AnyBody		
	ANSYS/LS-DYNA			

Germany**DYNAmore GmbH**uli.franz@dynamore.dewww.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	

The Netherlands**Infinite Simulation Systems B.V**j.mathijssen@infinite.nlwww.infinite.nl

ANSYS Products	CivilFem	CFX	Fluent
LS-DYNA	LS-PrePost	LS-OPT	LS-TaSC

Italy**EnginSoft SpA**info@enginsoft.itwww.enginsoft.it

ANSYS	MAGMA	Flowmaster	FORGE
CADfix	LS-DYNA	Dynaform	Sculptor
ESAComp	AnyBody	FTI Software	
AdvantEdge	Straus7	LMS Virtual.Lab	ModeFRONTIER

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	LSTC Dummy Models		LSTC Barrier Models	

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	www.dynamore.se		Oasys Suite	
	ANSA	μETA	LS-DYNA	LS-OPT
	LS-PrePost	LS-TaSC	FastFORM	DYNAform
	FormingSuite		LSTC Dummy Models	
			LSTC Barrier Models	

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	LS-DYNA		LS-OPT	LS-PrePost
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			LSTC Barrier Models	

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	www.oasys-software.com/dyna		TOYOTA THUMS	
	LS-DYNA		LS-OPT	LS-PrePost
	LS-TaSC	PRIMER	D3PLOT	T/HIS
	REPORTER	SHELL	FEMZIP	HYCRASH
	DIGIMAT	Simpleware	LSTC Dummy Models	
			LSTC Barrier Models	

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	www.eta.com/cn				
	Inventium	VPG	DYNAFORM	NISA	
	LS-DYNA	LS-OPT	LSTC Dummy Models	LS-PrePost	
			LSTC Barrier Models	LS-TaSC	
China	Oasys Ltd. China		Stephen.zhao@arup.com		
	www.oasys-software.com/dyna				
	PRIMER	D3PLOT	HYCRASH	T/HIS REPORTER	SHELL
	LS-DYNA		LS-OPT	LSTC Dummy Models	LS-PrePost
	DIGIMAT		FEMZIP	LSTC Barrier Models	LS-TaSC
China	Shanghai Hengstar Technology		info@hengstar.com		
	www.hengstar.com				
	LS-DYNA	LS-TaSC	LSTC Barrier Models	D3VIEW	
	LS-PrePOST	LS-OPT	LSTC Dummy Models		
	Genesis	VisualDoc		ELSDYNA	
	Visual-Crahs DYNA	Visual-Proeces		DynaX & MadyX	
	Enki Bonnet	Visual Environement			

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	www.oasys-software.com/dyna			
	PRIMER	D3PLOT	T/HIS	
			LS-OPT	LSTC Dummy Models
				LS-PrePost
			LS-DYNA	LSTC Barrier Models
				LS-TaSC

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	ANSYS	VPS	ESAComp	optiSLang
	LS-DYNA	LS-OPT	LS-PrePost	

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	LS-DYNA	LS-OPT	LSTC Dummy Models	LS-PrePost
	Complete LS-DYNA suite of products		LSTC Barrier Models	LS-TaSC

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	www.engineering-eye.com			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	CmWAVE	
Japan	JSOL			Oasys Suite
	www.jsol.co.jp/english/cae			JMAG
	JSTAMP	HYCRASH		
	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	
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
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	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	Planets
	eta/DYNAFORM	FormingSuite	Simblow	TrueGRID
	JSTAMP/NV	Scan IP	Scan FE	Scan CAD
	FEMZIP			

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	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.			
	www.agilesim.com.tw			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

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 use of LS-DYNA more and more in recent years.

In calculations of optimization, robustness, statistical analysis, larger amount of LS-DYNA license in short term are required.

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>



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.

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



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

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com/software-solutions/cloud-solutions/esi-cloud

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

TOYOTA - Total Human Model for Safety – THUMS

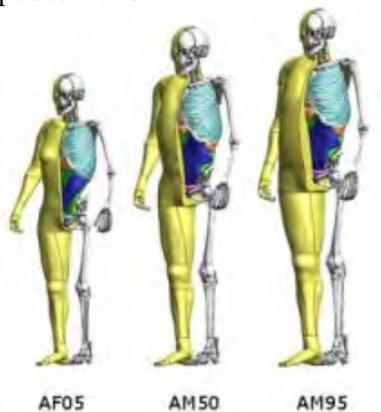


The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons, 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

e-mail to: atds@lstc.com.

