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LSTC Livermore Software Technology Corp.

Volume 8, Issue 5, May 2019

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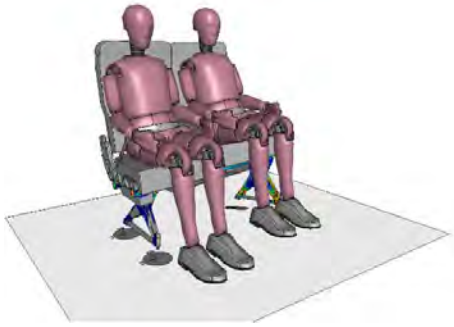
BETA CAE

ESI Group

LSTC



OASYS

FEA Information Engineering Solutions

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The focus is engineering technical solutions/information.

FEA Information China Engineering Solutions

www.feainformation.com.cn

Simplified and Traditional Chinese

The focus is engineering technical solutions/information.

LSTC - Livermore Software Technology Corp.

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

www.lstc.com

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

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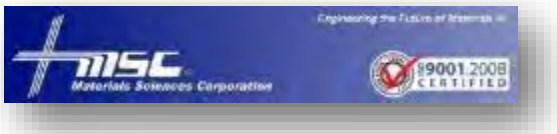
Platinum Particpants



Platinum Particpants

Table of contents

Announcements

LSTC Executive Vice President

As of March 04, 2019 Nathan Asher Hallquist has been appointed Executive Vice President of LSTC.

We are pleased to announce the appointment of Nathan Asher Hallquist to the position of Executive Vice President, effective March 4, 2019. With this appointment LSTC renews its commitment to the business model that our customers and partners have long valued and come to expect.

2019 China LS-DYNA Conference **October 21-23, Shanghai, China**

The 4th China LS-DYNA Users' Conference will be held on October 21st - 23rd, 2019 in Shanghai by LSTC and Shanghai Fangkun. LSTC will share the latest product function and development strategy during the conference. We will invite domestic and foreign experts, developers and engineers from LSTC, and customers to share their experience and successful cases with LS-DYNA, to discuss the latest features and developments in LS-DYNA, and to explore industrial development trends. There will have pre and post-conference training classes being held on Oct. 21st, 24th and 25th.

We wholeheartedly welcome your paper submission and attendance.

Conference Website: conference.lsdyna-china.com/

JSOL CAE Forum 2019 **November 6 - 8, Tokyo, Japan**

JSOL Corporation is holding the "JSOL CAE Forum" to provide our users with the latest and most comprehensive simulation technologies and case studies for various JSOL CAE packages including LS-DYNA.

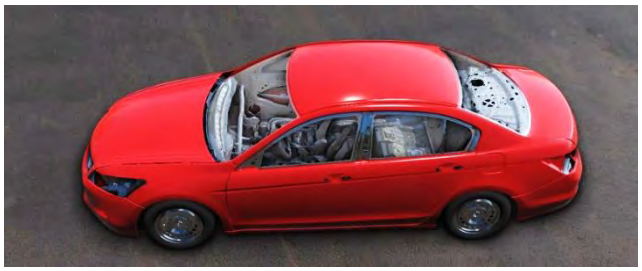
Venue: Tokyo Conference Center Shinagawa
1-9-36 Konan Minato-ku Tokyo Japan

Conference Website: https://www.jsol-cae.com/en/event/usersevent/2019/caeforum/

2019 Journals – Q2 ***FEA Information Engineering Journal (FEAIEJ™)***

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

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



BETA CAE Systems announces the release of the v19.1.2 of its software suite

About this release

BETA CAE Systems announces the new release v19.1.2 of ANSA/EPILYSIS/META suite.
Apart from fixes in the detected issues, this version also hosts numerous noteworthy enhancements and implementations. The most important enhancements and fixes implemented are listed below.

Contents

Enhancements and known issues resolved in ANSA

Enhancements in ANSA

Data Management

A new function "dm.SaveLibraryItem()" is now available, which allows saving rich library items to DM.
Furthremore, it is now possible to control the User Attributes, which will be written in the DM Header, during the output of Model Browser containers. The attributes that need to be included in the DM Header are specified in the respective ANSA.default setting for each Model Browser container (ex. SubsystemAdditionalAttributesInDmHeader).

Connections & Assembly

In the Connection Manager interface, apart from the Highlight of FE Rep. Settings property IDs that is now available, tooltips for fields indicating property IDs have also been added.
Specifically, when a field in FE Rep. Settings of Connection Manager points to a property ID, then a tooltip is created dynamically with the property name, in case there is a corresponding property with the given ID of field's line edit.

Shell Mesh

Significant performance improvements in the drawing of FE perimeters have been implemented, applying in actions such as:
Deleting a FACE, focusing on a FACE, changing from TOPO to MESH menu and vice-versa, opening a list (e.g. Properties).
Tools
Unit conversion is now supported for Parts fields, such as:

- Transformation matrix (x,y,z)
- Area
- Mass
- COG

This implementation can be verified by performing actions, such as apply Sync representation on the multi-instances.

Known issues resolved in ANSA

GUI

As far as the Drawing Styles are concerned, Fringe Color palette would not be displayed, in case "Use unique color for each range" option was enabled through the "Color Bar Options" and graph other than QGRAPH was selected.

Model Browser

The deletion of the Configurations would not be successful and the PID values would not be updated in the respective column, when their values were modified via script.
Moreover, "DM Status Update" column would not be updated after performing actions like: create mesh, erase mesh, fill hole, etc.

Compare

Upon execution of "Apply similarities/differences" function, FE mesh would not be copied among models.

FE Representations

A SOLID-WELD seamline that formed a closed loop would unexpectedly fail to realize.

Data Management

Excessive time would be taken when additionally saving JT file ("Light Representation" option), under Subsystems > Save in DM.

Connections & Assembly

Conversion of FE-entities referenced by different Modules into ANSA connection points would lead to abnormal termination, as well as to ANSA databases prone to get corrupted, once recovered.

Volume Mesh

Execution of Octree > Hextreme function would lead to unexpected termination on Windows OS.

Batch Meshing

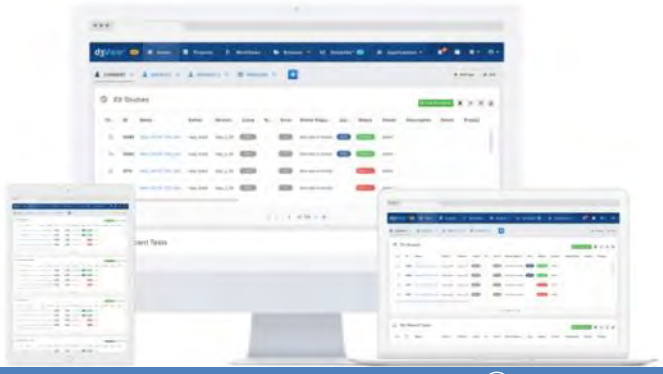
Speaking of Mesh Parameters [Features], "Defeaturing=remove" treatment for logos would not be applied, when CFD mesh algorithm was selected.

Laminates

Elements with no plies assigned would not be created during input of a Simulayt .Layup file.

For more details about the new software features, enhancements and corrections please, refer to the Release Notes document.

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



d3VIEW™

Turn LS-DYNA® data into decisions

HPC
Job Submission
Live Preview
Reporting and Statistics
On-premise and Cloud

Analytics
40+ Visualizers
Identify patterns in Data
Reporting to PDF/PPT

Experiments
Manage Safety and NVH
Compare with Simulations
Search Historical data

LS-DYNA
Extract data from any file
Perform DOE using LS-OPT
Web-based 3D Visualization
Explicit and Implicit

Workflows
Build and deploy workflows
Characterize materials
Model sequential impacts

Templates
400+ Math Expressions
Import from Library
Safety and NVH

http://www.d3view.com
contact marsha@lstc.com for more information

DYNAmore GmbH Company profile

The DYNAmore GmbH is the core of the DYNAmore Group and was established in 2001. In 2011 DYNAmore acquires ERAB Nordic, which is now well known as DYNAmore Nordic. At the same time, DYNAmore is assigned as Master Distributor for LS-DYNA in Europe. Also in 2011, the subsidiary DYNAmore SWISS is established, followed by DYNAmore Italia in 2013, DYNAmore France in 2015 and DYNAmore Corporation in 2017.

Services

DYNAmore is your contact partner for professional consulting in the CAE world.

We are first choice for pilot and development projects concerned with the simulation of nonlinear dynamic problems. Secured and qualified support for all application fields, FEM calculation services and general consulting on the subject of structural dynamics are counted among our services. The services provided also include software development for finite element solver technology and simulation data management as well as consulting and support for modern, massively parallel computer systems.

Customers

We are working with over 400 industrial companies and more than 150 universities in Europe and the US.

The majority of our customers are from the automotive and aerospace industry. Many companies value the services of DYNAmore. Some examples:

- 9 of the 10 largest car companies are our customers
- 7of the 10 world wide largest automotive suppliers are our customers.
- All OEMs located in Germany are customers of DYNAmore.
- 7 of the 10 largest German automotive suppliers are our customers.
- The dummy models developed by DYNAmore are used by almost all OEMs world wide.
- The majority of suppliers for crash relevant parts in the automotive industry use LS-DYNA.
- The vast majority of German engineering services companies for the crash simulation are customers of DYNAmore.

