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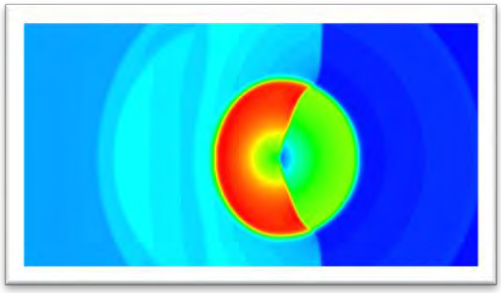
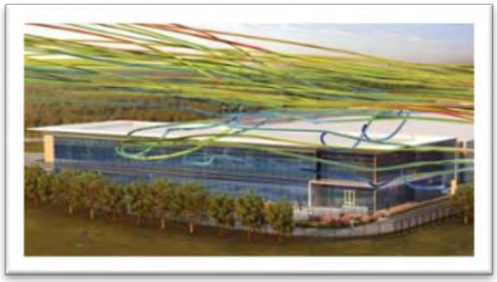


DYNAmore

Predictive Engineering



LS-TaSC® New Release Version 2021 R1

LS-DYNA@ New Feature and Application

- **On Setting up Boundary and Initial Conditions in S-ALE Models**
- **Multiphase flow CESE solver in LS-DYNA**

FEA Information Engineering Solutions

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The focus is engineering technical solutions/information.

Livermore Software Technology, an ANSYS company

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

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

Editor and Contact: Yanhua Zhao - news@feainformation.com

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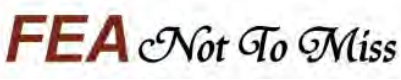

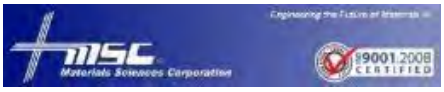

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Announcements

LS-TaSC® New Release Version 2021 R1

With the 2021 R1 release, LS-TaSC continues to expedite the optimization design process, enabling complex large nonlinear MDO problems to be tackled efficiently. A summary of top new features in LS-TaSC 2021 R1 is described as below.

Efficiency Improvements for the Multidisciplinary Design Optimization: Following the computation capabilities of the previous release in addressing constrained multidisciplinary topology optimization problems, 2021 R1 aims to improve the computational efficiency in multipoint analysis in the optimization design workflow. Disciplines with analytical design sensitivity information such as NVH load cases will no longer do a full multipoint analysis – the values for the sibling designs will be predicted instead. This enables the function evaluation time for NVH analyses at sibling points to be decreased enormously in each iteration.

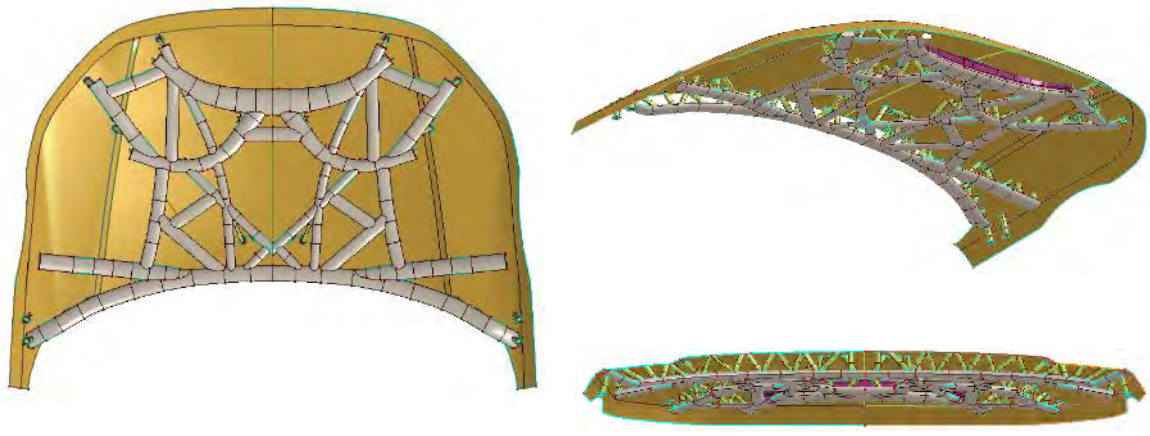
Facilitating Various Needs for NVH Design Optimization: The 2021 R1 supports computations using the design sensitivity information in NVH load cases for different design needs, such as a frequency gap "$f_3 - f_2$", and a normalized frequency constraint "$f_2/1000$". This also enables a frequency for a particular design purpose to be used as an objective for NVH design optimization.

Support for Structures using Rubber Materials: The 2021 R1 now supports structural designs for using materials *MAT_MOONEY-RIVLIN_RUBBER, *MAT_HYPERELASTIC_RUBBER, and *MAT_OGDEN_RUBBER.

Minimum Member Size Control: The latest release provides better control of minimum member size for parts, which can be selected from the method panel.

Better Support for Design of Head Injury Criterion: The 2021 R1 now enables to extract and define the HIC (Head Injury Criterion) responses directly from the constraint panel.

Support for STL Outputs: The 2021 R1 now provides the STL outputs of the isosurface plots of the optimized designs. The STL outputs can be used to create CAD version of the optimal designs through third-party tools.

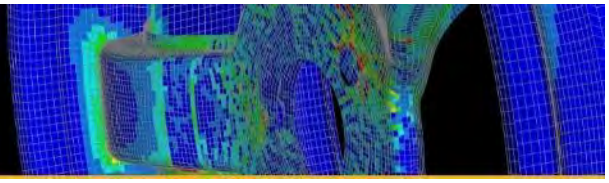


The CAD model of a LS-TaSC hood design as created using ANSA. CAD model courtesy of BETA CAE Systems.

New version download: http://ftp.lstc.com/user/ls-tasc/2021R1_beta/

Ansys

Ansys Blog



by Lynn Ledwith
Simulation World, Tips and Tricks
5G Networks, Ansys, Autonomous Vehicles, Digital Prototyping, Digital Twin, Electric Motors, Electric Vehicles, Internet of Things (IoT), Simulation World

Simulation World 2021 Speakers Push Technology's Limits

Businesses are moving faster than ever by capitalizing on digital transformation to drive innovation across industries. By next year, organizations will increase their investments in data governance, digital engineering and digital operations technologies by 40%, according to IDC1 and more than half of organizations with 1,000+ employees will accelerate their digital transformation projects2, putting their slower competition at a considerable disadvantage.

If you're merely keeping up in today's fast-paced environment, you're falling behind. That's why thought leaders from some of the world's most successful companies will share their advice on engineering what's ahead during Simulation World 2021, the world's largest virtual engineering simulation event.

Digital Transformation: Succeed with Simulation

The inaugural Simulation World event featured more than 300 speakers. Check out some of this year's featured speakers on the Simulation World 2021 website. Below is a sneak peak of a few of our executive presentations for Simulation World 2021, which takes place April 20-21 in the Americas and Europe, the Middle East and Africa; and April 21-22 in the Asia-Pacific region.

Microsoft VP of Manufacturing Industry, Caglayan Arkan, will present "The Art of Possible: Engineering New Business Value in Today's Disruptive Times." He notes that the businesses that are thriving during these disruptive times are doing so because they have the right vision, informed by what technology is capable of in terms of transforming product engineering and development, manufacturing and customer experiences.

Arkan will share how Microsoft and Ansys are partnering to unlock innovation and deliver new services using high-performance computing (HPC), simulation and digital twins.

Red Bull Racing CIO Matt Cadieux will present "Pushing the Boundaries of Simulation" at Simulation World to share how Red Bull Racing relies on virtualized design and development off the track to deliver race-winning performance on the track. This continuous and rapid process ensures the car is optimized for maximum performance at each race circuit.

During this session, Cadieux will highlight how the team leverages digital simulation to achieve real-world performance. The Aerodynamics Team at Red Bull Racing has leveraged simulation technology to rapidly iterate aerodynamic design in a time-pressured environment, optimize material selection and improve the car's safety structure. Simulation has greatly reduced the need for physical testing.

Industry leaders from **Hewlett Packard Enterprise (HPE)** and **AMD** will discuss the dawn of the Exascale era at Simulation World. Bill Mannel, VP and GM, High Performance Computing, Hewlett Packard Enterprise (HPE); and Mark Papermaster, CTO and EVP of Technology and Engineering at AMD, will present "The Supercomputer Comes to Everyone: Leveraging Exascale Era Technology in Today's Computing Environment."

During their presentation, you'll learn how Exascale can take engineering simulation to new levels of power and fidelity that deliver unprecedented engineering insight into how products like autonomous vehicles, next-generation aircraft and medical devices will behave and perform in real-world conditions. Learn how Exascale supercomputers will support extreme scaling of computationally demanding simulations, high-fidelity digital twins, generative product design using machine learning algorithms and more.

Something for Everyone at Simulation World

Simulation World is organized into multiple tracks. Arkan, Cadieux, Mannel and Papermaster are part of the Executive track, which explores the business of simulation and of innovating product development more affordably across industries ranging from aerospace and defense, automotive, healthcare and high tech. Leadership track speakers will share insights on a post-COVID macroeconomic outlook and how they're using sustainability, business transformation, diversity and inclusion, and other governance topics to their advantage. In the Academia track, you'll hear from professors, educators and students on the role that simulation, materials education and collaborative research have played in their success.

Application-focused tracks cover Autonomy and Automotive, Cloud Computing, Digital Mission Engineering, Digital Transformation, Electrification and 5G Connectivity. Two popular tracks with engineers: Solutions Showcase and Software Tips and Tricks, will feature software demonstrations and provide insight on the best ways to apply Ansys solutions.

Attendees can mix-and-match presentations from different tracks and create their own custom agendas. The full Simulation World 2021 agenda will be revealed March 26.

Much like the game-changing results of digital transformation, Simulation World will be here before you know it. The free, online event kicks off on April 20. Register today to engineer what's ahead.

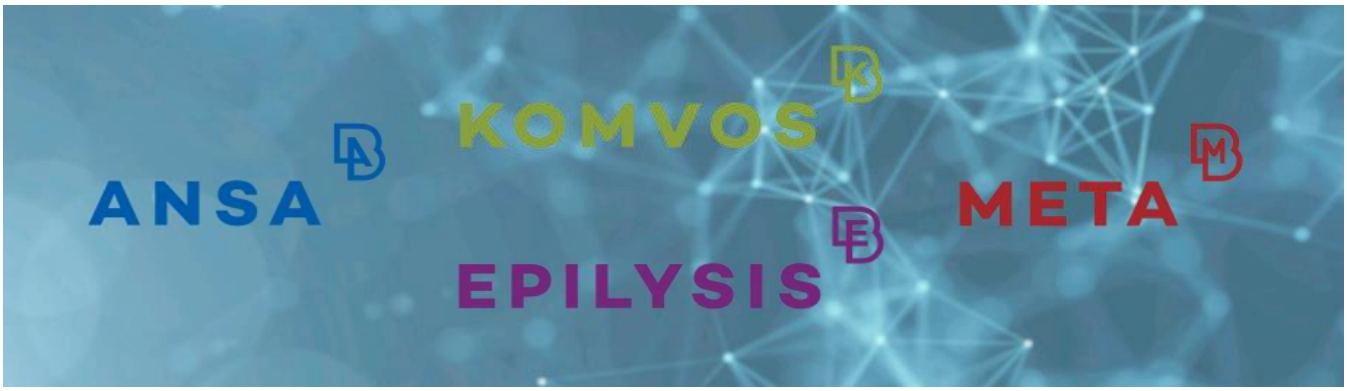
Sources:

"IDC's Worldwide IT/OT Convergence 2021 Predictions," IDC blog, Jan. 27, 2021

"IDC's Top 10 Worldwide Services 2021 Predictions," IDC blog, Dec. 18, 2020

Read from website

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



BETA CAE Systems announces the release of the v21.1.1 of its software suite

March 16, 2021

About this release:

BETA CAE Systems announces the first bug-fix release for ANSA/EPILYSIS/META and KOMVOS, hosting numerous fixes in recently detected issues.

Read more detail from website

BETA CAE Systems announces the release of SPDRM v1.5.0

February 26, 2021

About this Release

BETA CAE Systems announces the release of SPDRM v1.5.0. SPDRM v1.5.0 is now available, with numerous important enhancements in both the back-end and in the SPDRM client.

Read more detail from website

EuroBrake 2021 moves fully online

May 18 - 20, 2021, Hybrid

EuroBrake has grown from over 50 exhibitors and 660 delegates from 15 countries in 2012 with 96 papers presented to over 100exhibitors, 1,200 delegates from more than 40 countries with 146 papers presented in 2019.

Following the disruption to events in 2020, EuroBrake 2021 will be held fully online from17 – 21 May 2021, using an event platform that is intuitive, simple, and that offers key networking functions to bring as much of the physical event as possible, direct to you wherever you are.

EuroBrake 2021 - what to expect?

The virtual platform will offer many networking benefits

Register before 31 March to take advantage of our early bird offer, which also includes access to our full back catalogue of technical papers from EuroBrake 2012 up to last year.

We will send your personal link to access the virtual event site on 3 May 2021. To get the best experience from the virtual event, ensure your profile is fully updated and that you have selected all the options that you are offering or interested in at the event.