Editor: Yanhua Zhao

December

**Thermal Coupling Method Between SPH Particles and Solid Elements
in LS-DYNA**

Jingxiao Xu, Jason Wang

Previously Presented: For a copy write to yanhua@feainformation.com

November

Introduction to second order Lagrangian elements in LS-DYNA
Hailong Teng - Livermore Software Technology Corp.

October

An Introduction to *CONSTRAINED_BEAM_IN_SOLID
Hao Chen - Livermore Software Technology Corp

September:

Introduction to the new framework for User Subroutine Development of LS-DYNA
Zhidong Han and Brian Wainscott
*New Features in *ELEMENT_LANCING*
Xinhai Zhu, Li Zhang, Yuzhong Xiao

August :

Equivalent Radiated Power calculation with LS-DYNA
Yun Huang, Zhe Cui - Livermore Software Technology Corporation

July:

Recent Developments for Laminates and TSHELL Forming
Xinhai Zhu, Li Zhang, Yuzhong Xiao - LSTC

Thermal Coupling Method Between SPH Particles and Solid Elements in LS-DYNA

Jingxiao Xu, Jason Wang

LSTC

INTRODUCTION:

Heat transfer is very important in many industrial and geophysical problems. Many of the problems of geophysical and industrial fluid dynamics involve complex flows of multiple liquids and gases coupled with heat transfer. The motion of the surfaces of the liquids can involve sloshing, splashing and fragmentation. Thermal and chemical processes present further complications. The simulation of such systems can sometimes present difficulties for finite difference and finite element methods, particularly when coupled with complex free surface motion, while smoothed particle hydrodynamics can easily follow wave breaking, and it provides a reasonable simulation of splash on a length scale exceeding that where surface tension must be included.

SPH is a Lagrangian method for solving partial differential equations. Essentially, the domain is discretized by approximating it by a series of roughly equi-spaced particles. They move and change their properties (such as temperature) in accordance with a set of ordinary differential equations derived from the original governing PDEs. Cleary and Monaghan (1995) extended the method to heat conduction and then to coupled heat and mass flows due to that SPH has a range of strong advantages in modeling industrial heat and mass flows:

1. The Lagrangian framework allows momentum dominated flows to be easily handled.
2. Complex free surface and material interface behavior, including break-up into fragments, can be modeled naturally.
3. Complicated physics such as multi-phase, realistic equations of state, compressibility, radiation, solidification and fracturing can be added with comparative ease.

For the thermal coupling between any two parts in LS-DYNA, the standard way is through thermal contacts which require the contact areas between those two parts. Due to particle property, SPH particles can handle extremely large deformations, particles can be moved without limitation. In real engineering applications, SPH particles may have very complex free surface and material interface behaviors, including break-up into fragments, and new surfaces will be generated automatically every cycle when interacting with Solid elements. It is quite difficult to update new contact surfaces and calculate the true contact areas between SPH particles and Solid elements. Here we introduce a new thermal coupling method between SPH particles and Solid elements through keyword *DEFINE_ADAPTIVE_SOLID_TO_SPH with icpl=3 and iopt=0 options without using thermal contacts.

KEYWORD IN LS-DYNA AND APPLICATIONS:

Keyword *DEFINE_ADAPTIVE_SOLID_TO_SPH is used to adaptively transform a Lagrangian solid Part or Part Set to SPH particles, when the Lagrangian solid elements comprising those parts fail (Shown in Fig 1), or used as hybrid elements to couple between original SPH parts and Solid parts. One or more SPH particles (elements) will be generated for each failed element. The SPH particles replacing the failed

element inherit all of the properties of the failed solid element, e.g. mass, kinematic variables, and constitutive properties.