Facts

- The DYNAmore GmbH has 60 employees, which are located in 5 offices in Germany.
- Together with the affiliated companies we are 130 people from 18 different countries.
- The percentage of female staff is above 29 %.
- The fluctuation of employees is with 2% very low.
- We work closely with our subsidiaries in Sweden, France, Switzerland, Italy and the US.
- Our affiliated company SCALE works in the field of collaborative engineering for simulation.

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.

Casting the future of Mobility

June 25-29, 2019 - Düsseldorf, Germany - Hall 11 H39

Electrification is creating new market opportunities for the casting industry. To find the right balance between quality, cost, and range; engineers are rethinking die casting to achieve the best lightweight manufacturing strategy.

- Designing as castings complex parts such as battery housing, electric motors or power electronics
- Casting High Quality Lightweight components with new materials such as Aluminum

ESI ProCAST allows foundries to simulate the entire casting process and overcome the geometrical complexity and high production volumes challenges. Ultimately allowing foundries to become a key enabler of the E-Mobility Innovations as they innovate with confidence and deliver premium quality castings.

International Congress on Welding and Additive Manufacturing (ICWAM)

2nd Edition - Scientific conference and Technical exhibition for scientific approach to meet industrial needs

When 5 Jun 2019 - 7 Jun 2019

Location Metz, France

Contact person Elisa Felder

Phone +33 4 78 14 59 43

Event website

ICWAM'2019 is the 2nd edition of the International Congress on Welding, Additive Manufacturing and associated non-destructive testing organized by Institut de Soudure, the French Welding Institute.

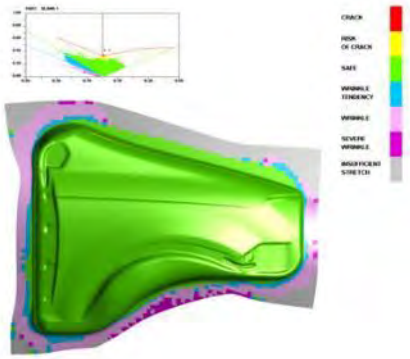
During this edition, the 3 main topics will be addressing both metallic and composite material which is mirrored in the scientific program and will encourage synergies and cooperation between stakeholders. ICWAM brings together welding and additive manufacturing actors to foster an international network of experts from academia and industry.The aim of the conference is to connect the scientific approach to industrial needs, and when it comes to develop extremely efficient manufacturing processes, ESI can help you. With this prupose, in addition to taking part in the technical exhibiton, ESI will present the latest advance supporting Additive Manufacturing, Friction Stir Welding, Innovative processes for composites and Machining:

- DAY 2 - 6th June 8.30 ROOM 4 : Support Strategy Optimization through Numerical Part Scale Manufacturability Predictions /
- DAY 2 - 6th June 10.10 ROOM 3 : Modeling of FSW process and prediction of distortions /
- DAY 2 - 6th June 11.40 ROOM 4 : Numerical simulation of machining distortions due to material removal sequencing: An aeronautical case study /
- DAY 2 - 6th June 13.30 ROOM 3 : Virtual Additive Manufacturing for Thermoplastic Composite Material: Focus on composite to metal bounding with COMMUNION project
- DAY 2 - 6th June 16.00 HALL 2.1 : ESI plenary Session on Industry 4.0

Come and visit us at our booth and attend the paper presentation as well as the ESI plenary Session

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

Dynaform Modules - Die Evaluation Module



Since most tooling designs are done in a CAD environment, DYNAFORM's D-Eval Module was specially created to support and analyze CAD based tooling and engineering designs.

A CAE solution, D-Eval is tailored to support engineers in the early stages of the product design cycle. It allows engineers to take manufacturability into consideration early in the design process, ahead of the tooling stage.

D-Eval includes the INCSolver, which allows engineers to generate reliable formability results in a reasonable response time.

D-Eval Provides CAE Tools for "What If" Studies:

- Tipping Adjustments
- Binder Generation & Modifications
- Morphing
- Drawbead Layout
- Line Bead & Geometry Bead Conversion
- Addendum Modifications
- Die Design Modifications
- CAM Trim Evaluation
- Trim Line Checks

INCSolver

The D-Eval Module Includes the INCSolver, which is a nonlinear transient dynamic finite element program. It was developed solely for the purpose of simulating sheet metal forming processes.

Using Shared Memory Processing (SMP), users can take advantage of the multiple-CPUs, Multiple-Cores and Multiple-Threads of the latest Windows computing platform. This allows for quick and reliable results. For most cases with a 4-core CPU, results can be generated in just minutes.

The INC Solver works well with non-connected mesh generated from non-conforming CAD surfaces. This solution is most suitable for CAD engineers and directly interfaces with all major CAD systems. In addition, the INCSolver's features and functions are excellent for early stage tooling evaluation and are very simple to learn and use.

Streamlined interface for common die face engineering applications including:

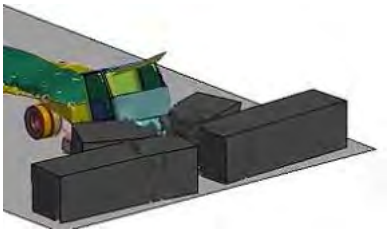
- Gravity Load & Binder Wrap Simulation
- Crush Forming Simulation
- Single Action Simulation
- Double Action Simulation
- Tailor-welded Blank
- Trimming & Lancing Function

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

Start your Monday with coffee or tea reading our engineering blog, at the FEA Not To Miss coffee shop.
Postings every Monday on what you have missed

www.feantm.com

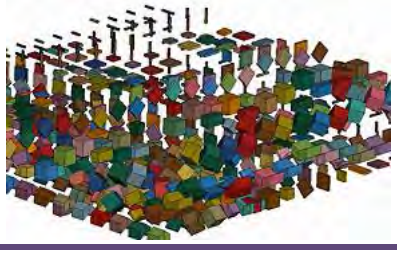
Monday 05/20/2019 - Welcome to an older particular favorite flavor, our Italian Specialty Corrado Espresso. Sipping our coffee, let's head over to YouTube. There we'll find the simulation from EnginSoft, Italy and hang on to that coffee cup, if you're driving the truck in this simulation!



Simulation LS-DYNA with Intrusion concrete barriers

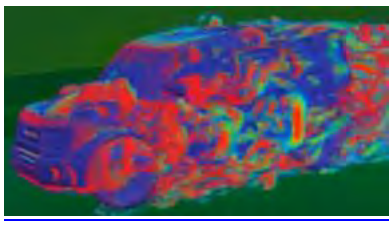
LS-DYNA Demo License - mv@feainformation.com

Monday 05/13/2019 - Wait till you see all the little doohickies floating in the air! Have you figured out that I'm not an engineer? Anyway, DooHickie Flavored Coffee this week and with the input deck you can create your own floating doohickies. I really love watching them! EngineerRMeNot



Simulation - **LS-DYNA: Common Contact Examples & Cases** - This LS-DYNA simulation shows common contact scenarios with various contact keywords.

Monday 05/06/2019 - Never take your coffee into a wind tunnel, especially if you have whip cream on top of it! Know what happens? Yep, whoooooosh!
Now, to see what happens to a Honda, we will whoosh on over to YouTube



Simulation - LS-DYNA, Honda Element in the Honda Wind Tunnel

input decks:
www.dynaexamples.com/

LS-DYNA Demo License - mv@feainformation.com

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

Shanghai Hengstar & Enhu Technology

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

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

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

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

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

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

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

Shanghai Hengstar Technology Co., Ltd

hongsheng@hengstar.com

http://www.hengstar.com

Shanghai Enhu Technology Co., Ltd

http://www.enhu.com

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

JSOL CAE Forum 2019

JSOL Corporation is holding the "JSOL CAE Forum" to provide our users with the latest and most comprehensive simulation technologies and case studies for various JSOL CAE packages including LS-DYNA. Until last year, we had held user's events individually for each package, like LS-DYNA & JSTAMP Forum, J-OCTA Users Conference, and Moldex3D technology exchange. In 2019, we decided to hold a comprehensive and unified event called "JSOL CAE Forum" at Shinagawa, Tokyo, from November 6 through 8. During the three-day event we will showcase a wide range of information to our structural, manufacturing, and material CAE package users all together.

We will start accepting applications in late September. A detailed program will be published on this page around the same time.

We encourage our users to take advantage of this opportunity and look forward to your attendance at the event.

JSOL Corporation

Engineering Technology Division

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

Interface for LS-DYNA supports large-deformation simulation

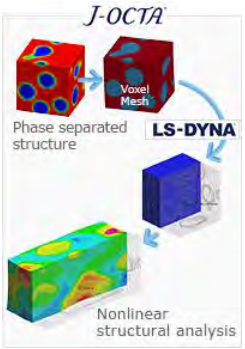
Recently, it is in high demand to estimate and evaluate the behavior during large deformation of micro-structured composites which contain phase separation and filler, by performing simulations.

Existing FEM engine of J-OCTA, "MUFFIN-Elastica" is for elastic simulation and is specialized for the behavior during a small deformation.

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

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

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



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.