In the virtual event site, you will be able to:

- Update your profile to show people what you are interested in at EuroBrake
- Tell people if you have a product or some research to share
- Set your personal agenda with times you are available to meet/network and times you are busy
- Select all the sessions you would like to attend and build your personal agenda
- Download technical papers, posters, and videos
- Private message other attendees and set up videocalls within the platform (including group calls)
- Network with speakers
- View special exhibitor and sponsor content and connect with these groups via messaging and video calls
- Chat to colleagues in the open chat forums
- Watch sessions back on-demand if you missed them live

The preliminary programme

The preliminary programme is now online. The event will run from Monday 17 May to Friday 21 May with the full series of technical and panel sessions you have come to expect at the physical event, plus much more!

FISITA and the Steering Committee have been focussed on understanding how an online event will be different, what key aspects of the physical event can we keep, and what we, as a community, gain through the transition to online.

We have put together a programme that, in conjunction with the intelligent networking options already available to you within the event platform, maximises the opportunity to chat with peers and meet new contacts.

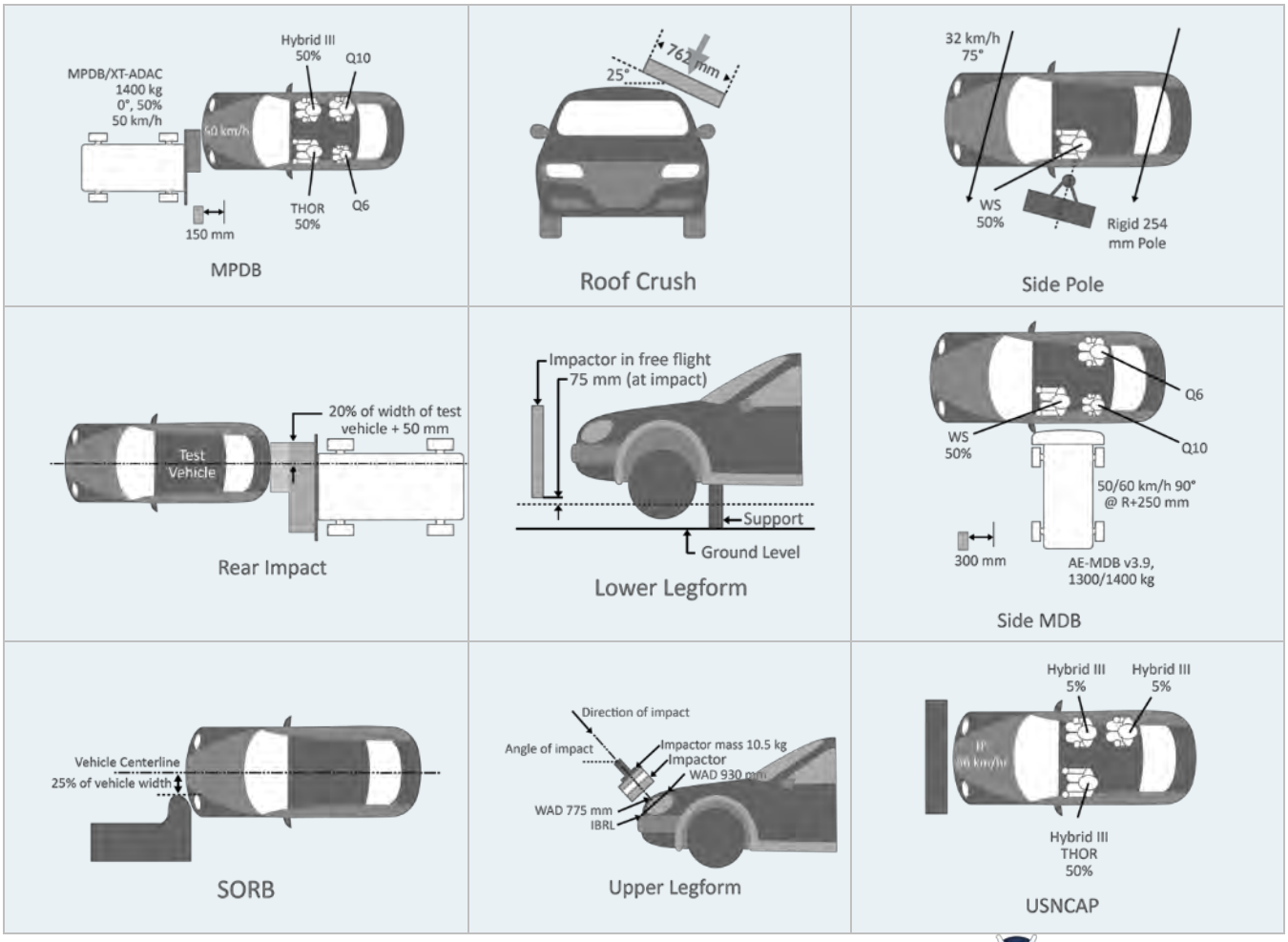
Networking, in the form of video meetings, messaging and forum chat, will be available from 06:00 until 20:00 BST each day. Targeted networking sessions aimed at allowing people to discuss the presented research, will also be available after each technical session.

The clever event platform also has functionality to suggest connections and give you percent profile matches, based on the interest tags you select when you log in.

The content hub, along with the event agenda, will contain all the event technical content, ready for you to view live or download, or watch back at your leisure and exhibitors and sponsors will have dedicated areas of content and be available to chat via the networking functions.

Read more online

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



Accelerate Crashworthiness Engineering.

d3VIEW

www.d3view.com | support@d3view.com

Author: Christian Frech christian.frech@dynamore.de

Submit your Abstract!

13th European LS-DYNA Conference
October 5-6, 2021, Ulm, Germany and online

Conference Website: www.dynamore.de/en/conf2021

Invitation

We kindly invite all users of LS-DYNA, LS-OPT, and LS-TaSC to the 13th European LS-DYNA Conference at October 5-6, 2021 in Ulm, Germany.

This year, for the first time, the conference will be held as a hybrid conference: on-site and online

Whether online or on site - the conference will be a great opportunity 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.

Venue

Ulm is located directly on the A7 and A8 motorways and can be easily reached from Stuttgart and Munich airports.

Address:
Basteistraße 40
89073 Ulm
Telefon: +49 731 922990
Telefax: +49 731 9229930
www.ulm-messe.de

We will inform you about the online part as soon as possible.

Abstract submission

Please submit your abstract (maximum length 2,500 characters) by E-Mail to conf@dynamore.de or online at:
www.dynamore.de/en/2021-abstract

Important Dates

Abstract submission: May 28, 2021
Author notification: July 9, 2021
Paper submission: September 3, 2021
Conference date: October 5-6, 2021

Participant fees

Industry speaker:	420 Euro
Academic speaker:	360 Euro
Online speaker:	150 Euro
Industry:	640 Euro[1)] / 690 Euro
Academic:	490 Euro[1)] / 540 Euro
Online	200 Euro

[1)] Registration before 30 June 2021. 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/en/conf2021

Author: Christian Frech christian.frech@dynamore.de

DYNAmore now distributes the ODYSSEE software package from CADLM

Overview

ODYSSEE is a powerful portfolio of 3 modules (Lunar, Quasar and Nova) from CADLM. It is a unique and powerful CAE-centric innovation platform that allows users to apply modern Machine Learning, Artificial Intelligence, Reduced Order Modelling (ROM) and Design Optimization to workflows. ODYSSEE uses Machine Learning and Reduced Order Model-ling techniques: It employs algebraic or machine learning solutions for reducing the volume of data while preserving the most important parts of the information contained within that data. This is commonly done via decomposition or machine learning or other efficient data fusion techniques. Such techniques allow for creating on-board and real-time applications based on existing experimental or simulation results. Typical applications are optimization, parametric sensitivity analysis and robustness.

Capabilities

ODYSSEE provides you with off-the-shelf solutions in order to profit from modern data science technology, allowing for cost effective digital twins applications in

- Real-Time predictive modeling and optimization (CAE or test data)
- Image compression, identification, learning, prediction (Images)
- Fault prediction (Sensor data)

Advantages

ODYSSEE, helps our clients to reach the following strategic challenges:

- Simulations and optimization in real time which contribute to reducing design time.
- Reduce cost and delay in analysis times as well as computational effort.
- In a period where the planet protection is a priority, it's important to minimize the number of simulation and exploit them efficiently in terms of the delay in performing the simulations and the data storage. With our solution, our client can predict any simulation based on any physics in real time (solver independent), using simply a DOE of few simulations.

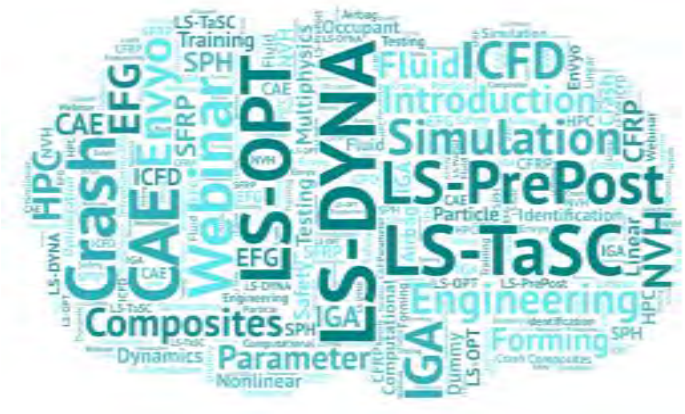
Contact

CADLM
32 rue Victor Baloche
91320 Wissous, France
Phone: +33 (0)1 69 07 29 22
www.cadlm.org

DYNAmore GmbH
Industriestrasse 2
D-70565 Stuttgart
www.dynamore.de
info@dynamore.de

Author: Christian Frech christian.frech@dynamore.de

Webinars and on-demand Video-Seminars 2021



Online trainings in April and May

Webinars LS-DYNA Compact	
LS-OPT Optimization	8 April
LS-OPT Robustness	9 April
Contact Modeling in LS-DYNA	12-13 April
Introduction to LS-DYNA	13-15 April
Joining Techniques in LS-DYNA	14-15 April
Introduction to Draping Simulation with LS-DYNA	27-28 April
Introduction to EFG	29-30 April
Introduction to LS-DYNA	3 May
Introduction to PRIMER for LS-DYNA	4-5 May
Introduction to LS-DYNA	4-6 May
NVH	10-11 May
CESE Compressible Fluid Solver	17-18 May
ALE and FSI	19-21 May
Introduction to LS-DYNA	26-28 May

Video Seminars	
Introduction to LS-DYNA online	anytime
Crashworthiness Simulation with LS-DYNA	anytime
Modeling Metallic Materials	anytime
LS-OPT - Optimization	anytime
LS-OPT - Robustness	anytime

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

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

Bridge the Gap Between Virtual and Real

Deliver safe and productive machinery, manufacturing, and maintenance processes for the heavy industry with virtual reality

Tuesday, March 2, 2021
By Eric Kam

All decisions have big impacts

Nobody wants to find out at the eleventh hour that a design & engineering decision they made for a new heavy industrial machine was the wrong one. Worse yet, that one decision creates a cascading effect of human centric concerns that risk safe productivity during the assembly, operator use, or maintenance of the final product. Unfortunately, scenarios like this happen all too often – a seemingly minor decision made early in the design process is later discovered to wreak havoc on the operability, assemblability, and serviceability of a new heavy machine.

In this blog, we will begin to recognize why this happens and identify how to address these human centric product and process validation issues early on.

People, processes, and product

The digitalization of most heavy machinery & equipment engineering organizations' product design & engineering is well accepted, practiced, and trusted – especially for those attributes which have quantifiable standards and objective limits. A decision to include a more durable hydraulic actuator, more cost-effective motor, or alternate seat in a design may be well supported with simulation or analytical data, but have we considered if that decision changes how operators will assemble that product, use the product, or service & maintain those components in the field? When it comes to considering the impact of engineering decisions on human operators, until people can walk around, climb on, sit in, and assemble-disassemble-reassemble the actual product, we often can't predict what is acceptable or not.

When planning the operation, assembly, and maintenance of a first-of-its-kind product or implementing new methods, we typically can't know what it is that we don't know about that product – what challenges operators will face when interacting with products they have yet to experience. For this reason, assembly process planning has long relied on pre-production prototyping and assembly piloting to allow workers to experience and evaluate proposed assembly processes and tooling. Similarly, service and maintenance planning is most often based on previous product history or require service teardown workshops conducted on the pre-production prototypes. However, no one has the luxury anymore to wait until the real products are produced if they wish to be competitive.

Experience tomorrow's products, today

In Part 2 of our Heavy Machinery Webinar Series, we put into simple terms how Virtual Reality can be applied to achieve cost, lead time, and downtime reduction targets for your new product launches using immersive technologies and specifics on how it can help you:

- Recognize addressable Human-Centric Product & Process concerns
- Discover how virtual assembly and service process validations are commonly performed
- Identify Product Integration and Packaging issues uniquely addressable in Immersive Reviews
- Differentiate between virtual reality for engineering purposes and other uses
- Find opportunities for virtual collaboration between distributed teams & suppliers

Join us to see how leading enterprises conduct product integration, assembly process, and service method validations in Virtual Reality.