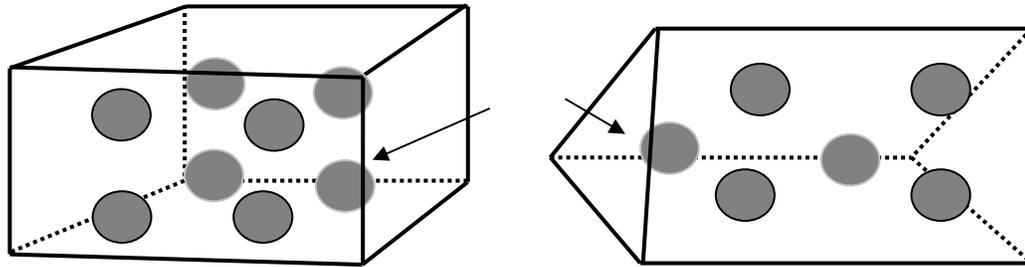


Fig 1. Transform Solid elements into SPH particles

With ICPL=0, this keyword is used for debris simulation, no coupling happens between newly generated SPH particles and solid elements, user need to define node to surface contact for the interaction between those two parts. When ICPL=1 and IOPT=1, the newly generated SPH particles are bonded with solid elements as one part through the coupling (Hybrid elements).

With ICPL=1 and IOPT=0, this keyword is used as Hybrid Elements coupling SPH with Solid. Hybrid elements are used as transit layers between SPH particles and Solid elements, for a portion of grid model comprises SPH particles because the likelihood of enduring large deformation, while the rest of the model comprises FEM solid elements, hybrid elements are placed between the solids and the particles, each hybrid element comprises two layers: solid layer and particle layer.

A new function was introduced into this keyword for the pure thermal coupling between SPH particles and Solid elements with ICPL=3 and IOPT=0. In this function hybrid elements were used, we have the SPH formulation and at the same time we have the Solid meshes which clearly describe the material interfaces. Solid elements constrain SPH nodal locations. SPH particles here provide real thermal coupling between original SPH parts and Solid element parts, also a coupling conductivity parameter between SPH part and Solid part was introduced here in the 8th parameter of the keyword input *DEFINE_ADAPTIVE_SOLID_TO_SPH (as shown in Fig 4).

EXAMPLES

Case 1:

A simple 3D pure thermal conduction example was tested here. For both SPH and Solid parts, initial temperature conditions were set to 0.0. On the surface nodes of the right side of the SPH part, a constant thermal BC was set (as shown in Fig 2). The thermal coupling between SPH and Solid part was applied through keyword *DEFINE_ADAPTIVE_SOLID_TO_SPH with icpl=3 and iopt=0. The default coupling conductivity between SPH and Solid parts was set (average value of the conductivities of two parts). Fig 3 shows the temperature results from the thermal conduction and the thermal coupling between SPH part and Solid part.