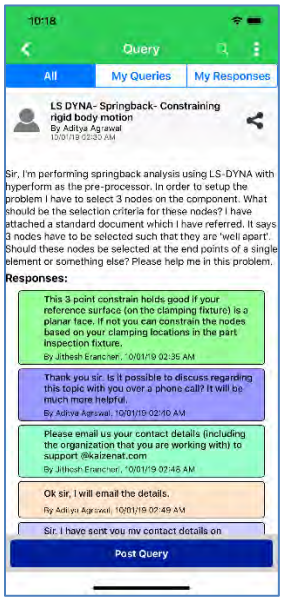
KAIZENAT Keep Improving

LUPA™ LICENSE UTILIZATION & PREDICTIVE ANALYTICS

KaizenDYNA – Revamped

We have revamped the KaizenDYNA application for iOS with latest OS compatible along with bug fixing and improving User Interface.

- A platform to discuss technical aspects of LS-DYNA
- Built to help LS DYNA software users across the world
- Stay connected with LSDYNA users and share knowledge
- Reward program for users sharing their knowledge (right answers to the questions)
- An opportunity to list LSDYNA job openings and get pre-filtered LS-DYNA users
- Quiz program for users to update their knowledge score and trend top in the job seekers list.
- An opportunity for new users to learn LS-DYNA with training materials & FAQ modules.
- Latest news about LS-DYNA & some useful general information.
- Download now from https://itunes.apple.com/in/app/kaizendyna/id1463065697?mt=8



To know more about the simulation, please contact support@kaizenat.com

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

LS-DYNA® Implicit Mechanical Analysis

APPLICATIONS:

Implicit Mechanical Analysis can be used on a wide variety of application areas, including but not limited to;

Automotive

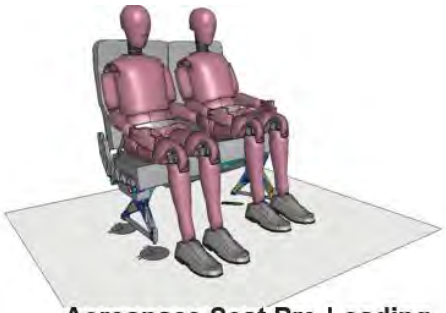
- Gravity Loading
- Dummy Seating
- Door Sag
- Roof Crush
- Seat Pull

Aerospace

- Fuselage Drop Test
- Jet Engine Start Up
- Analysis of Seats
- Satellite Stress and Vibration Tests

Consumer Goods

- Drop Test
- Vibration computations for Acoustical Analysis



Aerospace Seat Pre-Loading

RollOver Protection Structure

Door Sag

Crank Shaft

FEATURES:

- Linear and Nonlinear Analysis
- Buckling, Vibration and Modal Analysis
- Shared Memory Parallel (SMP)
- Massive Parallel Processing (MPP)
- Hybrid Parallel-combines SMP and MPP for scalability that can exceed 10K cores.

YouTube Channel:

www.youtube.com/channel/UCPuoss 7k_-IouTDXGT2EFiw

Twitter:

https://twitter.com/LSTCandDYNAmore

www.lstc.com

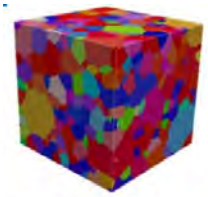
LSTC Livermore Software Technology Corp.

Machine Learning Data-Driven Discretization Theories, Modeling and Applications

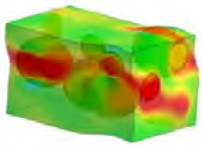
We cordially invite your participation in a short course "**Machine Learning Data-Driven Discretization Theories, Modeling and Applications**" as part of the pre-congress activities of 15th U.S. National Congress on Computational Mechanics Conference to be held on **July 28, 2019** at Austin, Texas.

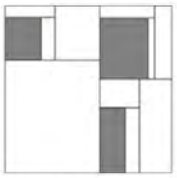
In this short **course**, we will introduce the participants to the latest efforts on data-driven methods for mechanical and material sciences. The course will cover topics on

1. mechanistic data-driven clustering methods, direct and reduced order modeling techniques,
2. physics-informed neural networks, multi-fidelity Gaussian processes,
3. deep material networks and multiscale material failure analysis.


Polycrystalline


Woven composite


Rubber composite


Deep material network

Some benchmarks on nano-polymer composites, polymer matrix composites, additive manufactured alloys will be demonstrated. For more details, please visit the website, http://15.usnccm.org/sc15-005.

The course number of this short class is SC15-005. You may register for this short course while registering for the congress at the USNCCM15 website:

http://15.usnccm.org/registration_information.

This is a great opportunity for researchers, graduate students and post docs who are interested in studying how machine learning techniques are used in mechanics and mechanical science. Please also share the information with your colleagues and friends. We look forward to your participation!

Short Course Organizers

W.K. Liu, Northwestern University, USA, w-liu@northwestern.edu

George Karniadakis, Brown University, USA, George_Karniadakis@brown.edu

C.T. Wu, Livermore Software Technology Corporation, USA, ctwu@lstc.com

Zeliang Liu, Livermore Software Technology Corporation, USA, zlliu@lstc.com

BROWN

Northwestern University

LSTC Livermore Software Technology Corp.

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.

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

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

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

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

Cost: In-House Class: $695 per person
Includes: Coffee, Lunch, Parking, USB with Course Content
Email Robin Mack for driving direction.

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

Description:

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

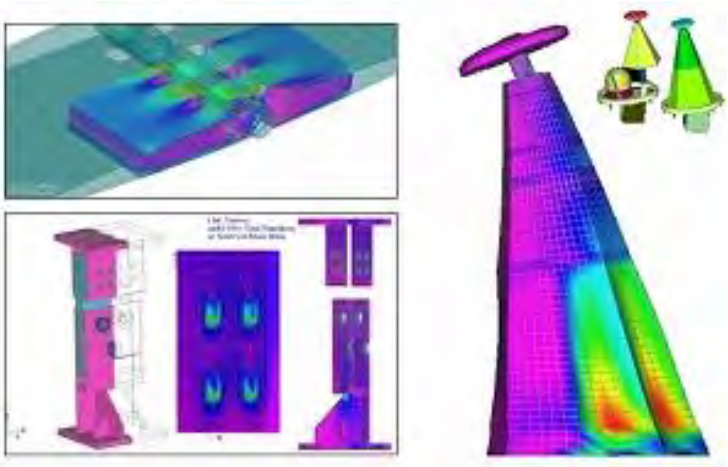
Topics Covered in this Short Course:

- Impact and Damage Modeling of Composites
  Application of MAT162 in Engineering and Research Problems
- Introduction to Composite Mechanics
  Introduction to Continuum Mechanics and Composite Mechanics

- Composite Material Models in LS-DYNA for Shell and Solid Elements
  Discussion on MAT2, MAT54, MAT59, & MAT162
- Theory and Practice in MAT162 Progressive Composite Damage Model for Unidirectional and Woven Fabric Composites
  MAT162 User Manual – Version 15A 2015
  Progressive Damage Modeling of Plain-Weave Composites using LS-Dyna Composite Damage Model MAT162
  Unit Single Element Analysis
- Comparison between Different LS-DYNA Composite Models
  Sphere Impact on Composite SHELL & SOLID Plates
- Low Velocity Impact and Compression after Impact Applications
  Modeling the Low Velocity Impact and Compression after Impact Experiments on Composites Using MAT162 in LS-DYNA
- Perforation Mechanics of 2-D Membrane and Thin Composites
- Penetration Mechanics of Composites and Soft-Laminates
- Introduction to LS-DYNA (Document Only)

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

Engineering Services



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

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

Oasys Suite version 16.0 now released

The Oasys Suite v16.0 includes a number of exciting new features and updates for PRIMER, D3PLOT, T/HIS, REPORTER and SHELL. Key highlights include:

PRIMER highlights:

Multiple stages can now be defined in simulation-based occupant positioning and seatsquash.
Full keyword support for R11 of LS-DYNA
Speed improvements for reading, writing and viewing models – now significantly faster for larger models
Morphing improvements – higher order morph boxes and integration with LS-OPT
Added the ability to mesh whole CAD components
New ICFD setup tool to allow easy creation of a CFD LS-DYNA analysis
Support for LS-DYNA IsoGeometric analysis models
Spotwelds and adhesive can now be created between solid parts and NURBs parts and well as shell parts
Speed improvements for model checking
New element quality checks added
New contouring options for forming analysis results, shell loading direction and element normals
Timestep information now read from the LS-DYNA output file for investigation within PRIMER along with error and warning messages

D3PLOT highlights:

New Material Attributes panel improves part-specific colour and lighting control
New capability to save and restore D3PLOT sessions
Loads can be displayed and contoured
Support for new database files and new data components added
Enhanced Measure menu
Enhanced Write menu
Support for rigid body data compression
Antialiasing

T/HIS highlights:

New capability to save and restore T/HIS sessions:
Extensive enhancements to the Curve Table
New data types and data components supported
Regression fit of data added
Block moving of curves
Antialiasing
Substantial enhancements to FAST-TCF and JavaScript functionality

REPORTER highlights:

Supports more fonts, giving you greater creative control over your reports, and allowing you to create templates that match your organisation's branding
Table and Autotable items can now be exported in Microsoft Excel format, complete with formatting (cell size, text alignment, font style, borders, colours, merged cells).
Various new functions have been added to the Item class of the JavaScript API to enable full control over Table and Autotable items. For example, it is now possible to:
Insert/delete/resize rows/columns
Merge/unmerge cells
Get/set cell properties (e.g. text, alignment, font, colour, border width)
Get/set cell conditions

Website:
https://www.oasys-software.com/dyna/news/oasys-suite-version-16-now-released/