For more information visit ESI's Heavy Machinery Industry Page

Learn more by registering for the Human Centric Product & Process Validation Webinar

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

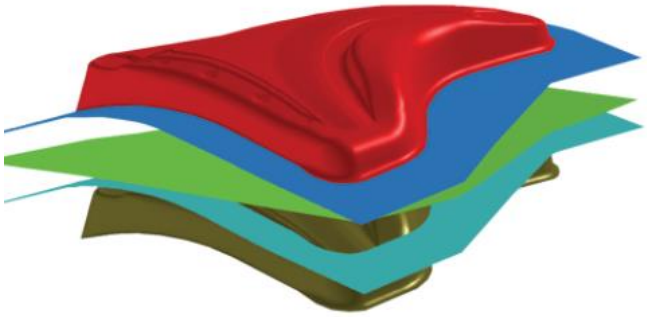
DYNAFORM

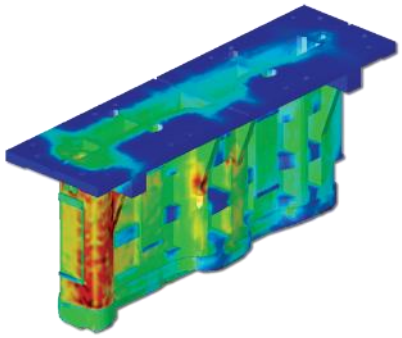
DYNAFORM is a simulation software solution, which allows organizations to bypass soft tooling, reducing overall tryout time, lowering costs, increasing productivity & providing complete confidence in die system design. It also allows for the evaluation of alternative and unconventional designs & materials.

DYNAFORM Version 6.0 is Now Available!

DYNAFORM 6.0 is the sixth-generation DYNAFORM product. It provides a user-friendly and intuitive interface with a streamlined design. The analysis process is fully based on the stamping process, which requires less CAE knowledge, and minimum geometry and element operations. This latest release offers the following features and improvements:

- Intuitive and Streamlined Interface
- Tree Structure to Manage Operation
- Simulation Data Manager
- Customized Icons Grouping for Drop-down Menu Functions
- Separate and Independent Application
- Unified Pre and Post Processing
- Multi-Window View
- Access Functions Using Right Mouse Button Clicks
- Supports Large Forming Simulation Models
- Geometry Manager
- Process Wizard for Blank Size Engineering
- Minimum Geometry and Elements Operations
- New Material Library Window
- New Drawbead Shape and Library
- Coordinate System Manager
- Instant Section Cut
- Tata Steel FLD
- Balloon Label
- PowerPoint and Excel Based Automatic Formability Report Generation





Highlights from our FEA Not To Miss Software & Engineering Solutions ISSN 2694-4707
and FEA Not To Miss Website - Sign up for our Monthly Magazine via email

FEA Not To Miss choice for March

"When is a good time to start learning, you ask? Well, NOW! So, let's take a look at two courses I find interesting. Additionally, we know they are important for you to take, as well as others you don't want to miss."

Electrostatic - This course introduces the fundamental properties of electrostatic fields. It defines the concepts of electric field, electric charge and the relationship between them. It also discusses forces between proximate charges, work done by electric fields, field energy storage and electric potential, or voltage. This course was developed by Kathryn Leigh Smith, Asst. Prof. in the Department of Electrical and Computer Engineering at the University of North Carolina-Charlotte in partnership with Ansys.

Aerodynamics - This course will let you explore how airplanes fly in the air, using an innovative and extremely engaging approach. You will learn basic concepts of aerodynamics through engaging videos, experiments and, mostly important, engineering simulations. This approach will help you understand and remember better the concepts thanks to direct visualization and hands-on learning using engineering simulations. You will learn how to perform aerodynamic analyses directly on your computer, with the same Ansys technology that scientists and engineers across the globe use.

Additional New Courses - Grab your coffee and sign up now.

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

恒士达科技 Hengstar Tech.

ENHU

Online workshop for basic of LS-DYNA

Shanghai Hengstar Technology will organized a Web Training of the basic in LS-DYNA on Mar 24 2021.

Contents:

1. Introduction of LS-DYNA
2. Control card
3. Instructions of LS-PrePost
4. Output files and data
5. Element Type
6. Time `step` and CPU time
7. Selection of material model
8. Hourglass
9. Loading and setting initial conditions
10. Connect
11. Boundary condition
12. Damping application
13. Contact settings
14. Finite element model evaluation
15. Exercise

Instructor：

Jun Liu (Senior Engineer)
Jun Liu was graduated from Tongji University in 2008 in vehicle engineering. He has been engaged in automobile R & D industry for more than ten years, and has rich experience in automobile safety performance research and simulation. He has accumulated a lot of pre-processing and post-processing techniques for FRB, ODB, aemdb collision modeling and simulation analysis. And He has a lot of experience in simulation and optimization of five-star vehicle development process . Also can master LS- DYNA and ansa, meta, HyperMesh, hyperview, primer and other pre-processing software.

Duration and Style:(7 hours web training): Mar 24 (9:00AM-17:00PM) **Language:** Mandarin

Contact: Xixi Fei Tell:021-61630122 mobile:13524954631 Email:Training@hengstar.com

Shanghai Hengstar Technology Co., Ltd

hongsheng@hengstar.com

http://www.hengstar.com

Shanghai Enhu Technology Co., Ltd

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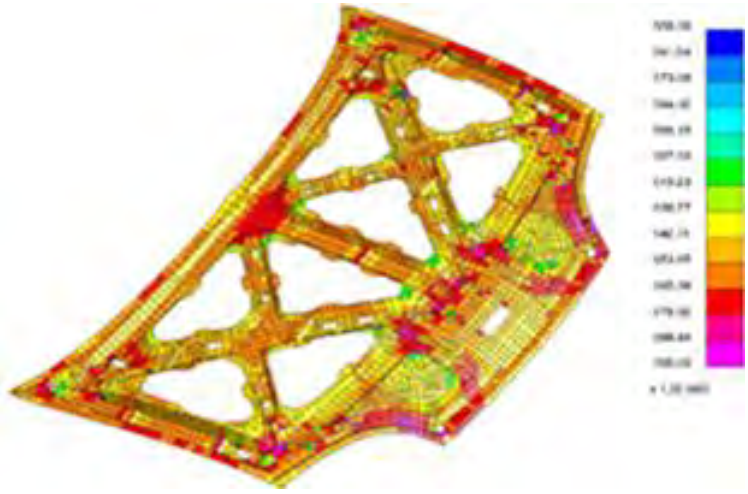
Calculate the thickness and plastic strain for a formed sheet metal from an existing crash simulation model. The result will be the initial conditions for LS-DYNA simulation.

The effect of residual strain distribution and non-uniform thickness due to sheet metal forming - the manufacture process for most of the automotive parts for crash energy absorption - is well known as one of the most affecting factors for correlations between analysis and tests. So that some tries are carried out to calculate the initial strain and thickness before the crash/strength analysis.



Usually, the element size for crash analysis and metal forming analysis are different due to their difference in geometrical information (R size etc.), so after forming analysis, stress, strains, and thickness are mapped to the structural analysis.

However, this process costs pretty much and not very effective. Moreover, the information of die geometry is required for the forming analysis, which usually doesn't exists in structural analysis phase.

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

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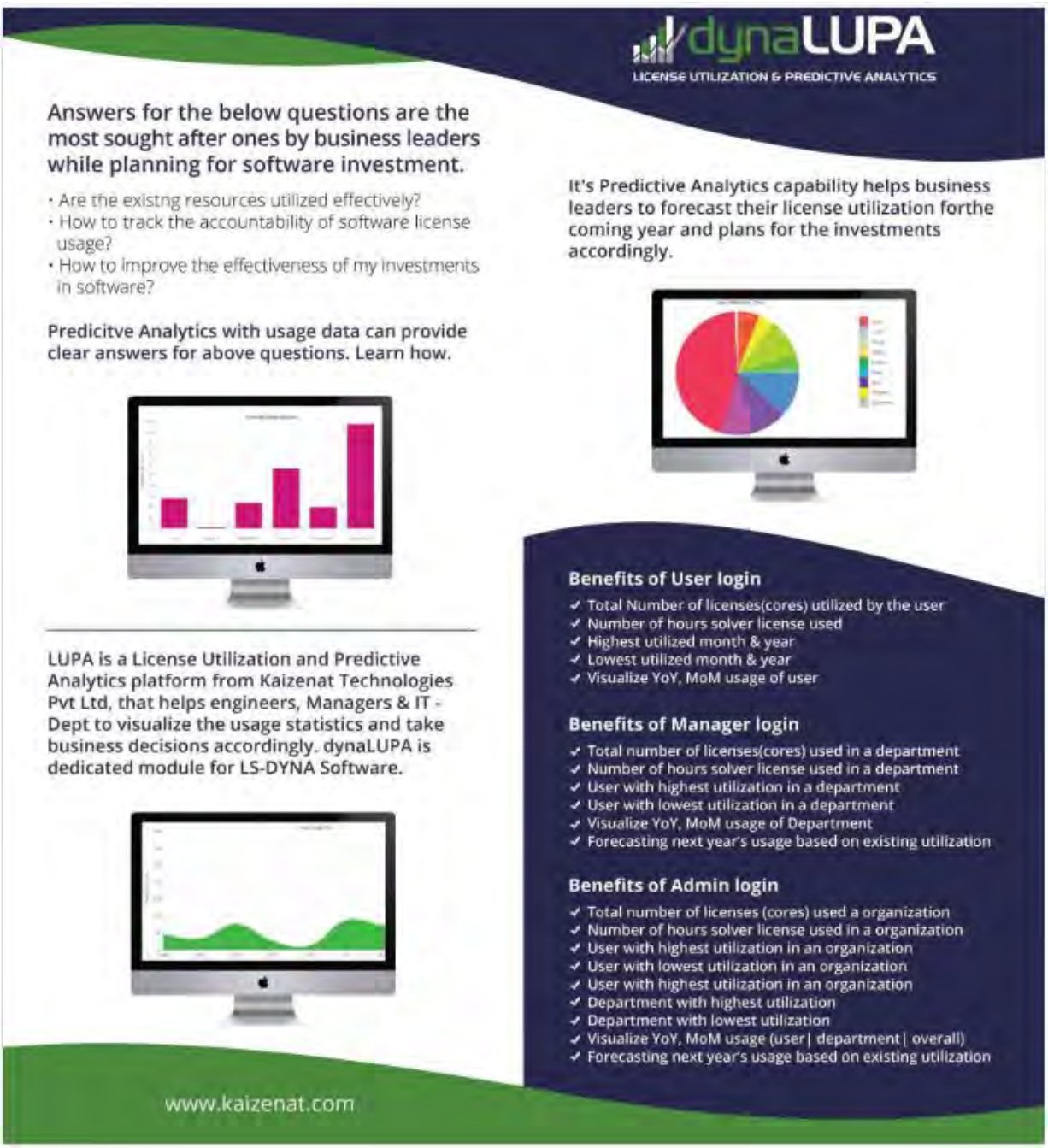


Contact
Email : support@kaizenat.com Phone: +91 80 41500008

On Setting up Boundary and Initial Conditions in S-ALE Models

Hao Chen, Ansys

LS-DYNA ALE has been widely used to simulating moving fluids interacting with structures. Unlike CFD, the focus is rather on the structure response under dynamic loading from fluids, than the fluids' motion. Fluids are agitated by a high pressure gradient; and then hit the structure, carrying a large momentum. The key in successfully capturing the physics lies in the fluid-structure interaction algorithm. It needs to accurately predict the peak of pressure loading during the impact, which is characterized as a momentum transfer process. This request could only be fulfilled by a transient analysis with a penalty-based coupling between fluids and structure.

In 2015, LSTC introduced a new structured ALE (S-ALE) solver option dedicated to solve the subset of ALE problems where a structured mesh is appropriate. As expected, recognizing the logical regularity of the mesh brought a reduced simulation time for the case of identical structured and unstructured mesh definitions. It also comes with a cleaner, conceptually simpler way of model setup. This article gives a brief description on setting up the boundary and initial conditions in S-ALE models.

What is Boundary?

In a Lagrangian model, mesh conforms to the material interface. The boundary is a collection of surface segments and nodes enclosing the material (*PART). And we could choose a set of segments or nodes to apply boundary conditions on them. For example, one uses *LOAD_SEGMENT to apply pressure on a set of segments; *BOUNDARY_SPC to apply nodal constraints on a set of nodes, etc.

However, in an ALE model, things are totally different. Mesh is no longer the spatial representation of the material. Rather, it is simply a domain in which we study the flow of that (and other) material. In Lagrangian, what really happened was that we applied boundary conditions on the material surface. The equivalent thing to do in an ALE model is to apply some force or constraints at the material interface, NOT at the mesh boundary. As the mesh boundary is just the limit of our working field, nothing more.

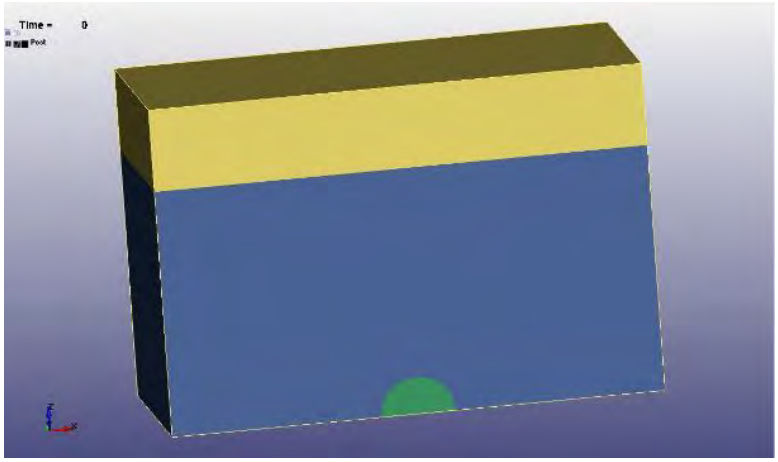
As the material interface is evolving in ALE models, plus it has no explicit description, generally it is not possible to apply "boundary conditions" directly at the material interface. Most of times, boundary conditions are applied through fluid-structure interaction (FSI). For example, we want to create a wave by pushing water sideways from left to right. If modeled as Lagrangian water, all we need to do is to find its boundary nodes and apply a prescribed motion on them. In ALE, it is not possible as these nodes do not move with water. Remember? Mesh does not move; fluids flow inside it. So what we do is to create a Lagrange plate and set up a FSI between water and the plate. Then we apply this prescribed motion onto the plate. Then FSI is going to enforce the water to move together with the plate.