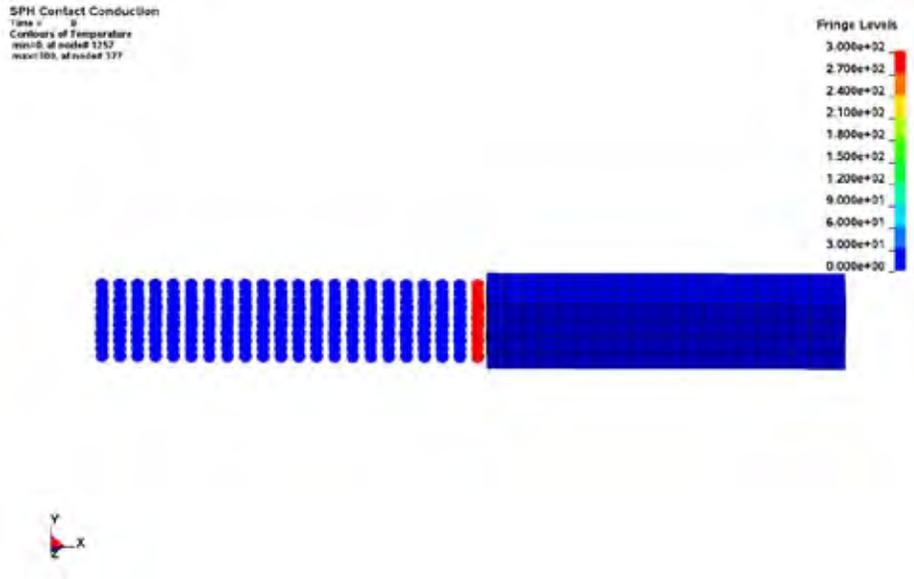


Fig 2. Initial set up for thermal coupling between SPH part and Solid part

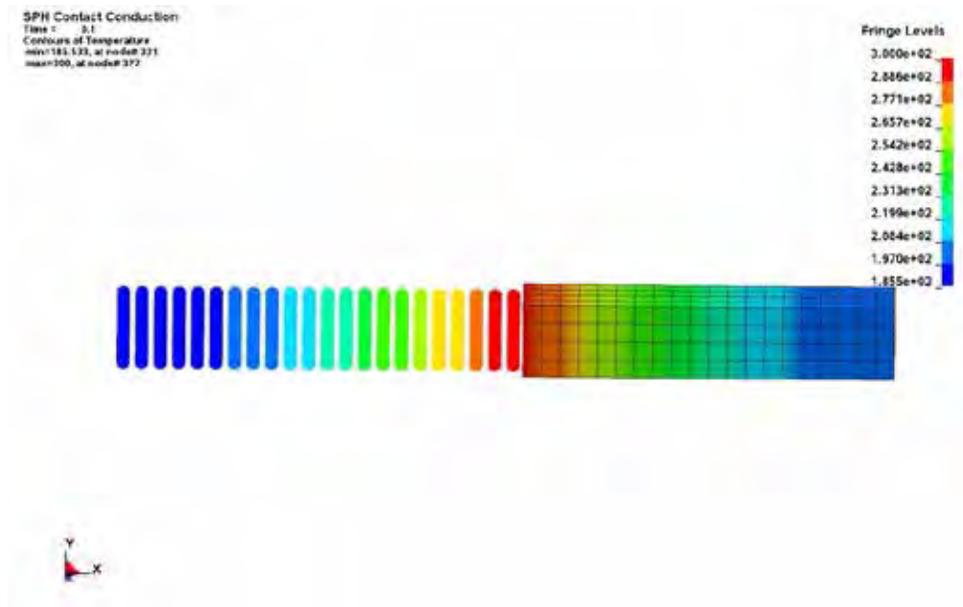


Fig 3. Temperature contour plot for thermal coupling between SPH part and Solid part

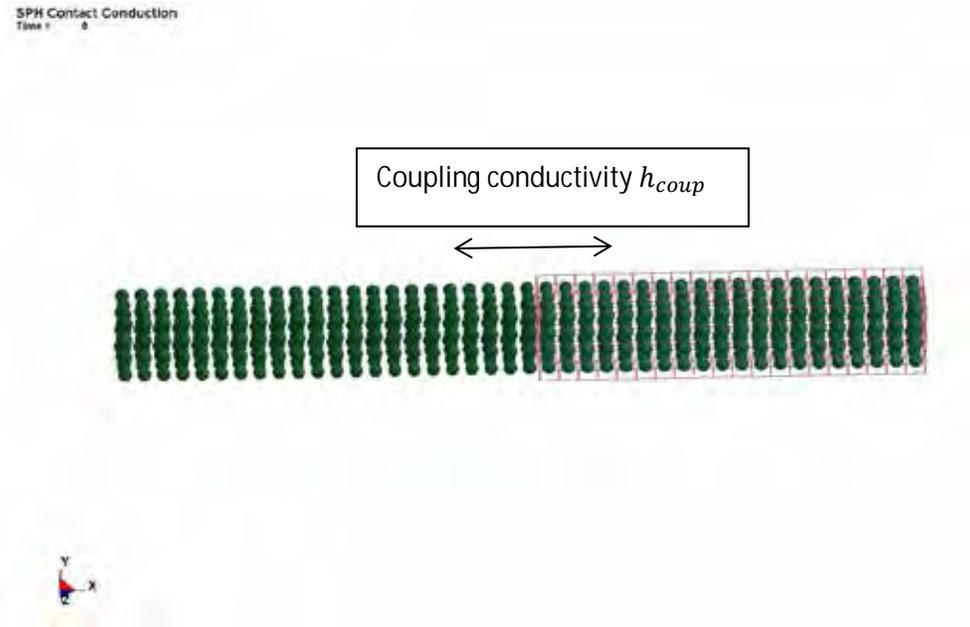


Fig 4. Hybrid element set up for thermal coupling between SPH part and Solid part

Case 2:

A more complicated high velocity impact problem was tested in this case. A SPH part hit a thin Solid plate with very high initial speed. During the impacting process, SPH part endured very complex free surface and material interface behaviors, including break-up into fragments and new surfaces generation every cycle when interacting with Solid plate. For the structure behavior, a node to surface contact was used for the interaction between SPH part and Solid plate. The temperature of the SPH body changed due to the conversion of mechanical work into heat through plastic deformation. The process was fast enough such that there is no heat transfer with the environment. Thermal coupling between SPH part and Solid plate was applied through *DEFINE_ADAPTIVE_SOLID_TO_SPH (Fig 6 shows the hybrid elements setup for this coupling) with ICPL=3 and IOPT=0, the default coupling thermal conductivity was set for the thermal interaction between SPH part and Solid plate. Fig 5 shows the temperature contour plot during thermal coupling processing for HVI problem between SPH part and Solid plate.

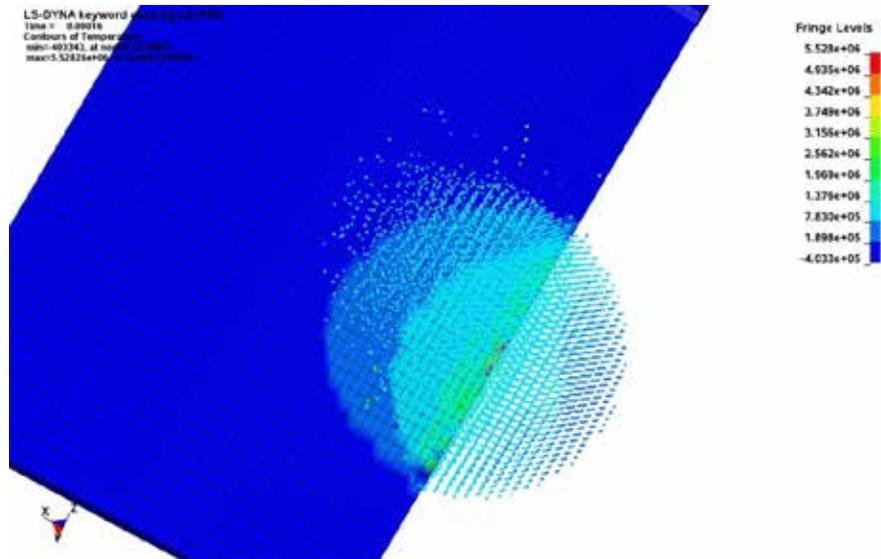


Fig 5. Temperature contour plot for HVI between Solid plate and SPH part with thermal coupling.

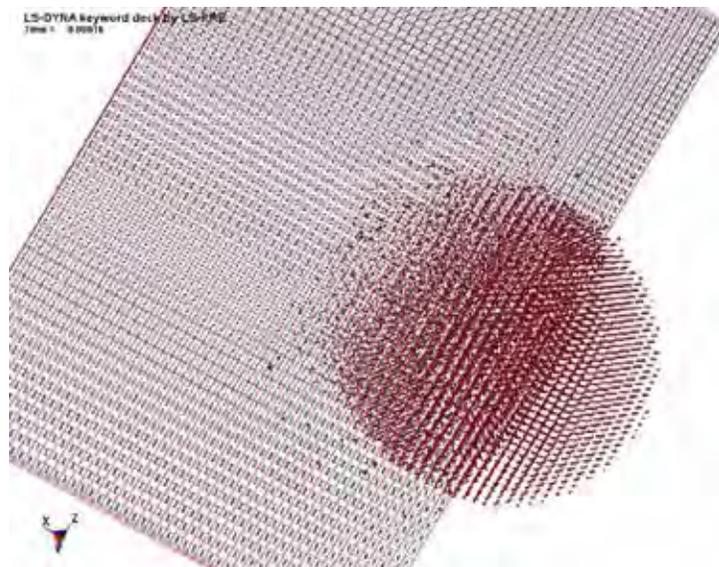


Fig 6. Hybrid element set up for HVI between SPH part and Solid plate with thermal coupling.

FUTURE WORKS

A more sophisticated coupling thermal conductivity model between SPH part and Solid part is needed for the further application of this keyword to the more complicated engineering behaviors.