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

FINITE ELEMENT ANALYSIS
Predictive Engineering

Who We Are

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

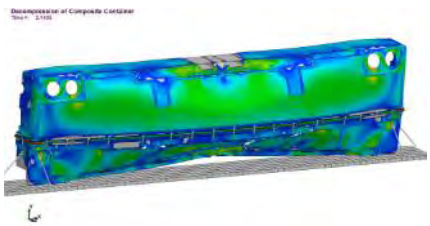
Our History

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

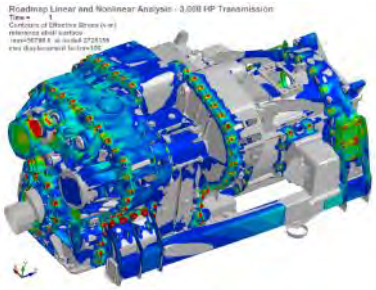
View our portfolio

FEA, CFD and LS-DYNA consulting projects

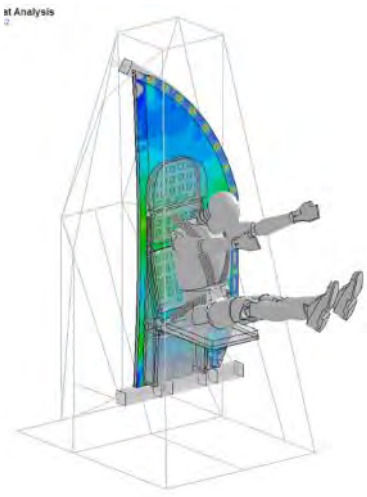
Composite Engineering



Nonlinear Dynamics



Aerospace



Posted By Adrian Jensen

Model Checkout Dashboard using the FEMAP API

Everyone knows that checking your FEA model is boring but oh so necessary if one wants to keep your job. But what happens if you're responsible for a whole team of engineers using the “divide-and-conquer approach” to build the next generation of spacecrafts? How does one ensure that your team or your colleagues are creating high-quality meshes, using consistent material properties or maintaining laminate orientations?

Of course, the simple answer is that you outsource this work to an off-shore company where a team of independent engineers can do this checking overnight, strip out the IP, sell it on the black market and have the checked models back to you in the morning; well, maybe not.

What is reality? Last year, the Sierra Nevada Corp (SNC) manager of the Dream Chaser Global FEM came to Predictive Engineering looking for a better way to ensure his team was maintaining quality and consistency. We suggested the development of a custom program using FEMAP’s Application Programming Interface (API). With the FEMAP API, users can automate organizational tasks, modeling checks and extraction of data, reducing time and potential for error.

We started with their internal model checkout procedure and broke the list into different groups of checks: General Analysis, FE Mesh, Thermal, Body Load, Free-Free Dynamics, Grounding, and the GFEM “Runner” Check. The automated checkout programs are embedded in an Excel Macro-Enabled Workbook to act as a GUI or “dashboard.” This provides a format in which the programs can document which FEMAP models and input files have been checked along with information from the model checking process.

The dashboard was designed with several modes of operation. The user can use a single button to execute all model checkout tasks or execute the commands individually. With this tool, the team at SNC was able to drastically reduce the time of the checkout procedure, reduce errors and most importantly, ensure that every simulation engineer was checking their model since the boring part become much, much smaller.

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

Big Compute Podcast: HPC and Genomics Revolutionize Medicine

May 16, 2019 Gabriel Broner

In this Big Compute Podcast episode, Gabriel Broner hosts Mark Borodkin, COO of Bionano Genomics, to discuss how genomics and HPC enable doctors and researchers to diagnose complex diseases and prescribe unique personalized treatments based on individual variations of the DNA.

Overview and Key Comments

Advances in genomics and in high performance computing enable a new form of medicine. DNA variations point to the type of disease affecting a patient and they also point to the best possible treatment. Traditionally treatments have been prescribed based on the type of disease like "lung cancer" but only a fraction of patients would react positively. Variations in the DNA enable doctors to understand the particular type of cancer and the best course of action for treatment, as me move to a new form of personalized medicine.

What are complex diseases?

"I lump complex diseases into two distinct types of diseases: one is the rare disorders that occur in a small percentage of the population (while in the US alone, there are 25 million people living with those.) The other area is cancer, where each patient has a unique signature that determines how the cancer progresses, and what the treatment needs to be."

How does the DNA changes with a disease?

"Our DNA encodes who we are. That genome is altered constantly. The majority of those changes cause no harm and they are simple "spelling mistakes." However if those variations delete a gene, then that function will be missing. Sometimes our bodies are able to compensate, while other times our bodies can't compensate and in that case, for example, a muscular dystrophy may be fatal. Some variations are very far apart but they can be fused together to create a new protein that may cause harm which is the case of a leukemia called CML."

How can we detect variations to improve diagnoses?

"We have detected large variations in the DNA for many years. You can look at chromosomes under a microscope. More modern techniques include DNA sequencing which enable to find small variations. Most recently my company has introduced optical mapping. We take very long pieces of DNA from human blood or tissue, we prepare them with labeling chemistry, and we feed those through 100,000 nanochannels. By comparing with a healthy individual we find structural variations. Doctors can look for variations that have already been discovered for diagnosis. Researchers use optical mapping to find new variations and new markers for developing new drugs or new therapies."

How can we improve treatments based on the DNA information?

"Look at cancer. We say a person has a particular type of cancer by saying he or she has lung cancer. There are therapies that are prescribed for lung cancer. There are folks that respond well and others very poorly. So why is that? Cancer researchers have been realizing that each of these cancers had a different signature that makes them progress differently and respond to therapy differently. The goal of this new way of therapy is to prescribe a therapy that is just for you."

How are the solutions you developed being used today?

"We are currently being used for clinical studies applied to patients with leukemia and muscular dystrophies worldwide. Researchers are looking to replace standard care with something that is cheaper, faster, and provides higher resolution. In some of these studies they are looking at identifying new biomarkers. When a patient seems to have a rare disease from clinical tests, the accuracy of diagnosis today is 30-50%. Finding these biomarkers is the precursor of a new therapy"

Can you talk about your choice to use HPC in the Cloud for DNA analysis?

"We came to a realization that we are outpacing Moore's law in our ability to generate patient data, get the genomics of patients more quickly, and look at more complex events in the DNA. We needed more compute. We looked at HPC in the cloud as the best way to scale for what we are doing today and in the future as it enables us to scale quickly. We've chosen to have an integrated HPC in the cloud solution, and that allows us, as soon as we get the data out of our instruments, to push the data to the cloud. Our bioinformatics pipeline resides in the cloud and we are able to handle a large number of customers at the same time. Our transition to the cloud was enabled by the unique capabilities Rescale have."

"One of the things we realized pretty early on as we researched the cloud. Is that we wanted to provide a solution to our researchers and clinicians that is easy to use. One option was to do it ourselves: put our pipeline in a container in AWS, write application notes, and have our users go at it. What we realized very quickly is that our customers would be very turned off by that, because our job is to find insightful finding of patients, so we decided to abstract HPC in the cloud through Rescale and our software. All our customers need to know is that the solution offers the security and performance they need, and they don't need to learn the new jargon of cloud."

Can we imagine a future where we get regular DNA tests in the doctor's office?

"That future will come. Some of the challenges are related to technology. But beyond those, there are far bigger challenges, and those are around having genetic counselors to be able to convey the information that was found in your genome in the proper context. Sometimes we can say you have this type of disease, but more often it's a probability of you getting a disease. Trying to convey those probabilities in a meaningful way is done by genetic counselors, and we will have a shortage of genetic counselors. We are at the beginning of understanding what these genomic tools can do"

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

仿坤软件 LS-DYNA China

2019 4th China LS-DYNA Users' Conference
Call for Paper

The 4th China LS-DYNA Users' Conference will be held on October 21st - 23rd, 2019 in Shanghai. During this conference LSTC will share the details of its latest product developments as well as its road map for the future. At this conference engineers and scientists from LSTC and customers from all over the world will meet to share their experiences and successful cases with LS-DYNA, to discuss the latest features and developments in LS-DYNA, and to explore industrial development trends.

This conference aims to promote interaction and communication among developers and end users. Therefore, we call for papers with topics covered but not limited to the automotive industry, aerospace and aeronautics, electronics industry, daily consumer goods, biomechanics, locomotive, shipbuilding, civil engineering, and general machinery.

LSTC, Shanghai Fangkun Software Technology, Ltd., and Dalian Fukun Technology Development Corporation wholeheartedly welcome your paper submission and attendance.

Hosts: Livermore Software Technology Corp. USA
Shanghai Fangkun Software Technology, Ltd. China
Dalian Fukun Technology Development Corp. China

Date: October 21st- 23rd, 2019

Location: Pullman Shanghai South Hotel (http://www.pullmzxhotel.com/)
No.1 Pubei Road, Xuhui District, Shanghai, China, 200235

Training: There will have pre and post-conference training classes being held on Oct. 21st, 24th and 25th.

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

Contact us: conf@lsdyna-china.com

Call for Paper

Overview. This conference covers all topics related to LS-DYNA. At this conference our developers will review the current developments and share their plans for the future. One of the major goals of this conference is to give users a chance to provide feedback, but most of all we hope that users, and especially students, will have an enjoyable opportunity to showcase the creative things that they are doing with LS-DYNA.

Topics. In the boxes below we list some of the topics that we expect submissions will cover. Topics not in the lists are also welcome. Authors of accepted submissions will be invited to present during the Technology and Application Sessions.