Boundary Conditions

The above being said, on one condition we could still use boundary conditions in an ALE model. As you might have guessed, that is when the mesh boundary conforms to the material interface. Say we have a half symmetry model and -x mesh face is the symmetry plane. What we need to do is to apply nodal constraints along x direction on all nodes at that face. Another example is a flat bottom container. If we choose to align the bottom mesh face with that simple geometry container, we could apply a SPC along z direction at -z face nodes.

Another exception is transmitting boundary condition, i.e. *BOUNDARY_NON_REFLECTING. The transmitting boundary is to apply an impedance to minimize the pressure wave reflection at the mesh boundary when we use a finite mesh to model the infinite domain. It is designed for Lagrangian but used often in ALE models to help reducing the model size.

In both cases, we first define a set of nodes (SPC) or segments (NON_REFLECTING). And then we setup the SPC cards or NON_REFECTING cards using those definitions. Let us use a case of underwater explosion to show the process. We have three multi-materials (fluids) in the model - a half sphere high explosive (HE), water above and around it, and then air on the top, as shown in the figure below. We construct a half symmetry model with symmetric plane aligning with -y face.



https://ftp.lstc.com/anonymous/outgoing/hao/sale/models_R121/underwater/

We follow the three-step setup. First mesh. A 24x12x16 box spans from (-12,0,0) to (12,0,16).

```
 *ALE_STRUCTURED_MESH
$    mshid       pid      nbid      ebid      ityp    nparts
         1         9    200001    200001         0         0
$     nptx      npty      nptz      nid0     lcsid
     3001      3002      3003
*ALE_STRUCTURED_MESH_CONTROL_POINTS
     3001
                1            -12.00
               25             12.00
```

```
*ALE_STRUCTURED_MESH_CONTROL_POINTS
    3002
              1            0.00
             13            12.00
*ALE_STRUCTURED_MESH_CONTROL_POINTS
    3003
              1            0.00
             17            16.00
```

Next, multi-materials. Water, HE and Air. Please note, air has a reference pressure of 1.0e-5; water and HE have their reference pressure set to 0.

```
*ALE_STRUCTURED_MULTI-MATERIAL_GROUP
$# mmgname      mid     eosid                                  pref
 water          10       10
 He             11       11
 air            12       12                                  1.0e-5
*MAT_NULL
$#     mid       ro       pc       mu     terod     cerod       ym      pr
      10  1.000000
*EOS_GRUNEISEN
$#   eosid        c       s1       s2       s3    gamao        a      e0
      10  0.148000  1.750000    0.000    0.000  0.280000
$#      v0
 1.000000
*MAT_HIGH_EXPLOSIVE_BURN
$#     mid       ro        d      pcj     beta        k        g    sigy
      11  1.630000  0.784000  0.260000
*EOS_JWL
$#   eosid        a        b       r1       r2     omeg       e0      vo
      11  3.710000  0.032300  4.150000  0.950000  0.300000  0.043000 1.00000
*MAT_NULL
$#     mid       ro       pc       mu     terod     cerod       ym      pr
      12  0.001280
*EOS_LINEAR_POLYNOMIAL
$#   eosid       c0       c1       c2       c3       c4       c5       c6
      12    0.000      0.0    0.000    0.000  0.400000  0.400000
$#      e0       v0
  2.25e-5    0.000
```

And then, volume filling. First, all elements filled with water. Next, inside a sphere to HE. Then above a plane to air.

```
*ALE_STRUCTURED_MESH_VOLUME_FILLING
$    mshid                to
       1              water
$ geometry
      ALL
*ALE_STRUCTURED_MESH_VOLUME_FILLING
$    mshid                to
       1                HE
$ geometry    in/out     NID1        r
```

```
 ELLIPSOID           199997      2.0
*ALE_STRUCTURED_MESH_VOLUME_FILLING
$    mshid               to
         1              air
$ geometry    in/out     NID1      NID2
    PLANE              199998    199999
*NODE
  199997   0.0000000e+00   0.0000000e+00   0.0000000e+00
  199998   0.0000000e+00   0.0000000e+00  12.0000000e+00
  199999   0.0000000e+00   0.0000000e+00  15.0000000e+00
```

And let us be a Minimalist on *CONTROL_ALE.

```
*CONTROL_ALE
$#     dct     nadv     meth     afac     bfac     cfac     dfac    efac
                  1        1 -1.000000
$#   start      end    aafac    vfact     prit      ebc     pref   idebc
```

Now to apply boundary conditions on the six faces of the S-ALE mesh. They could be categorized into three types:

1. Symmetric plane: -y face. This translates to a *BOUNDARY_SPC on all nodes at that face along the local y direction.
2. No flow in and out: -z face. This face aligns perfectly to the seabed. Water and HE could move freely inside the plane. But nothing could flow in/out of the plane. This translates to a *BOUNDARY_SPC on all nodes at that face along the local z direction.
3. Transmitting boundary: all other 4 faces. At those four faces, we want to allow the pressure wave travel freely into the unmeshed infinite domain. We do that by adding a *BOUNDARY_NON_REFLECTING on all segments on those faces.

For a more user-friendly S-ALE setup, we added the following "macro-like" keyword to apply SPC constraints. It will be available in the next release in R12 (R12.1).

*BOUNDARY_SALE_MESH_FACE							
OPTION	MSHID	-X	+X	-Y	+Y	-Z	+Z
SYM	1			1			
NOFLOW	1					1	
NONREFL	1	1	1		1		1

Internally it is translated into the following keywords:

```
*BOUNDARY_SPC_SET
       1               0       1       0
*BOUNDARY_SPC_SET
       2               0       0       1
*SET_NODE_GENERAL
$      SID
       1
$  OPTION    MSHID      XMN      XMX      YMN      YMX      ZMN      ZMX
  SALEFAC       1                   1
*SET_NODE_GENERAL
$      SID
       2
$  OPTION    MSHID      XMN      XMX      YMN      YMX      ZMN      ZMX
  SALEFAC       1                            1
*BOUNDARY_NON_REFLECTING
$      SID
      11
*SET_SEGMENT_GENERAL
$      SID
      11
$  OPTION    MSHID      XMN      XMX      YMN      YMX      ZMN      ZMX
  SALEFAC       1        1        1                1                1
```

It is totally users' choice to use *BOUNDARY_SALE_MESH_FACE or not. Other than being concise, another advantage is that it is less error prone. Especially when the mesh is tilted, i.e. there is a local coordinate system. In this case, if we use *BOUNDARY_SPC, we need to remember to set up a local coordinate system, and make sure that we constraint the correct component. *BOUNNDARY_SALE_MESH_FACE, on the other hand, handles all those silently and automatically and takes off those unnecessary burdens from users.

One thing to note is that the two options SYM and NOFLOW, are doing the same thing. That is to constrain the flow perpendicular to the plane. We have both options available, simply to provide a one-to-one match between the options and real physical scenarios.

Another option, as you might have guessed, is FIXED. It is to fix all nodal motions at that face.

SALECPT and SALEFAC in *SET_?_GENERAL

In the model example above, when using the traditional *BOUDNARY_SPC and *BOUNDARY_NON_REFLECTING setup, one can notice that *SET_NODE_GENERAL and *SET_SEGMENT_GENERAL are used to generate node and segment sets, respectively. Unlike traditional ALE, S-ALE relies solely on *SET_?_GENERAL to create node/segment/element sets. This is because S-ALE mesh is generated internally so it is difficult, if not possible, to explicitly list out IDs of nodes/segments/elements. So what we do is to generate those sets by using SALECPT and SALEFAC options in *SET_?_GENERAL.

SALEFAC will pick up all nodes/segments/solids at certain S-ALE mesh face(s). The one below added all nodes at -y face of S-ALE mesh #1 into node set #1.

```
*SET_NODE_GENERAL
$     SID
        1
$  OPTION    MSHID      XMN      XMX      YMN      YMX      ZMN     ZMX
  SALEFAC        1                    1
```

SALECPT provides a more flexible way. It picks up all nodes/segments/elements inside a box indexed by S-ALE control points. For example, this one below added the bottom half of nodes in the S-ALE mesh #1 into node set #101. (Remember our mesh is a box of 24x12x16 elements?)

```
*SET_NODE_GENERAL
$     SID
      101
$  OPTION    MSHID      XMN      XMX      YMN      YMX      ZMN     ZMX
  SALECPT        1        1       25        1       13        1       9
```

One thing we need to stress here. No other options in *SET_?_GENERAL could be applied onto S-ALE mesh. A common mistake is BOX option. The reason we did not support it was to avoid user mistakes. Most of the time Lagrange mesh and S-ALE mesh are on top of each other, i.e., overlaps in space. And more likely users tend to pick nodes inside a box for the Lagrange mesh; or the S-ALE mesh. Not both. Supporting BOX option might accidentally include S-ALE nodes into an intended Lagrange node set, without users even realizing that.

Initial Conditions

Initial conditions are relatively simple. Typically it is only to assign some initial velocity to some nodes. But still, there is some fine difference between LAG and ALE models. Again, we must emphasize that ALE material interface is not necessarily at the boundary. And it makes sense to apply initial velocities on certain nodes only if those nodes are the real spatial representation of a material.

Most commonly, initial velocities are applied simultaneously with volume filling process, through the *ALE_STRUCTURED_MESH_VOLUME_FILLING card. Like the following:

```
*ALE_STRUCTURED_MESH_VOLUME_FILLING
$#  mshid       -   ammgto       -  nsample       -       -      vid
       1            plate                                1
$#   geom   in/out    boxid
BOXCOR          0        1
```

And the initial velocity (vx=-61.631,vy=208.06) is prescribed by using the *DEFINE_VECTOR card.

```
*DEFINE_VECTOR
$#     vid       xt       yt       zt       xh       yh       zh      cid
       1   -61.631   208.06      0.0      0.0      0.0      0.0        0
```

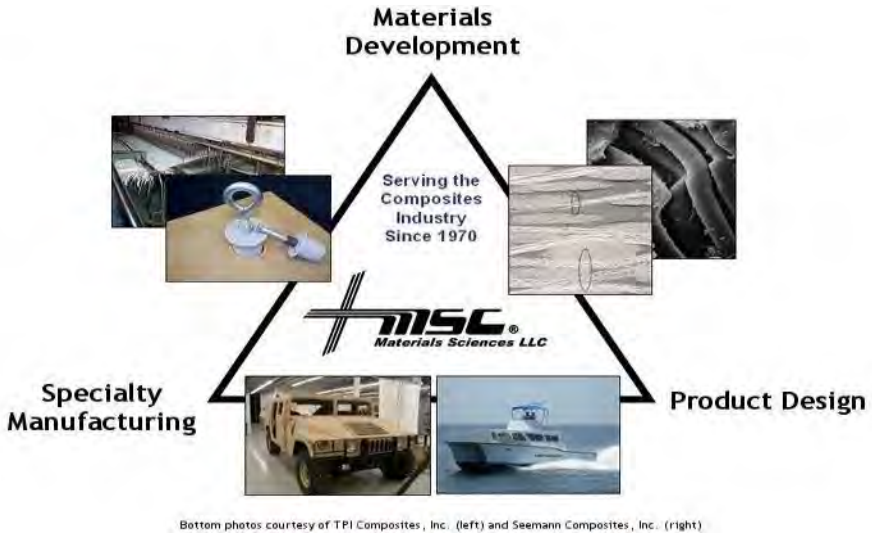
The volume filling process will first fill the box with the multi-material named “plate” and then, find all nodes belongs to “plate” and assign an initial velocity to them.

Ending Remarks

LS-DYNA ALE module has been known for its steep learning curve. Partially it was because setting up Eulerian models are intrinsically different from Lagrange models. But the design of ALE keyword cards, for sure, has caused quite a lot of confusions among our users, new and experienced.

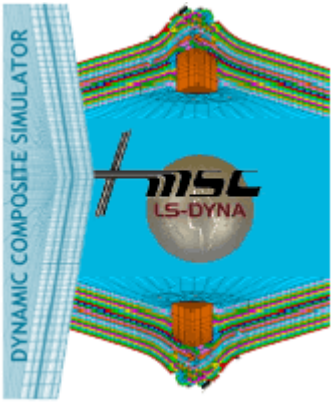
To prompt LS-DYNA ALE usages, Structured ALE solver introduced a new, user-friendly, streamlined three-step setup. We hope this effort could help users, new or old, to perform their work more efficiently and smoothly.

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



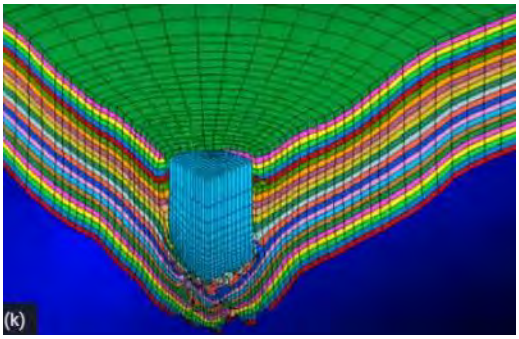
Bottom photos courtesy of TPI Composites, Inc. (left) and Seemann Composites, Inc. (right)

MSC/LS-DYNA Composite Software and Database



Materials Sciences Corporation (MSC) and Livermore Software Technology Corporation (LSTC) announce the Dynamic Composite Simulator module of LS-DYNA.

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



Dyna Fact Sheet (PDF)

Pricing and Contact:

- Types of licenses include: Educational, Commercial, and 30-Day Trial (US only).
- MAT161/162 annual licenses start at $1725 for commmercial use and $175 for educational. (New pricing effective 2017. Contact us for details.)
- Licenses include User's Manual and Technical Support (maintenance, support and updates for time duration of license).
- Please call 215-542-8400 or email dyna_161@materials-sciences.com for more information.

This helps our clients avoid pitfalls, and make exceptionally rapid technological progress. The same broad reach allows us the opportunity to interact with, and evaluate a wide range of suppliers.

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

Save the date for this free online global event!

For the first time ever, we'll be bringing together Oasys LS-DYNA users from across the globe to join a free, online event providing updates about developments in the Oasys LS-DYNA Environment software.

Register here

New IIHS Specification 2.0 Side Impact Shell Barrier is now available!

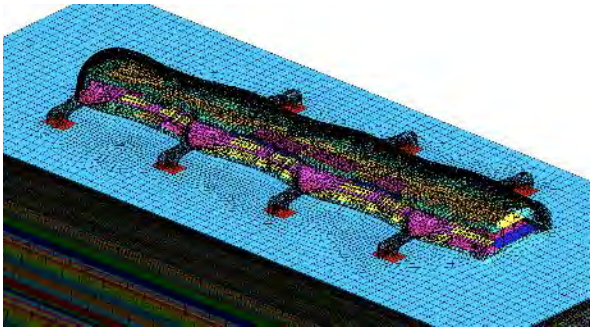
The new Shell model reflects the changes in the IIHS Side Impact Specification 2.0 Barrier for the upcoming 2022 protocol.

This new 2.0 barrier has been redesigned to better represent the front-end shape of certain types of vehicles, SUVs and pick-ups, and is being introduced to make the barrier to vehicle tests more representative of real-life vehicle impacts.

This new model is made of Shell elements which provide a more accurate representation of the physical barrier. It has been calibrated at different levels using test data provided by Cellbond. The IIHS Specification 2.0 Shell model replaces the previous IIHS Solid Side Impact Barrier developed back in 2006.

Click here for more information about the barrier.

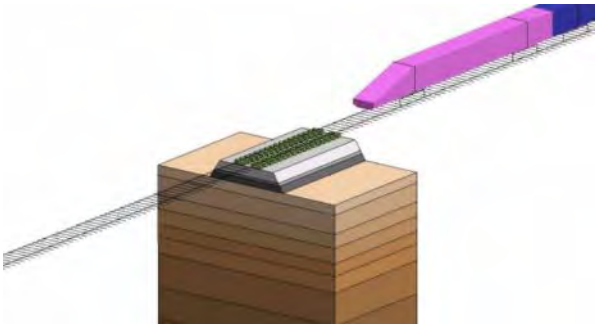
To discuss a lease or a trial, please contact dyna.support@arup.com



Webinar: LS-DYNA - Civil/Structural Applications

This webinar shows how LS-DYNA is used in the civil domain to inform the design of complex buildings and structures. Through project examples, a variety of applications will be shown including how LS-DYNA enables advanced seismic analysis of structures, complex soil-structure interactions and helps to overcome construction challenges.

To view this webinar click on website here.



Upcoming webinar: Predicting Vibration from Trains Using LS-DYNA

15:00 BST on Thursday 22nd April 2021

Featuring Andrew Cunningham
Associate Director, Arup

Hosted by Ansys, this webinar will feature Arup's Andrew Cunningham on how LS-DYNA is used for predicting the vibration caused by trains.

It will include examples of both structural and acoustic vibrations and the associated transfer of these to train passengers and to buildings near the track.

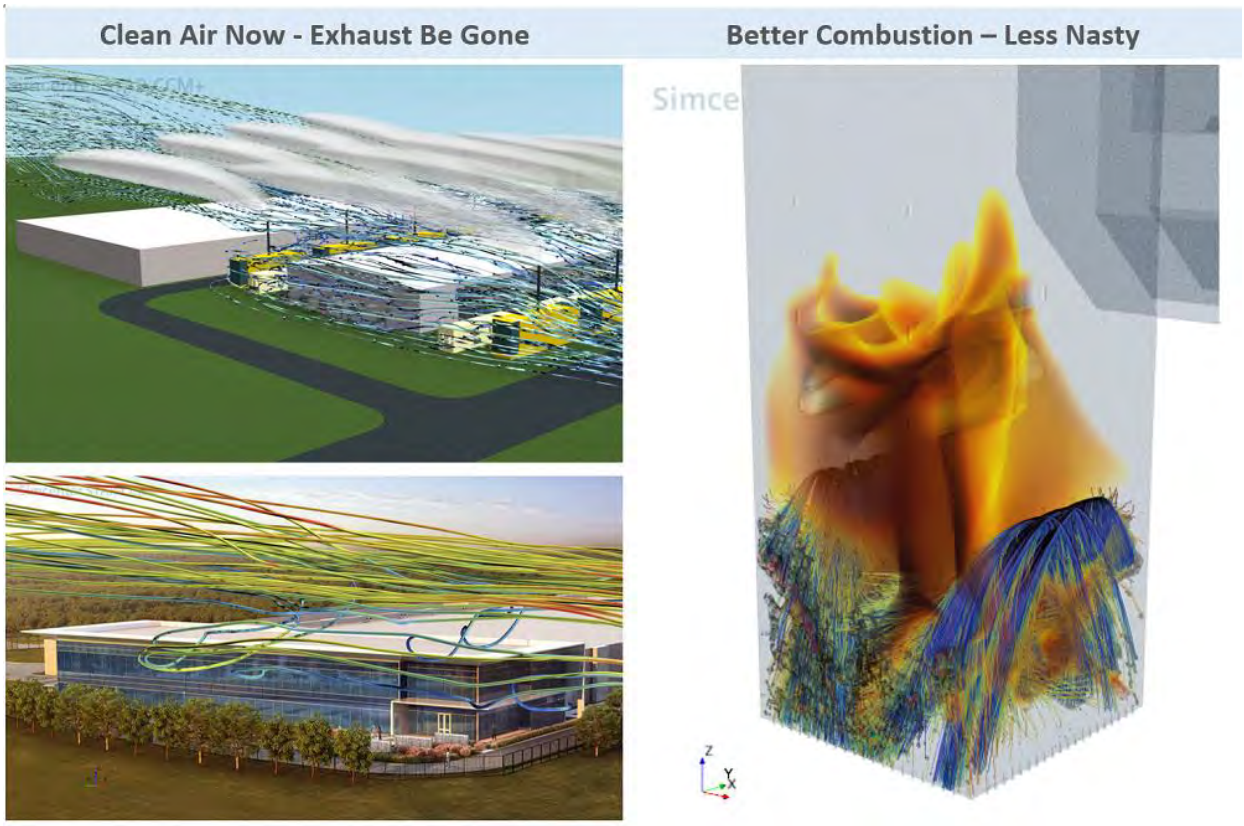
Register here

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

CFD Virtual Prototyping Clean Air and Free of Nasty Stuff

March 2, 2021 Posted By: George Laird

It seems that the decade of 2020 is going to be focused on clean air, whether it is on the street or inside of a building. Given what we know about how viruses spread and especially so about Covid-19, the importance of clean air has never been greater. Since the start of 2020 and going into 2021, we have seen a strong uptick in requests for CFD engineering services to improve air quality inside and outside of buildings. It seems obvious, but to ensure clean air inside the building one starts from the outside to keep exhaust out and clean air in. Our CFD consulting projects have ranged from hospitals, data centers, factories, large parking garages to office towers. In every case, the requirement was to digital prototype the air quality inside these buildings. We also get involved in combustion engineering to maximize the efficiency of boilers. This is often the most challenging work to optimize the combustion process to reduce air-borne particulate. All-in-all, we do live in a cleaner world than that chronicled by Dickens in the early 1800's, where the streets of London were often night-like at noon, and I'm sure that in the following years we will see continued improvement in the air quality that we all breath.



Watch video in youtube.

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FINITE ELEMENT ANALYSIS
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Predictive Engineering – Western States ANSYS LS-DYNA Distributor – Your Free Coffee Cup is On Its Way!

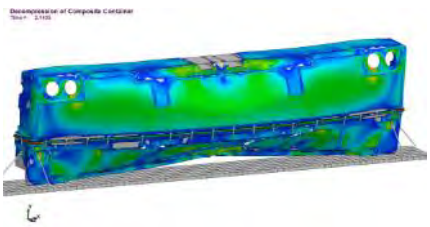
LS-DYNA has been one of Predictive's core analysis tools pretty much since we got started in 1995. It is an amazing numerical workhorse from the basic linear mechanics (think ANSYS or Nastran) to simulating well nigh the impossible. At least that is the way I feel at times when the model is not solving and spitting out arcane error messages and I'm basically questioning my sanity for accepting this project from hell that has a deadline at the end of the week. Which brings me to my favorite project management image – "trough of despair followed by wiggles of false hope then crash of ineptitude and finally the promised land" but I'll leave that for another blog.

For now, let's talk about those free coffee cups. Predictive is now the western states distributor of ANSYS LS-DYNA and provides complete sales, training and services for ANSYS LS-DYNA clients in this region. It is a continuation of our prior setup with LSTC (now ANSYS LST) with the addition of Predictive's ability to offer ANSYS Workbench with LS-DYNA and other ANSYS software tools. So where's my free coffee cup? If you are a current Predictive ANSYS LS-DYNA client, we'll be shipping'em out to you at the end of February and for our new client's – just send us an email or give us a call.

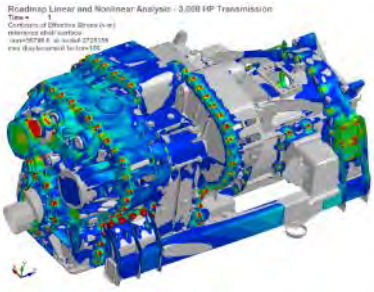
View our portfolio

FEA, CFD and LS-DYNA consulting projects

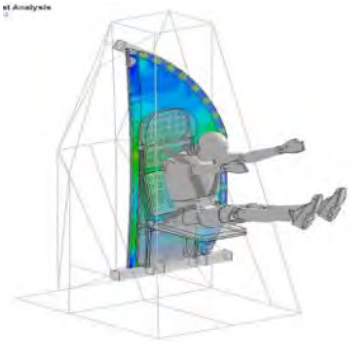
Composite Engineering



Nonlinear Dynamics



Aerospace



Contact:

Address:
2512 SE 25th Ave
Suite 205
Portland, Oregon 97202
USA

Phone:
503-206-5571
Fax:
866-215-1220
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4 Reasons Why Others are Adopting Cloud HPC and EDA Should Too!

March 11, 2021
Engineering, English, Semiconductor
Tanner Ham

With the complexity of transistors at an all-time high and growing foundry rule decks, fabless companies consistently find themselves in a game of catch-up. Semiconductor designs require additional compute resources to maintain speed and quality of development. But deploying new infrastructures at this current speed is a tall order for IT professionals tasked with supporting development and verification teams. When these resources can't keep up, engineers become compute constrained rather than compute empowered.

The semiconductor industry is not alone in the struggle to adopt new technologies that can accelerate the pace of science and engineering breakthroughs. For that reason, cloud solutions are increasingly being implemented to empower R&D in a way never before seen. Breakthroughs in aerospace design, new drugs and vaccines, alternative energy solutions, and much more are now being realized on cloud or cloud HPC infrastructures. Because of security and IP concerns, EDA companies have primarily maintained on-premise data centers for their computing needs. However, that preference is changing due to manufacturers such as TSMC endorsing cloud. The industry has also seen a rise in startups entering the industry that do not have the infrastructure of their own and are turning to the cloud to compete.

So let's look at the main benefits of expanding EDA to a cloud HPC environment.

Security

As companies look to move workloads to the cloud, the primary area of focus is how to protect sensitive information and IP. Recent research by Cloud Vision states, two-thirds of companies consider this the main roadblock in adopting cloud. In light of this, major cloud providers have put substantial focus and investment to reduce risks and safeguard datacenters from any breach. As you can imagine, with companies like AWS, Microsoft, and Google, no expense is spared to ensure they deliver a secure environment. As proof of these security measures, the public cloud will experience 60% fewer security incidents compared to typical data centers this year. For organizations that require full-stack compliance and security, platforms such as Rescale cover end-to-end workflows across the hardware and software layers with the highest of industry standards. Even going as far as obtaining industry-leading certifications to meet the strictest compliance requirements.

Agility

Never in our history has technological agility been more important than 2020. Facing a pandemic was the ultimate test of our systems and most companies found themselves not prepared. Being cut off from typical on-premise infrastructure caused delays across the industry. VPNs became overwhelmed as engineers struggled to access the data and resources needed to continue development and run verification. The need to enable remote teams is not the only consideration. Systems need to have the flexibility to scale with phases of projects and production deadlines. For these reasons, cloud far outperforms traditional infrastructures. It's accessible anywhere you can find a wifi connection and compute resources scale as needed. The Rescale platform also offers remote desktop solutions and a wide variety of admin controls over budgets and permissions to keep operations running smoothly. With the stability and options of a multi-cloud infrastructure and a variety of core types available on the platform, users can match the ideal core type to their workload and be confident in the stability of the infrastructure with a service level agreement that their job will run.