Submissions:

- Submit abstracts to http://conference.lsdyna-china.com/.
- Submission can be in Chinese or English. Submission of both Chinese and English versions is greatly appreciated but not mandatory.
- Elva Yu is responsible for processing submissions.

  Tel: 15001986675

  email: conf@lsdyna-china.com
- Abstract submission deadline — 20th August 2019
- Notice of acceptance deadline — 1st September 2019
- Full paper submission deadline — 20th September 2019

Excellent Paper Awards. We will be giving prizes for the best papers. Award winners will be announced at the banquet on October 22nd. The best paper in English will be published in the English edition of FEA Information Engineering Journal (ISSN #2167-1273) and the best paper in Chinese will be published in the FEA Information Chinese edition.

- One first prize will be awarded. The winner will receive RMB 5,000.00 and a free trip to the 2020 international LS-DYNA Users' Conference including round-trip ticket and hotel fee.
- Two second prizes will be awarded. The winners will receive RMB 3,000.00.
- Three third prizes will be awarded. The winners will receive RMB 2,000.00.

Conference Website: http://conference.lsdyna-china.com/
Contact us: conf@lsdyna-china.com

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

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

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

FE analysis

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

CFD analysis

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

EM analysis

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

Metal sheet

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

Pre/ Post

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

Biomechanics

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

HH-60H helicopter made its final fight, ending 30 years of service in the U.S. Navy

NATIONAL HARBOR, Md. — The Navy will retired the last HH-60H Seahawk special operations support helicopters this year, an official said.

Speaking to an audience at the Navy League's Sea-Air-Space expo in National Harbor, Maryland, Marine Maj. Gen Greg Masiello, the Navy's program executive officer for Air, ASW, Assault and Special Mission PEO (A), said the last seven of the HH-60Hs in the inventory would be retired and replaced by the next-generation Seahawk, the MH-60S.

The HH-60H is flown by reserve Helicopter Sea Combat Squadron 85 and deploys in support of Navy special warfare forces and other forces.

MH-60S helicopters for the squadron will be modified with the 7.62 mm GAU-17 six-barrel rotary machine gun used for fire suppression.

The HH-60H is the last of three Seahawk versions from the H-60's initial naval service: the SH-60B, SH-60F, and HH-60H. The MH-60R and MH-60S are the latest versions in the Navy.

Ford Collaboration with Gravity Sketch Introduces Co-Creation Feature, Allowing Designers Across Globe to Work in Same Virtual Reality Space

Ford is the first automaker to work with Gravity Sketch – a 3D VR tool that enables designers to come up with more human-centric designs.

- Co-Creation feature in Gravity Sketch gives global designers at Ford the ability to use the same 3D virtual reality design space, improving collaborative efforts and real time decision-making when designing vehicles.
- Co-Creation has the ability to save designers time and reduce the requirement for global travel during the development process of creating new vehicles

DEARBORN, Mich., May 6, 2019 – A designer from Shanghai and another from Dearborn step into a virtual design space together to make changes to a global vehicle design. Both walk around the 3D design, review it and make changes on the fly. Once finished, the two remove their VR headsets and return to their separate workspaces -- thousands of miles apart.

Thanks to Co-Creation, a feature developed by Gravity Sketch in collaboration with Ford, designers across the globe can create, collaborate and evaluate vehicle designs with one another in real time without leaving their physical workspace.

Ford is the first automaker to work with Gravity Sketch – a 3D virtual reality tool that enables designers to create more human-centric vehicle design. Designers trade in their sketchpads for a headset and controllers to become immersed in virtual reality, imitating gestural interactions through motion tracking that replicates sketching with pen and paper. Designers can draw, rotate, expand and compress a 3D sketch. The Co-Creation feature allows multiple designers to engage in content creation, while making these real-time adjustments.

Consumer purchasing trends differ in each global region, meaning an attractive design in one region may not be as appealing in another. Co-Creation gives designers from different regions the opportunity to come together in one space and review a 3D sketch to make important decisions earlier in the design process.

”The Co-Creation feature adds more voices to the conversation in a virtual environment, which results in more efficient design work that may help accelerate a vehicle program’s development,” says Ford Design Manager Michael Smith.

Gravity Sketch allows designers to speed the process from weeks to hours, skipping the 2D stage and working with a 3D model from the beginning. Through Co-Creation, a designer can transfer to another designer’s point of view within virtual reality to see from his or her perspective. This is especially helpful when training other designers in Gravity Sketch.

Across five global Ford design studios, dozens of interior and exterior designers are now experimenting with Gravity Sketch for workflow feasibility and its capability for real-time co-creation and collaboration. Shifting to a model that designs and evaluates in virtual reality could revolutionize the entire process by drastically reducing development time and allowing for more 3D representations in the evaluation stage.

“Our collaboration with Ford designers has enabled us to get immersed in their creative process and discover ways to help fine-tune this application to better suit their needs so they can build the best possible vehicles for their customers,” said Oluwaseyi Sosanya, Gravity Sketch CEO & Co-founder.

About Ford Motor Company: Ford Motor Company is a global company based in Dearborn, Michigan. The company designs, manufactures, markets and services a full line of Ford cars, trucks, SUVs, electrified vehicles and Lincoln luxury vehicles, provides financial services through Ford Motor Credit Company and is pursuing leadership positions in electrification, autonomous vehicles and mobility solutions. Ford employs approximately 196,000 people worldwide. For more information regarding Ford, its products and Ford Motor Credit Company, please visit http://corporate.ford.com/.

FEA Not To Miss www.feantm.com

YouTube Tutorials

Webinars - Workshops

New showcased:

DES	Set-up of LS-DYNA DES simulations
ICFD	ICFD sloshing
CFD	Solution Explorer Dam break example
LS-RUN	How to use/setup LS-Run

Previous

LS-TaSC	LS-TaSC An introduction Laura Crespo
EFG	LS-DYNA: Implicit element-Free Galerkin (EFG) - Cutting Simulation Corp Channel Tutorial
SPH	Modeling Splashing and Sloshing in LS-DYNA using Smoothed Particle Hydrodynamics (SPH) Erik Svenning
Implicit	Intro to the use of implicit analysis in LS-DYNA
Composite	Intro to LS-DYNA composites modelling
FSI	Setting up a simple FSI problem set up with ICFD-LS-DYNA
EM	LS-DYNA EM : Tutorial for Metal forming application (Part I)
Occupant	Occupant Modeling Workshops
	**Start your Monday with coffee reading our engineering blog, FEA Not To Miss coffee shop.**

mv@feainformation.com

Locations:
Livermore Software Technology Corp.
7374 Las Positas Rd. Livermore, CA 94551
1740 West Big Beaver Road Troy, MI 48084

Contact: classes@lstc.com
www.lstc.com/training

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1740 West Big Beaver Road Troy, MI 48084 Contact: classes@lstc.com
www.lstc.com/training

SPG and Peridynamics for Material Failure Analysis

This two-day intermediate level class is intended for attendees who are using the LS-DYNA code for their advanced dynamic material failure analyses in solids and composites. It is of particular interest to LS-DYNA users in the automotive, aerospace and defense industries for modeling various material failure scenarios in design, manufacturing and safety of vehicle, aircraft and weapon systems.

Metal Forming Training using LS-PrePost® and LS-DYNA®

The course will review some of the important metal forming features developed in LS-DYNA. Using the hands-on workshops provided, students will be able to use LS-PrePost and its metal forming interface to generate required input files for LS-DYNA and conduct metal forming simulation.

LS-DYNA - Resource Links

mv@feainformation.com

LS-DYNA Multiphysics YouTube	LS-DYNA Frequently Asked Questions
LS-DYNA Examples Site	LS-DYNA Conference Publications
LS-DYNA Support Site	LS-OPT & LS-TaSC Support Site
ATD - Dummy Models	LSTC ATD Models
Aerospace Working Group	LS-DYNA Yahoo Group

mv@feainfomation.com

www.hengstar.com

HengStar Technology
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www.lsdyna.co.kr

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www.cadfem.com

CADFEM
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Training - Webinars

Participant's Training Classes

Webinars

Info Days

Class Directory

Directory

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
LSTC - (corporate)	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

Training - Dynamore

Author: Christian Frech christian.frech@dynamore.de

Seminars 2019

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

Selection of trainings for June / July

Introduction

Introduction to LS-DYNA	4-6 June 16-18 July
Introduction to LS-PrePost	03 June

mplicit Capabilities

Nonlinear Implicit Analyses	19 June
New Features in LS-DYNA and LS-OPT	13 June
Cloud solutuion for LS-DYNA	08 July

Metal Forming

Applied Forming Simulation with eta/DYNAFORM	08 July
Hot Forming with LS-DYNA	11 July
Introduction to Welding Simulation	24 June
Sheet Metal Forming in OpenForm	10 July

Particle Methods

Smoothed Particle Hydrodynamics	27-28 June

Multiphysics/Biomechanics

ALE and FSI	25 June

www.lstc.com

June 2019

Date				Location	Course Title	Days	Instructor(s)
Jun 5		Wed		MI	Airbag Particle Method (APM) Modeling	1	A. Gromer
Jun 10	Jun 11	Mon	Tu	CA	Blast using LS-DYNA®	2	A. Tabiei
Jun 12	Jun 13	Wed	Th	CA	Penetration in LS-DYNA®	2	A. Tabiei
Jun 18	Jun 21	Tu	Fri	MI	Introduction to LS-DYNA®	4	S. Adya

July 2019

Date				Location	Course Title	Days	Instructor(s)
Jul 9	Jul 10	Tu	Wed	***MI***	SPG and Peridynamics for Material Failure Analysis	2	Y. Wu, J. Xu
Jul 11	Jul 12	Th	Fri	***MI***	Introduction to Metal Forming	2	Q. Yan, L. Zhang
Jul 17		Wed		CA	Introduction to LS-PrePost	1	P. Ho, Q. Yan
Jul 17	Jul 18	Wed	Th	***MI***	Contact Modeling in LS-DY-NA®	2	N. Karajan
Jul 23	Jul 26	Tu	Fri	***MI***	Introduction to LS-DYNA®	4	A. Nair
Jul 29	Jul 30	Mon	Tu	***MI***	Advanced LS-PrePost	2	A. Nair
Jul 31	Aug 1	Wed	Th	***MI***	Advanced LS-DYNA®	2	S. Bala

DynaS+

Complementary tools

LSTC Livermore Software Technology Corp.