Impact and Productivity

Enabling engineers to focus on design means better products at a quicker pace. IT leaders need to look at the ways in which engineers are distracted or slowed from their core responsibilities. Companies spend top dollar to secure engineering expertise and talent and they should be working on the portion of the business where they will make the biggest impact. Distractions can come in the form of queues, slow workflows, license issues, and more. Rescale looks to solve these issues with an intelligent control plane and full-stack approach. Having an intelligent control plane for both local and cloud hardware allows R&D the ability to divert workloads to the best infrastructure based on performance and cost. A simple user interface with robust automation allows them to easily set up runs without relying on IT. And if they do come across a challenge, the Rescale support team is stacked with HPC and simulation experts that average a 15 min response time. All of this combines to allow engineers to be hyper-focused on what they do best.

Speed to Market

A major component of gaining a competitive advantage is to be first to market with a new product. This allows you to gain brand recognition, build customer loyalty, and secure market share before competitors are even in play. A cloud approach enables semiconductor companies to dial up the number of iterations and accelerate speed to answer. Additionally, verification is expedited with virtually unlimited resources available. When coupled with automated workflows, templates, and continuous optimization from the Rescale platform, companies can make substantial improvements.

pSemi used Rescale to substantially speed up their development process, "We were able to use Rescale's cloud platform to highly parallelize our simulations and bring the simulation time down from 7 days to 15 hours. We've demonstrated a 10x speed improvement on numerous occasions in our EM simulations using Rescale…"

The next wave of semiconductor advancements will be powered by the cloud. The foundries have already started to adopt the technology. It is poised to revolutionize the industry by empowering engineers like never before and reaching new levels of performance and efficiency.

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

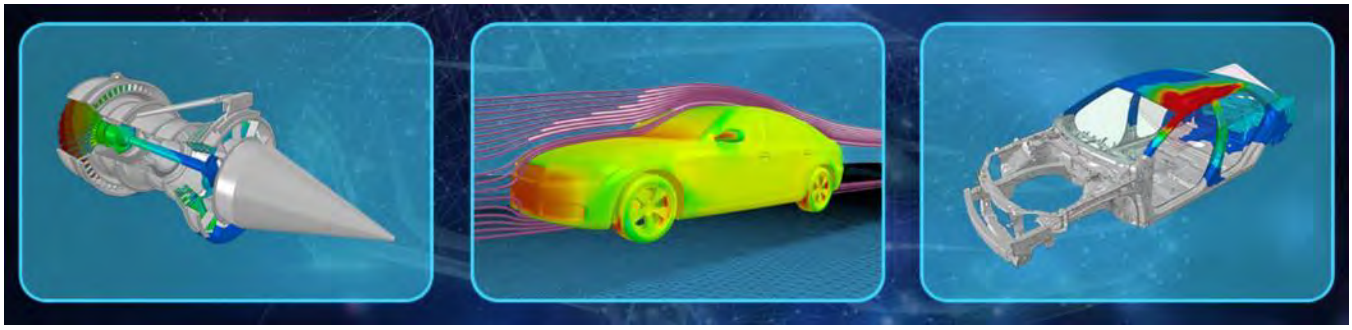
Shanghai Fangkun Software Technology Ltd

Shanghai Fangkun Software Technology Ltd. was authorized by ANSYS Inc as the domestic master distributor of LS-DYNA software. Shanghai Fangkun is fully responsible for domestic sales, marketing, technical support of LS-DYNA. By integrating and managing a wide range of resources such as LS-DYNA agents and partners, Shanghai Fangkun is focus on providing a strong technical support for domestic LS-DYNA users, and help customers to effectively use LS-DYNA software for product design and development.

Based on the strong technical support and developing capability from ANSYS Inc, Shanghai Fangkun attracts a group of top LS-DYNA application engineers and commit to provide LS-DYNA technical support in the automotive industry, electronics industry, rock-soil, aerospace, general machinery and other industries. Shanghai Fangkun devotes to providing all products of LSTC including LS-DYNA, LS-OPT, LS-PREPOST, LS-TASC and LSTC FEA models (dummies model, pedestrian model, etc).

In the meantime, Shanghai Fangkun also relies on strong technical support of ANSYS Inc and will focus on secondary development and process customization of LS-DYNA and its application process. In view of domestic users customization requirement, Shanghai Fangkun will concentrate on customizing custom interface based on LS-PREPOST processing platform, to adjust, standardize and analyzes specific process, improve the efficiency in application, reduce human error, accumulate experience of engineering application, improve customer R&D and competition capabilities.

Shanghai Fangkun will keep mission firmly in mind, devote to improving user satisfaction of LS-DYNA and providing high-quality technical support and engineering consulting services for users.



Contacts

Address: Room 2219, Building No.1, Global Creative Center, Lane 166, Minhong Road, Minhang District, Shanghai
Postcode： 201102 **Tel：** 4008533856 021-61261195
Sales Email： sales@lsdyna-china.com Technical Support Email：support@lsdyna-china.com

LS-DYNA Training Plan in 2021

Shanghai Fangkun has successfully held several series of LS-DYNA related webinars and training courses in 2020 and received much attention and feedback. Now Shanghai Fangkun release the training plan for 2021 as shown in the following table. Please follow us official Wechat "LSDYNA" to get latest information. All LS-DYNA users and those who interested in are welcome to attend. If you have any questions, please contact email **training@lsdyna-China.com, or dial 021-61261195, 4008533856.**

Date	Topic	Duration
Jan.	LS-DYNA Basic Training	2 days
Feb.	Introduction to LS-PrePost	4-8 hours
Feb.	Introduction to LS-Form & Stamp forming	4-8 hours
Mar	Crash & Safety analysis in LS-DYNA	2 days
Mar	Introduction to LS-Form & Stamp forming	4-8 hours
Apr	GISSMO failure model theory and application of LS-DYNA	4-8 hours
Apr	Simulation of battery crush and nail penetration in multiphysical field with LS-DYNA	4-8 hours
May	Concrete material model in LS-DYNA	2-4 hours
May	Introduction to S-ALE	4-8 hours
Jun	Drop analysis in LS-DYNA	4-8 hours
Jun	Introduction to Contact in LS-DYNA	4-8 hours
Jul	Introduction to EM in LS-DYNA	4-8 hours
Jul	Introduction to LS-OPT	4-8 hours
Aug	ICFD analysis in LS-DYNA	2-4 hours
Aug	LS-DYNA Basic Training	4-8 hours
Sep	Implicit analysis in LS-DYNA	4-8 hours
Sep	CESE analysis in LS-DYNA	2-4 hours
Oct	LS-DYNA application in constranit system	4-8 hours
Oct	Meshfree,SPG and Advanced finite element analysis in LS-DYNA	4-8 hours
Nov	LS-DYNA composite material model training	4-8 hours
Nov	LS-DYNA Thermal-structural-Coupling Analysis	4-8 hours
Dec	LS-DYNA Welding Analysis	4-8 hours
Dec	NVH, Frequency domain and fatigue in LS-DYNA	4-8 hours

Shanghai Fangkun Software Technology Ltd. was authorized by ANSYS Inc as the domestic master distributor of LS-DYNA software and will keep mission firmly in mind, devote to improving user satisfaction of LS-DYNA and providing high-quality technical support and engineering consulting services for users.

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

TERRABYTE Co.,Ltd.
Customer Satisfaction by Computer Solution & Computer Simulation

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

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

FE analysis

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

CFD analysis

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

EM analysis

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

Metal sheet

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

Pre/ Post

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

Biomechanics

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

2022 Chevrolet Bolt EUV introduced along with revised Bolt EV

Yes, there are now two Bolts, which won't be confusing at all

JAMES RISWICK
Feb 14th 2021 at 4:00PM

Chevrolet always tried to market its Bolt electric car as a crossover, but the tall, skinny hatchback wasn't fooling anyone. Now, the brand is making more of a go at it with the reshaped and slightly embiggened 2022 Chevrolet Bolt EUV. Except it's not a replacement for the old car – it's an addition to an expanded lineup that still includes the old body style, albeit revised with many of the same elements as its more SUVish sibling.

The key difference between the pair, besides a letter U, is in the EUV's stretched wheelbase. Growing nearly 3 inches, it contributes to a commensurate increase in rear seat legroom – one of the areas of improvement indicated by current Bolt EV owners. They were apparently fine with the cargo capacity since it's virtually identical: 16.6 cubic-feet with the back seat up in the EV and actually a wee bit smaller at 16.3 in the EUV. The EUV's overall length is also 6.3 inches longer, but it's only 0.2 inch wider and taller, its track is stretched 0.4 inch and the curb weight is only 90 pounds more. So yeah, it's really not that much bigger.

Bolts EV and EUV share the same carryover electric powertrain: a single motor and gearset that sends 200 horsepower and 266 pound-feet of torque to the front wheels only. Chevrolet says that all-wheel drive isn't a requisite for a crossover. The battery is also the same as before (no Ultium for the Bolt), a 65 kWh pack that continues to provide 259 miles of range for the EV and a minor reduction to 250 for the bigger EUV. No complaints there.

Both come standard with DC fast charging capability that allows the Bolts to recharge up to 100 (EV) or 95 (EUV) miles worth of electricity in 30 minutes. A dual-level charge cord is also available (standard EUV, optional EV) meaning you don't need separate 120-volt and 240-volt cords, though this is now commonplace in electric and plug-in hybrid vehicles.

Chevrolet also announced that it is now offering to cover the installation cost of 240-volt charging capability for its customers, which is a great incentive worthy of more attention than Chevy gave it during a brief product presentation Friday. Note that this doesn't include a separate charger. Rather, it's covering the cost of installing a 240-volt outlet you can plug the dual-level charge cord into. Although installation costs can vary by job, Chevrolet says that there should be enough economies of scale to make the program work financially (though they did acknowledge that there might be some extreme examples that might disqualify someone from the offer).

The interior sees the biggest change for the Bolt EV with a new design shared with the EUV. It's more horizontally oriented with a center stack that's less pod-like. The standard 10.2-inch touchscreen returns, but it has an all-new UI, plus support from now-standard wireless charging, Apple CarPlay and Android Auto.

Two more customer requests were addressed inside: more comfortable seats, please, and better interior materials. We can't comment on the seats yet, but the materials are quite obviously nicer. The old Bolt's unusual light gray plastics always came off vaguely like they were sourced from a hot tub. These seem more normal and there's even some pleather stitched on the dash per current fashion. The switchgear also gets an upgrade with rows of glossy black HVAC buttons more clearly separated from those for the infotainment system (it retains knobs for volume and redundant screen control plus a menu button).

Down on the redesigned center console is a new push-and-pull button shifter, not unlike Honda's, replacing the unloved electronically controlled lever that can still be found in various other GM vehicles. A fifth button (the green one) is added to engage one-pedal driving. Previously in electrified Chevys, going all the way back to the original Volt, you'd engage one-pedal driving by dropping the gear lever into L. That was obviously unintuitive; this is better. The new flat-bottom steering wheel also adopts GM's distinctive Regen on Demand paddles.

The exterior styling is far bolder, highlighted by Chevy's "high-eye" LED lighting elements, separate headlight units below. Will it be everyone's cup of tea? Perhaps not, but to our eyes, the look is far less dorky.

Though it's awfully hard to tell the new EUV and refreshed EV apart from a glance, they actually don't share any sheetmetal. Key tells including the black trim that connects the mirrors to both lighting elements on the EV and the differing lower bumper trim. The EV has a bit of colored trim bifurcating the airdam; the EUV has some SUVish chrome chin cladding. The EUV's rear is a big boxier, its taillights look like Y's on their sides and the black bumper trim extends further up. There are also differences in the upper rear quarter panel where the ubiquitous floating roof effect is created. In profile, you can note the differing body sculpting and window lines. In total, the EUV looks less like a tall, narrow hatchback, but its position as a crossover is still a bit tenuous.

Finally, pricing for the 2022 Chevrolet Bolt EV plunges by $5,000 despite the nicer interior and presence of now-standard driver assistance tech (the Bolts will also be the first Chevrolets and GM EVs to be available with Super Cruise). The base price, including destination, is $31,995. The Bolt EUV is only $2,000 more at $33,995, which makes you wonder a bit why Chevy even bothered keeping the original around at all. Especially considering their similar looks and sizes, plus the potential confusion of marketing two vehicles of the same name, plus or minus a U. That whole Bolt/Volt thing was bad enough.

Also, keep in mind that the Bolts are not eligible for the $7,500 federal tax credit applicable to most other EVs. Like Tesla, since Chevrolet started down Electric Avenue so early with the Volt and Bolt, it exhausted the finite number of credits granted to each manufacturer. One can certainly debate the merit of that given the supposed point of the credits is to encourage the purchase of electric cars. Nevertheless, that's the situation, and it's possible that state and local tax credits may still apply. Speaking of states, the Bolts will be sold in all 50 of them, but only 1,300 of Chevy's 3,000 dealers will sell them. Not all meet the requirements for service and sales of electric cars, nor the DC fast charging at dealers. Many, presumably, also have no interest in one of these newfangled things when their customers just want Silverados and Tahoes.

Fair enough, but GM has announced quite clearly that its future is electric, and with another Bolt in its toolbox, that future is one step closer.