OUT-06

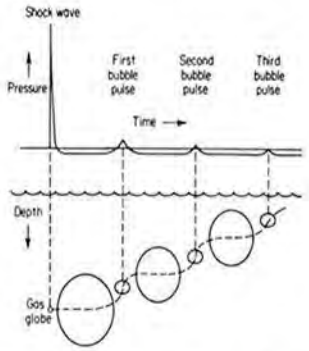
Underwater Shock Analysis with USA/LS-DYNA

Goal

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

Contents

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



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

Audience

CAE Engineers / Researchers

Prerequisites

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

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

Duration

3 days

Trainers

External expert
(Tom LITTLEWOOD–LSTC)

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

Training provided in English, English course material

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

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Latest FE Model Development of THOR-50M Crash Test Dummy

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**Humanetics Innovative Solutions, Inc. Farmington Hills, MI (USA)

Abstract

THOR-50M LS-DYNA® Finite Element (FE) dummy model, developed by Humanetics (Humanetics Innovative Solutions, Inc.), has been widely used in occupant safety by OEMs and suppliers and has proved to be a mature model since its first release in early 2014. In the next two years, major development work had been completed, including material characterization, component validations, sled test validations and robustness verifications.

The latest release of version 1.5 FE model focused on improving the thorax. New tests were carried out on single rib, as well as on thorax and on whole dummy level for FE model improvement.

Version 1.5 also reflected the recent update of the Anthropomorphic Test Device (ATD), commonly known as crash test dummies, includes build level A and B (SBL-A, SBL-B) update for US NCAP (New Car Assessment Program) version, and SBL-A update for Euro NCAP version. The two versions differ in physical part design, certification performance requirements and more, resulting in two different FE models.

Introduction

As with all FE models, crash test dummy models consist three critical aspects: accurate geometry, material modeling and structural connectivity. As part of the largest and most established manufacturer of physical ATDs, the Humanetics CAE group has access to the most up-to-date hardware which ensures that the delivered FE models incorporate the latest geometry and materials. Material characterization and modeling in Humanetics FE dummies has become increasingly important over time as more accurate model responses are required. The use of advanced material models and extensive material testing has allowed for more representative non-linear and rate-dependent responses in a number of key components [1].

To validate each dummy model, Humanetics has developed stringent processes to carry out an extensive amount of physical tests, ranging from component to sub-assembly and full dummy levels, covering a wide variety of loading conditions at various levels of complexity to ensure the model's predictive capabilities are as high as possible. Some of these tests are required to certify the physical dummy while most are non-certification tests carried out specifically for dummy model validation purposes. Along with rigorous quality assurance checks and robustness verifications, all FE dummy models can sustain severe loading without causing pre- mature simulation termination.

The presented work summaries the work prior to V1.5 development, then highlights the major work completed for V1.5 model, with a focus on chest performance improvement.

THOR-50M FE Model Development Prior to Version 1.5

Tremendous amount of work had been done to develop THOR-50M FE model since 2013. More than forty deformable materials were tested, their material characteristics were extracted and verified in coupon simulations, then further fine-tuned in component test validations. Key components that were tested and validated include rib, neck, thoracic spine, lumbar spine, abdomen, knee slider, pelvis, ankle and foot. All different level validations, from component to sub-assembly and whole dummy, are carried out at different energy levels (initial velocities) to evaluate the model performance in rate sensitive dynamic loading environment.

Geometry verification (Figure 1) was done by using laser scan of the assembled dummy, as dummy parts may take a slightly different shape than when all are assembled, especially in the thorax. With the scan data of physical dummy, faithful representation of geometry was achieved in the FE model.

Three key components in the dummy received special attention during development - neck, lumbar spine and thoracic spine. For example neck can undergo considerable torsion when the dummy is loaded in the vehicle tests constrained by seatbelt and airbag. Earlier versions of neck model was quite good at predicting injury in bending mode, but not so for torsion. To better predict BrIC injury, pure torsion tests (Figure 2) were designed for neck, and later on mini-sled tests were executed, which have combined deformation modes of both bending and torsion, were added to complement flexion, extension and lateral bending tests. Similar tests were done for lumbar spine and thoracic spine as well, and extremely good correlation was achieved for those 3 components in about 12 different tests for each component.

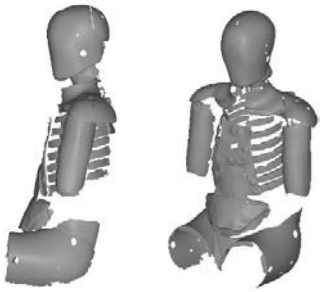

Figure 1: Laser scan for geometry verification

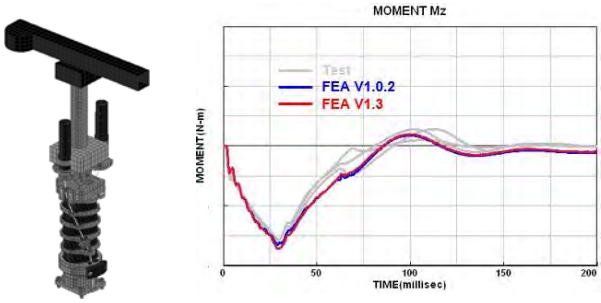

Figure 2: Neck pure torsion validation

Validation of dummy model in sled test environment is essential for a good quality model, simple sled tests with rigid seat and seatbelt in oblique loading conditions (Figure 3) were used to validate THOR-50M FE model currently, before more advanced sled test data become available.

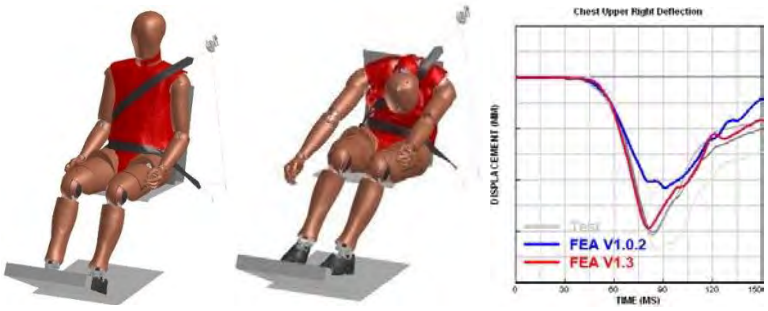

Figure 3: Sled validation

Multiple robustness cases were developed to evaluate FE dummy model stability. In those cases, rigid seats were used with seatbelt constraining the dummy model, with scaled up sled pulse. Those cases were done for straight and oblique loading, for both driver and passenger positions to ensure that FE dummy model can run to the end of simulation without abnormal termination or contact failure. As result of this effort, most users have very good experience using THOR-50M FE model in their analyses. Figure 4 shows some of those cases.

Figure 4: Robustness verifications

Because of the enormous investment in development mentioned above, V1.4 (Figure 5) was already a mature FE model and was widely used for occupant safety evaluation with this new test dummy for NCAP.

Figure 5: THOR-50M LS-DYNA model (left) and physical ATD (right)

New Development in Version 1.5 FE Model

National Highway Traffic Safety Administration (NHTSA) certification guideline (draft) was published in August 2016 [5], in which included changes to test speeds and corridors, dummy positioning, also the shape of the probe for abdomen certification. Since then the manufacturer of the ATD (Humanetics Innovative Solutions, Inc.) has conducted many certification tests on existing and new production ATDs, and the certification corridors had been discussed with NHTSA and adjusted, resulting in service build level A and B (SBL-A, SBL-

B) [2, 3, 4] along with small design changes to parts.

Updates in SBL-A that affect FE dummy model include longer neck front cable, more relaxed lower abdomen bag, doubled sided tape used to attach lower abdomen front and rear foam pads together, more rounded corners for A.S.I.S load cells, added straps around sternum bonding assembly to prevent foam from tearing, as shown in Figure 6.

Figure 6: SBL-A updates

Most updates in SBL-B don't affect FE model (such as improved design of IR TRACC mounts), what affects FE model is the adjustment in performance requirements of certification tests (corridors). V1.5 model was certified following NHTSA's guideline and achieved satisfactory result in meeting the corridors.

Neck torsion certification was a new test proposed in NHTSA's certification guideline, V1.5 neck model performs very well in torsion certification (Figure 7) and can be used to study BrIC with more confidence.

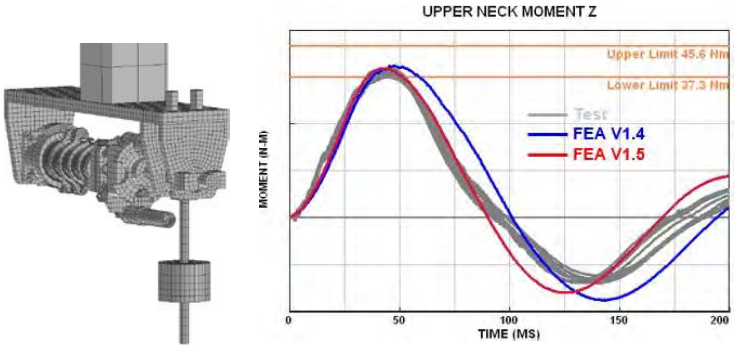

Figure 7: Neck torsion certification validation

Besides keeping up the updates in physical ATD, a number of new component tests were carried out to further improve V1.5 FE model. Following new tests were added to the existing extensive validation suite:

Single rib drop tower tests (Figure 8, 9) in three orientations, each was carried out at two speeds to achieve low and high rib deflections. The three orientations are straight, angled and oblique, designed to simulate different loading conditions that physical ATD undergoes in vehicle tests.

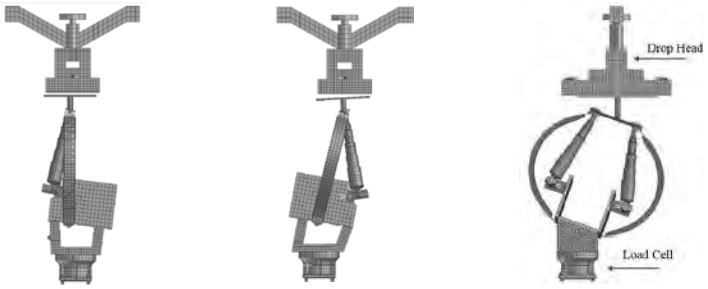

Figure 8: Single rib tests – Straight, Angled and Oblique

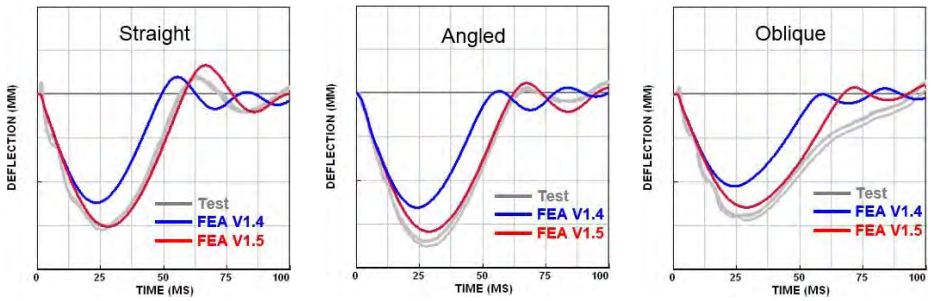

Figure 9: Single rib test validations - Straight, Angled and Oblique

Bib 3-point bending tests were realized to validate this critical component which contributes directly to dummy chest deflection. It turned out the material implemented FE model prior to V1.5 already represents the physical part quite faithfully (Figure 10).

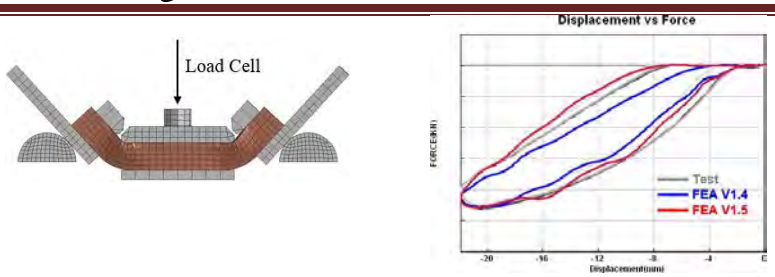

Figure 10: Bib 3-point bending validation

Built on the foundation of well validated component models, the materials of ribs were further tested in sub-assembly tests – thorax pendulum tests (Figure 11), in which thorax was fixed at the back, hit by a probe at different speeds from different angles at different locations, 6 test configuration in total, were used in V1.5 model validation (Figure 12) to further enhance the model capability in predicting chest deflection.

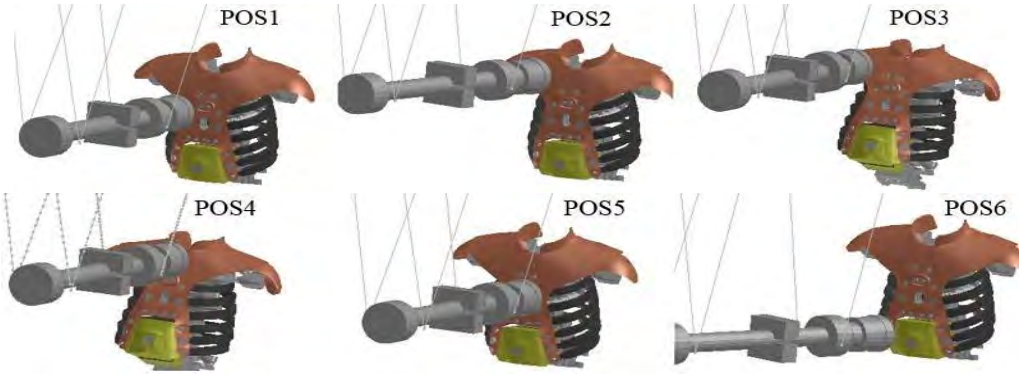

Figure 11: Thorax pendulum tests

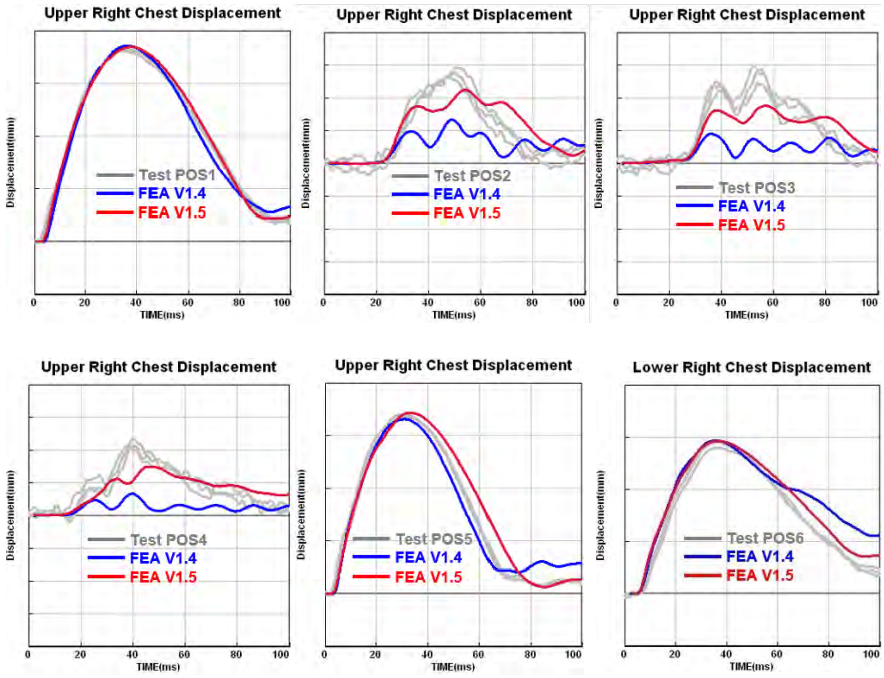

Figure 12: Thorax pendulum validations

V1.5 FE model was ultimately scrutinized in the whole dummy tests, including all certification tests (NHTSA guideline August 2016), and non-certification tests (Figure 13, 14) which were newly introduced into V1.5 validation suite. As a result of this effort, further improvement was achieved.

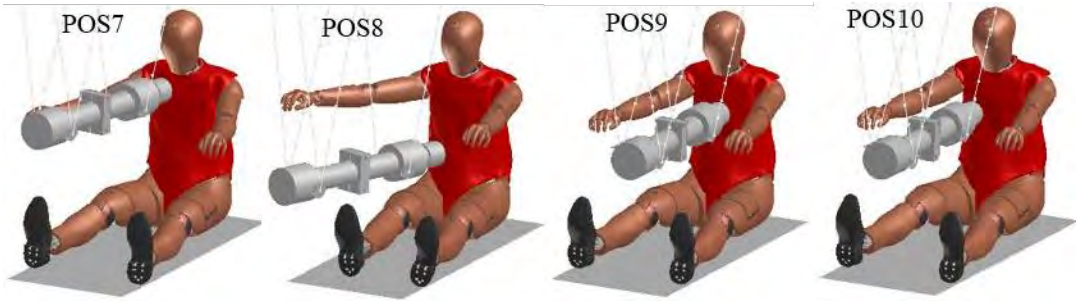

Figure 13: Whole dummy pendulum tests (non-certification)

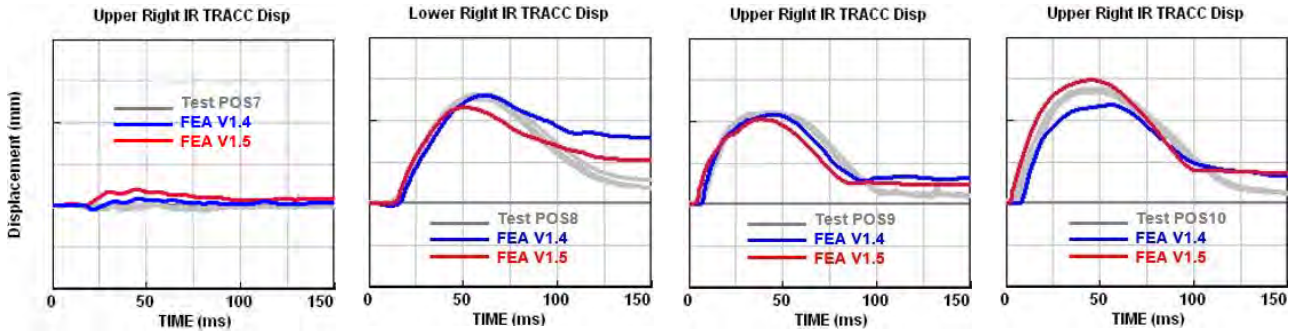

Figure 14: Whole dummy pendulum validations (non-certification)

FE model was validated in sled test prior to V1.5, passenger side test (Figure 15) was added to the validation suite of V1.5.