Read from website

LS-DYNA - Resource Links

LS-DYNA Multiphysics YouTube

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

FAQ LSTC

ftp.lstc.com/outgoing/support/FAQ

LS-DYNA Support Site

www.dynasupport.com

LS-OPT & LS-TaSC

www.lsoptsupport.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/mailinglist

AEROSPACE WORKING GROUP

http://awg.lstc.com

Training - Webinars

Participant's Training Classes

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Info Days

Class Directory

Directory

ANSYS	https://www.ansys.com/services/training-center
BETA CAE Systems	www.beta-cae.com/training.htm
DYNAmore	www.dynamore.de/en/training/seminars
Dynardo	http://www.dynardo.de/en/wost.html
ESI-Group	https://myesi.esi-group.com/trainings/schedules
ETA	http://www.eta.com/training
KOSTECH	www.kostech.co.kr
ANSYS LST	www.lstc.com/training
LS-DYNA OnLine - (Al Tabiei)	www.LSDYNA-ONLINE.COM
OASYS	www.oasys-software.com/training-courses
Predictive Engineering	www.predictiveengineering.com/support-and-training/ls-dyna-training

Contact : 513-331-9139
Email : courses@lsdyna-online.com

LS-DYNA LIVE ONLINE TRAINING & CONSULTING SERVICES

Lsdyna online was created by the LSTC instructor after 25 years of teaching various LS-DYNA courses for LSTC nationally and internationally (more than 20 countries). The online company was established in 2012 and we have been providing many live interactive courses to many companies and organizations. We do consulting work in addition to instructions. Here are some courses, for full list see our webpage.

1. Introduction to LS-DYNA (2 days @ $800)
December 11-12

2. Composites in LS-DYNA (2 days @ $1000)
October 1-2

4. Fracture, Damage, & Failure (2 days @ $1000)
October 5-6

5. Fluid Structure Interaction (2 days @ $1000)
September 29-30

6. Material Models Tests to Simulation (2 days @ $1000)
October 8-9

3. Contact in LS-DYNA (2 days @ $1000)
October 12-13

13. Plasticity, Plastics, & Visco-Plasticity (2 day @ $1000)
November 2-3

14. Penetration Using LS-DYNA (2 days @ $1000)
June 15-16

15. Composite Materials (1 day @ $500)
October 30

16. Blast using LS-DYNA (2 days @ $1000)
November 5-6

17. Introduction to LS-PREPOST (1 day @ $500)
November 4

18. Advance LS-PREPOST (1 day @ 500)
email us for dates

About Tabiei

Dr. Al Tabiei has been a consultant on the use of large scale finite element simulation for more than 25 years to more than 80 large and small companies and government labs in the US and abroad. He was the director of the Center of Excellence in DYNA3D Analysis at the University of Cincinnati (1997-2001). He has more than 150 journal, refereed reports, and conferences papers
He lectured at nearly 20 countries. He also did code development for LSTC. The instructor has developed and implemented many material models in LS-DYNA. Composite Shell element for composite materials and various other development in the code. He was consultant to the US government for several years on the use of simulation for home land security problems. He has served as a Subject Matter Expert (SME) for the government for more than 20 years. He was also on a NASA team for the return to the moon program to investigate different landing scenarios (2006-2010).

Multiphase flow CESE solver in LS-DYNA

Zeng-chan Zhang, Grant Cook, Jr. & Kyoung-su Im

Livermore Software Technology, an ANSYS Company, Livermore, CA 94551, USA

Abstract

In this paper, we will introduce a new capability of multiphase flow simulations in the LS-DYNA CESE compressible solvers. It is a hybrid multiphase flow model proposed by L. Michael [1]. This model is targeted for high-speed explosions, especially shock-to-detonation transition in liquid nitromethane. While the space-time conservation element and solution element (CESE) method, originally proposed by Chang [2], is designed for solving compressible flows, it is especially good for high-speed flows with complicated flow patterns. So we will use the CESE method to solve this hybrid multiphase flow model, and this approach will avoid a lot of complicated and time consuming treatments such as Riemann solvers and the Strang-splitting that are used in Ref.[1]. Our numerical examples show that we can get similar results using the CESE method. In the next sections, we will first give a brief introduction to the hybrid multiphase model, then the CESE method. Finally, we will give some numerical examples.

Hybrid multiphase model

Multiphase and multicomponent flows are very common in many engineering applications such as fuel sprays in combustion processes, ammonium-nitrate-based explosion in mining, and liquid-jet machining of materials. In past decades, many different multi-phase flow models have been proposed, and each one has its merits and limitations. A hybrid multiphase flow model proposed by L.Michael [1] is one of them. This multi-phase model is based on an augmented Euler approach to account for the mixture of the explosive and its products. It integrates the advantages of the augmented-Euler and Baer-Nunziato (BN)-type formulations while allowing for the interaction of an inert component with the reactant-product mixture, through a diffuse interface approach. Reduced versions of this formulation include modelling cases where the inert component is not present, when explicit modeling of the products of reaction is not required, or even when the phases are all non-reacting and could form free-surfaces. The main usage of this model is the numerical simulation of combustion and transition to detonation of condensed-phase commercial and military grade explosives, such as the propagation of detonations in compliantly-confined charges and the sensitization of commercial explosives by means of collapsing micro-balloons and shock-induced cavity collapse in liquid explosives.

The full conservation form system of equations for this model can be written as:

$$\frac{\partial U}{\partial t}+\frac{\partial F}{\partial x}+\frac{\partial G}{\partial y}+\frac{\partial H}{\partial z}=S \tag{1}$$

With

$$U=\begin{Bmatrix} z_1\rho_1 \\ z_2\rho_2 \\ \rho u \\ \rho v \\ \rho w \\ \rho E \\ z_1 \\ z_2\rho_2\lambda \end{Bmatrix},\qquad F=\begin{Bmatrix} z_1\rho_1 u \\ z_2\rho_2 u \\ \rho u^2+P \\ \rho uv \\ \rho uw \\ u(\rho E+P) \\ z_1 u \\ z_2\rho_2\lambda u \end{Bmatrix},\qquad G=\begin{Bmatrix} z_1\rho_1 v \\ z_2\rho_2 v \\ \rho uv \\ \rho v^2+P \\ \rho vw \\ v(\rho E+P) \\ z_1 v \\ z_2\rho_2\lambda v \end{Bmatrix},$$

$$H = \begin{Bmatrix} z_1\rho_1 w \\ z_2\rho_2 w \\ \rho u w \\ \rho v w \\ \rho w^2 + P \\ w(\rho E + P) \\ z_1 w \\ z_2\rho_2\lambda w \end{Bmatrix}, \quad S = \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ z_1\nabla\cdot(u,v,w) \\ K \end{Bmatrix}$$

If two-dimensional axisymmetric cases are considered, an additional geometric source term should be included in S. Also in the source term, K is a function giving the rate of conversion of reactants to products. Depending on the reaction rate law form used, term K usually depends on the temperature or pressure of the mixture, as well as the total density, the density of material 2 and λ. z_1 and z_2 are volume fractions of material 1 and 2 with respect to the volume of the total mixture with density ρ respectively, and we have $z_{1+}z_2 = 1$; For example, if we consider a gas-filled cavity embedded in a liquid explosive, collapsing due to its interaction with an incident shock wave, the gas can be treated as material 1 with density, velocity and pressure given by (ρ_1, V_1, p_1), and the heterogeneous reactant-product mixture as material 2, with properties (ρ_2, V_2, p_2). The two components are separated by a material interface, and physical mixing between the two is not observed. Mechanical equilibrium (velocity and pressure) is assumed between the two materials, while thermal equilibrium (temperature) is assumed only between the components representing the reactants and products, i.e., the components that are allowed to physically mix.

Material 2 is composed of two components; the explosive reactants (material α), with properties $(\rho_\alpha, V_\alpha, p_\alpha)$ and the explosive products (material β), with properties $(\rho_\beta, V_\beta, p_\beta)$. The mass fraction of material α with respect to the explosive mixture with density ρ_2 is denoted by λ. As a result, the mass fraction of material β with respect to the explosive mixture is given by 1- λ. Velocity and pressure equilibrium between the two constituents of the heterogeneous mixture is assumed, such that $V_\alpha = V_\beta = V$ and $P_\alpha = P_\beta = P$. Effectively, all three materials in the system (i.e. material 1, α, and β) are in velocity and pressure equilibrium. Temperature equilibrium is only assumed between the constituents of the explosive mixture, i.e. $T_\alpha = T_\beta$.

This multiphase flow model is focused on high-speed explosion and it exactly matches the CESE method's key capabilities, so this multiphase flow model will be solved using the CESE method under our dual CESE framework.

CESE Method

The simulation of multiphase flows poses far greater challenges than that of single-phase and single-component flows. These challenges are due to interfaces between phases and large or discontinuous property variations across interfaces between phases and/or components. In ref.[1], a conventional Godunov (MUSCL-Hancock) scheme is used, plus a Strang-splitting to account for multiple dimensions. A hierarchical adaptive mesh refinement (AMR) is also used to increase the resolution of shocks and material interfaces. Furthermore, an energy correction step is adopted in order to suppress the numerical oscillations near the smeared material interfaces. It is not only complicated, but also time-consuming.

The space-time conservation element and solution element (CESE) method proposed by Chang [2] is especially designed for high speed compressible flows. It has several nontraditional features such as (i) a unified treatment of space and time, thereby ensuring good conservation in both space and time; (ii) simple but efficient discontinuity (shock) treatments. It is particularly useful for complex flows with shock waves and/or detonations. Here we use the CESE method to solve the aforementioned hybrid multiphase flow model under our dual mesh CESE framework.

In order to use the CESE method, Eq. (1) is rewritten as:

$$\nabla \cdot h = S \tag{2}$$

Where $h = (F, G, H, U)$ and $\nabla = (\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}, \frac{\partial}{\partial t})$. Here the time coordinate is treated as the fourth dimension in three dimensional cases. Applying Gauss's divergence theorem in the space-time domain, Eq. (2) is the differential form of the integral conservation law

$$\oiint_{s(V)} h \cdot ds = \iiint_V S \tag{3}$$

Where $s(V)$ is the boundary of an arbitrary closed space-time region V and $ds = d\sigma n$ in which $d\sigma$ and n are the length (area or volume) and unit outward normal vector of a microelement on $s(V)$ respectively.

Now the fluid domain will be divided into nonoverlapping elements (mesh). In the CESE method, there is no limitation to the element shape; for example, Fig. 1(a) shows a two-dimensional spatial mesh (triangles and quadrilaterals mixed). In our new dual CESE framework, the flow variables are solved and stored on two different sets of nodes (denoted as solution point (SP)) in two successive time steps. One set is associated with the element centers (C_i is Fig.1(a)), the other set is associated with the element vertices (A_i in Fig.1(a)) (but not necessarily coincident with it).

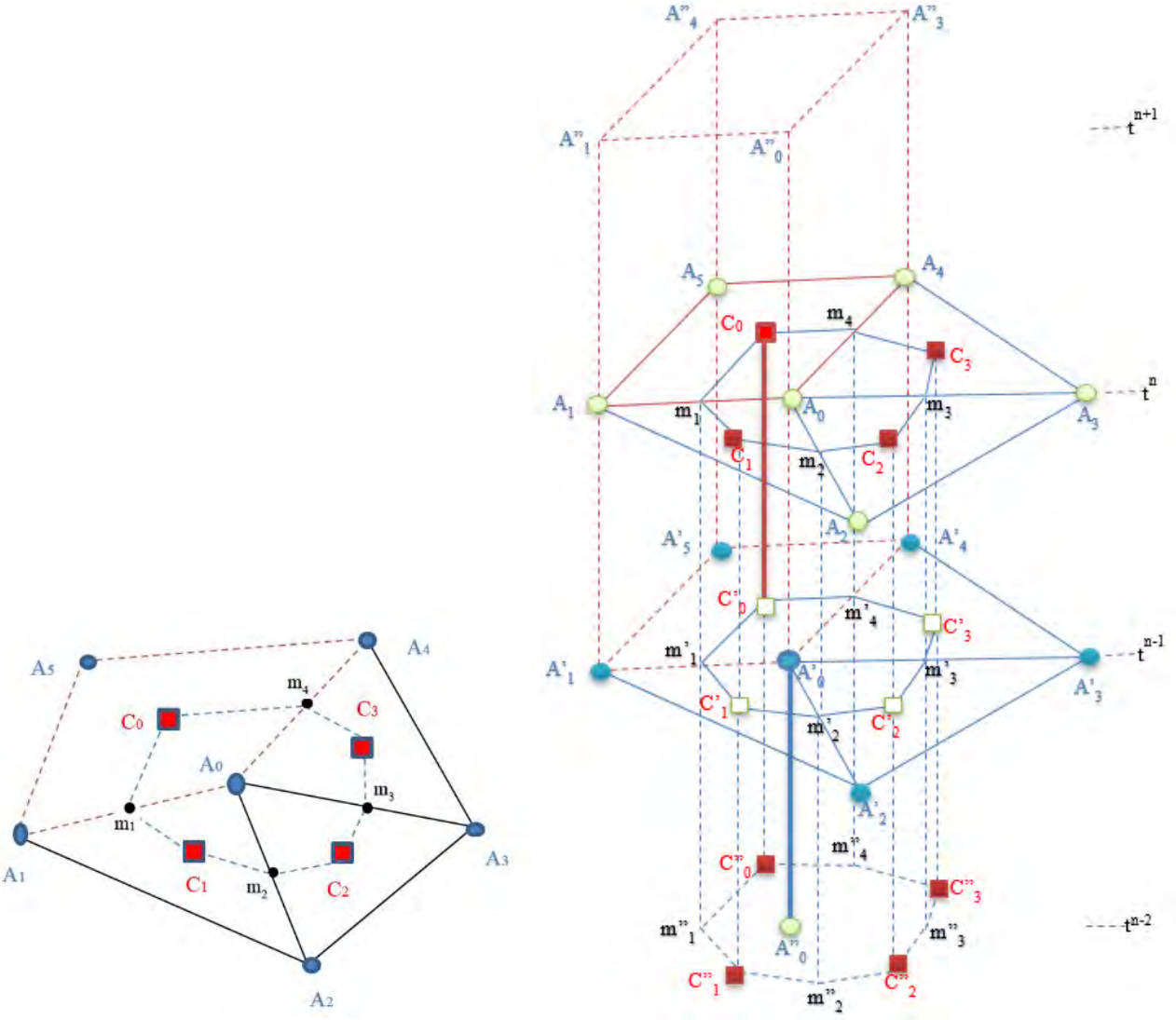
There are two important concepts in the CESE method, i.e., conservation element (CE) and solution element (SE), that is where the CESE name comes from. Associated with each solution point, there is a CE and a SE. Different definition of the CE and SE will make the CESE method a little different. Fig.1(b) shows the CE and SE definitions in our dual mesh CESE method for a two-dimensional hybrid mesh. If at $t=t^n$, the element center solution point value are updated, then the CE associated with element center C_0 is defined as the quadrangular cylinder $A'_0A'_1A'_4A'_5A_0A_1A_4A_5$, while the SE is defined as the quadrangular cylinder $A_0A_1A_4A_5A"_0A"_1A"_4A"_5$. Similarly, the CE associated with vertex A_0 at $t=t^{n-1}$ will be the polygonal cylinder $C"_0m"_1C"_1m"_2C"_2m"_3C"_3m"_4C'_0m'_1C'_1m'_2C'_2m'_3C'_3m'_4$, while the SE is defined as the polygonal cylinder $C'_0m'_1C'_1m'_2C'_2m'_3C'_3m'_4C_0m_1C_1m_2C_2m_3C_3m_4$ (see Fig.1(b)).

Inside each SE, the flow variables are approximated by a first-order Taylor expression, e.g. in two dimensional cases,

$$U(x, y, t) = U(x_0, y_0, t^n) + \Delta x U_x(x_0, y_0, t^n) + \Delta y U_y(x_0, y_0, t^n) + \Delta t U_t(x_0, y_0, t^n) \tag{4}$$

Where $\Delta x = x - x_0$, $\Delta y = y - y_0$, $\Delta t = t - t^n$ and (x_0, y_0, t^n) are the coordinates of solution point C_0 in space-time. Since the time derivative U_t can be calculated by Eq. (1), there are only three set of unknown variables that need to be approximated, i.e., U, U_x and U_y.

In each CE, the conservation law Eq. (3) is enforced to obtain the main flow variables U. For the other two set of spatial derivatives, there are different ways to get it. For example, the conservation law Eq. (3) can be applied in the sub-conservation elements (sub-CE), e.g., the sub-CE of quadrangular cylinder $m'_1A'_0m'_4C'_0m_1A_0m_4C_0$, to get some additional discrete equations to solve other two sets of unknows. Another way is to use flow variable information at neighboring points, plus some derivatives calculation strategies. Of course, when there is a discontinuity or shock in the flow field, limiters of some kind (such as some weighting strategies) are also needed to suppress the overshoot and/or undershoot. Here in our CESE solver, we developed a very simple but efficient method for calculating derivatives for shock capturing.



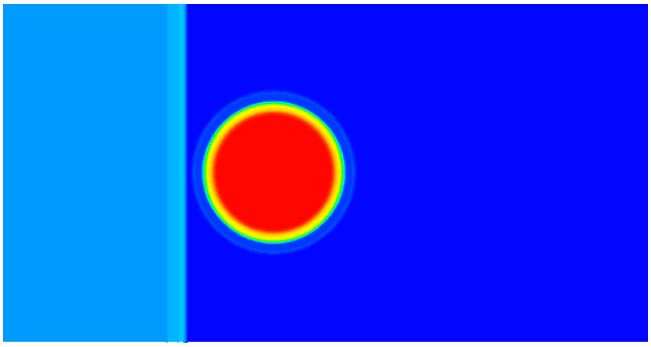
(a) (b)

Fig. 1 (a) Schematic 2D spatial mesh grids and (b) definitions of CE and SE in space & time under dual CESE framework

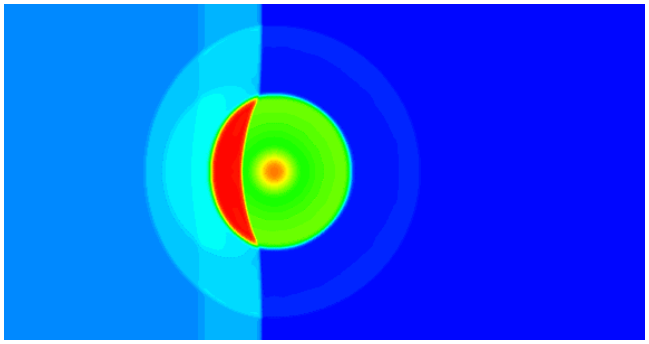
Numerical examples

1. Planar shock interaction with cylindrical gas bubbles

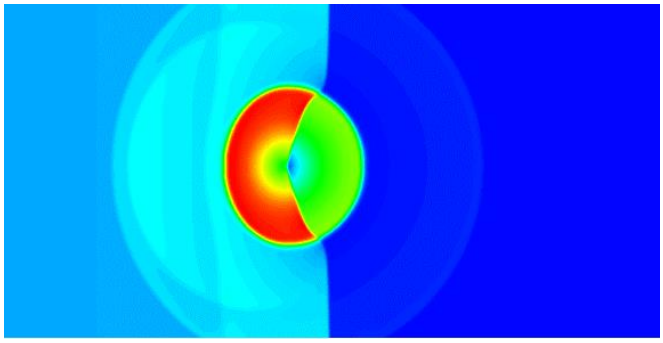
In this example, we use one of the reduce cases of the aforementioned hybrid model, i.e., two immiscible materials multiphase model, to test a planar shock wave interaction with an isolated bubble. Initially, a relatively weak shock in air with shock Mach number equal to 1.22 impacts a cylindrical bubble filled with refrigerant. Details about this problem's setup and the experimental results can be seen in Ref. [3]. The shock is initially located in front of the bubble at x=0.05 and moving from left to right. Fig. 2 shows four snapshots before and after the shock impacts the bubble. These results agree well with the results of Ref. [3], where they use a Godunov method (so some kind of Reimann solver is needed) and an energy correction technique is also needed to suppress the numerical errors near the interface. They also use adaptive mesh refinement (AMR) to increase the shock resolution. But here we only use the CESE method with a uniform mesh (with far fewer mesh elements) to get similar results.



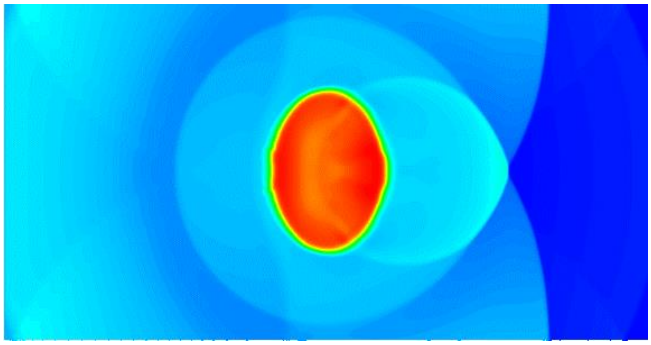
t=0.02



t=0.08



t=0.16

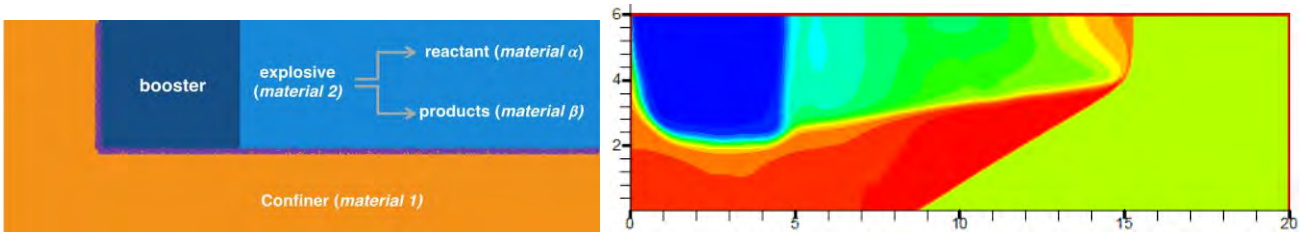


t=0.35

Fig.2 Planar shock interaction with a helium-filled bubble at four different time (density contours)

2. Detonation propagation in a JWL rate stick with confinement

This is the example in Ref. [1], where a slab of explosive in a stick form is confined by an inert material, as illustrated in Fig. 3 (a). The explosive (LX-17) is initiated by a booster of the same material. The equation of state (JWL) and reaction rate law parameters are scaled with respect to appropriate reference quantities. This problem is cylindrically symmetric, with axis of symmetry the centerline of the rate stick, and only the bottom half of the domain is simulated. Fig. 3 (b) shows the numerical results of density at t=11 using the CESE method, it agrees well with the results in Ref. [1], but without adaptive mesh refinement, operator splitting and an energy correction approach. Also, no Riemann solver is needed when using the CESE solver.



(a) (b)

Fig. 3 (a) Schematic of confined JWL rate-stick and (b) numerical results of density at time t=11

References

[1] L.Michael, N.Nikiforakis, A hybrid formulation for the numerical simulation of condensed phase explosives, J. Comp. Phys. 316 (2016) 193-217.

[2] S.C. Chang, The space-time conservation element and solution element – a new approach for solving the Navier-Stokes and Euler equations. J. Comp. Phys. 119 (1995) 295-324

[3] J.W. Banks, D.W. Schwendeman, A.K. Kapila, W.D. Henshaw, A high-resolution Godunov method for compressible multi-material flow on overlapping grids, J. Comp. Phys. 223 (2007) 262-297

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 of LST, an ANSYS company to provide an integrated solution in the field of optimization.

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.

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

ETA – Engineering Technology Associates www.eta.com
etainfo@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.

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.

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.

Visual*DSS* 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. Visual*DSS* 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.

LST

Livermore Software Technology, an ANSYS Company
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 LST, an ANSYS company. 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.

LST, AN ANSYS COMPANY 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.

LST, AN ANSYS COMPANY Barrier Models

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

Material Sciences Corporation www.materials-sciences.com

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

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

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

MSC/LS-DYNA Composite Software and Database -

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

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

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

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

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

Oasys PRIMER

Key benefits:

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

www.oasys-software.com/dyna

Oasys D3PLOT

Key benefits:

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

www.predictiveengineering.com

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

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

Our History

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

恒士达科技
Hengstar Tech.

Shanghai Hengstar www.hengstar.com

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

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

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

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

Consulting

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

Cloud - HPC Services - Subscription JSOL

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

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

JSOL Corporation is cooperating with chosen cloud computing services

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

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

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

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

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

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

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

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

Platform Computation Cloud - CreDist.Inc.

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

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

Cloud - HPC Services - Subscription RESCALE

www.rescale.com

Rescale: Cloud Simulation Platform

The Power of Simulation Innovation

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

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

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

True On-Demand, Global Infrastructure

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

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

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

ScaleX Enterprise: Transform IT, Empower Engineers, Unleash Innovation

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

Rescale Cloud Simulation Platform

www.rescale.com

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

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

Industry-Leading Security

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

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

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

LSTC - DYNAmore GmbH JSOL Corporation

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

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

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com

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

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

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

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

Virtual Performance Solution:

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

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

The benefits of VPS hybrid on ESI Cloud include:

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

VPS On Demand

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

Key solution capabilities:

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

Result visualization

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

Key result visualization capabilities:

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

Collaboration

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

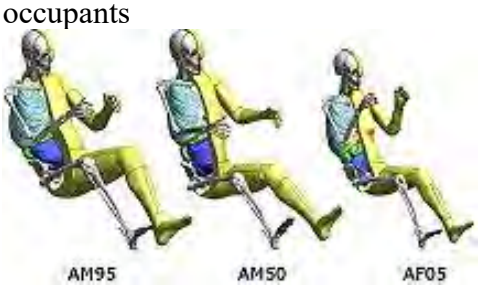
Key collaboration capabilities:

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

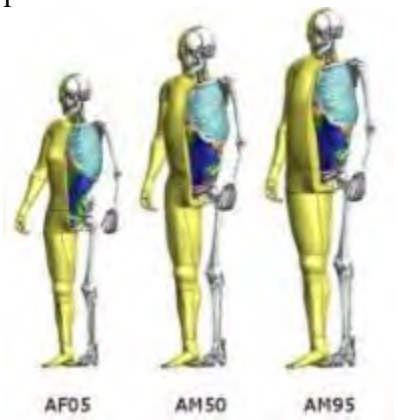
TOYOTA - Total Human Model for Safety – THUMS

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.

LST, An ANSYS Company – Dummy Models

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

LST, An ANSYS Company – Barrier Models

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

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

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

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

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

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

Social Media

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CADFEM

LINKEDIN

BETA CAE Systems
CADFEM
DYNAmore Nordic
ETA
ESI Group

YOUTUBE

YOUTUBE Channel	WebSite URL
BETA CAE Systems	www.beta-cae.com
CADFEM	www.cadfem.de
ESI Group	www.esi-group.com
ETA	www.eta.com
Lancemore	www.lancemore.jp/index_en.html
LS-DYNA OnLine - (Al Tabiei)	https://www.youtube.com/user/LSDYNATV

GOOGLE+

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