Figure 15: Sled test validation - passenger

Euro NCAP V1.5 Model

Euro NCAP version of THOR-50M ATD is equipped with Hybrid III 50th knee sliders and lower legs (Figure 16), a different design of spine pitch mechanism, and complies with SBL-A design [3] currently. As a result, attention was paid to ensure that Euro NCAP FE model V1.5 meet SBL-A performance requirements in certification tests (Figure 17). FE model of knee slider and lower leg was borrowed from Harmonized H3-50 FE model and they were validated extensively in HH350 model development [5].

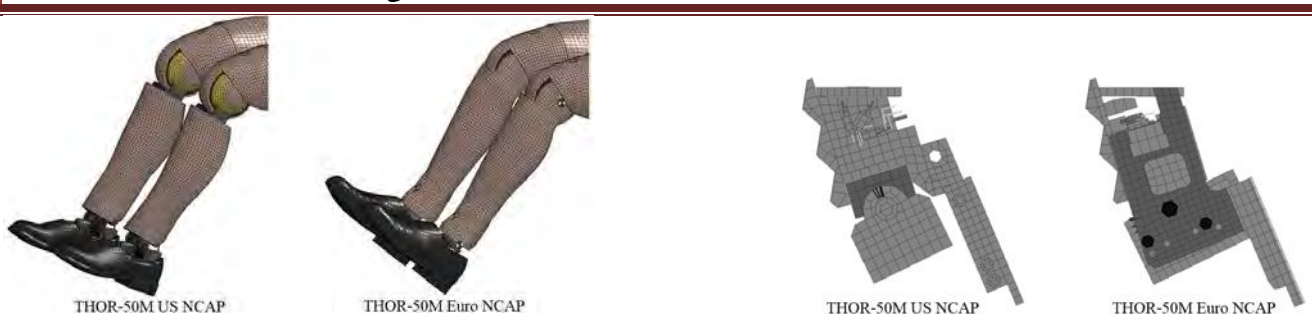

Figure 16: US NCAP vs Euro NCAP

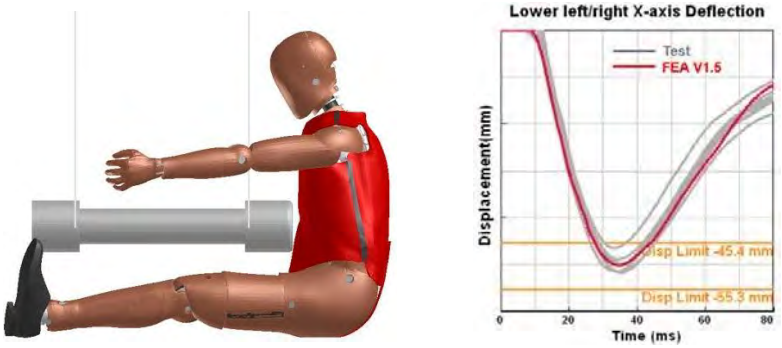

Figure 17: Euro NCAP model certification (lower thorax)

Statistics of THOR-50M V1.5 LS-DYNA FE Model - consists of 445K nodes and 476K deformable elements. An initial time-step of 0.7 micro-second was achieved for the dummy model. The V1.5 FE model has been tested using the LS-DYNA solver version R7.1.2.

Conclusions

The following conclusions can be drawn from the presented work:

- Very detailed THOR-50M V1.5 dummy models was developed using the LS-DYNA FE solver, its performance was on a higher level, compared to previous versions.
- Hardware updates in SBL-A and SBL-B were implemented in V1.5 model of US NCAP and Euro NCAP configurations.
- Main focus of V1.5 development was on thorax assembly.
- Both US NCAP and Euro NCAP models demonstrate extremely promising predictive capabilities.

References

[1] Newly Developed LS-DYNA Models for THOR-M and Harmonized HIII 50th Crash Test Dummies, Chirag S. Shah, et al, Humanetics Innovative Solutions, Inc., Farmington Hills, MI (USA), 13th International LS-DYNA Users Conference.
[2] THOR-50M U.S. NCAP SBL-A Update, January 2017, Humanetics Innovative Solutions, Inc., Farmington Hills, MI (USA)
[3] THOR-50M Euro NCAP SBL-A Update, January 2017, Humanetics Innovative Solutions, Inc., Farmington Hills, MI (USA)
[4] THOR-50M Standard SBL-B Update, January 2018, Humanetics Innovative Solutions, Inc., Farmington Hills, MI (USA)
[5] THOR 50th Percentile Male (THOR-50M) Qualification Procedures Manual, Draft August 2016, National Highway Traffic Safety Administration (NHTSA)

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 LSTC 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:

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

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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.

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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.

Livermore Software Technology Corp. www.lstc.com

LS-DYNA

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

LS-PrePost

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

LS-OPT

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

LS-TaSC

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

LSTC Dummy Models

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

LSTC Barrier Models

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

Material Sciences Corporation www.materials-sciences.com

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

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

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

MSC/LS-DYNA Composite Software and Database -

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

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

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

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

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

Oasys PRIMER

Key benefits:

- Pre-Processor created specifically for LS-DYNA®
- Compatible with the latest version of LS-DYNA®
- Maintains the integrity of data
- Over 6000 checks and warnings – many auto-fixable
- Specialist tools for occupant positioning, seatbelt fitting and seat squashing (including setting up pre-simulations)
- Many features for model modification, such as part replace
- Ability to position and depenetrate impactors at multiple locations and produce many input decks automatically (e.g. pedestrian impact, interior head impact)
- Contact penetration checking and fixing
- Connection feature for creation and management of connection entities.
- Support for Volume III keywords and large format/long labels
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Oasys D3PLOT

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- 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

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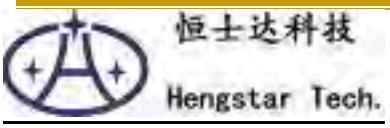
Since 1995, Predictive Engineering has continually expanded its client base. Our clients include many large organizations and industry leaders such as SpaceX, Nike, General Electric, Navistar, FLIR Systems, Sierra Nevada Corp, Georgia-Pacific, Intel, Messier-Dowty and more. Over the years, Predictive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



Shanghai Hengstar www.hengstar.com

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

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

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

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

Consulting

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

www.lenovo.com

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

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

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

Cloud - HPC Services - Subscription JSOL

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

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

JSOL Corporation is cooperating with chosen cloud computing services

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

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

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

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

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

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

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

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

Platform Computation Cloud - CreDist.Inc.

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

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

www.rescale.com

Rescale: Cloud Simulation Platform

The Power of Simulation Innovation

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

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

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

True On-Demand, Global Infrastructure

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

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

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

ScaleX Enterprise: Transform IT, Empower Engineers, Unleash Innovation

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

Rescale Cloud Simulation Platform www.rescale.com

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

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

Industry-Leading Security

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

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

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

LSTC - DYNAmore GmbH JSOL Corporation

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

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

ESI Cloud Based Virtual Engineering Solutions

www.esi-group.com

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

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

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

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

Virtual Performance Solution:

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

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

The benefits of VPS hybrid on ESI Cloud include:

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

VPS On Demand

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

Key solution capabilities:

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

Result visualization

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

Key result visualization capabilities:

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

Collaboration

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

Key collaboration capabilities:

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

Distribution, Consulting

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

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

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

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

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

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

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

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

Distribution, Consulting

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

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

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

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

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

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

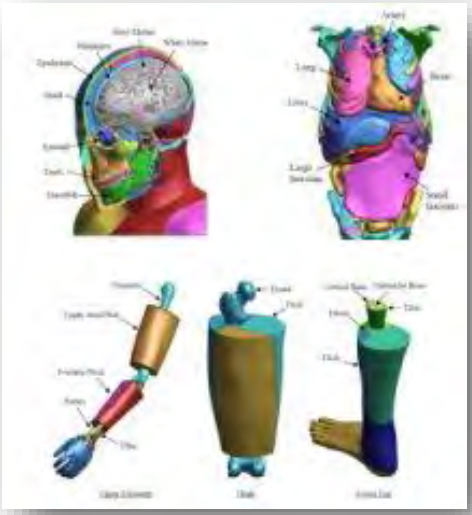
Korea	**KOSTECH**	young@kostech.co.kr		
	www.kostech.co.kr			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM
	eta/DYNAFORM	DIGIMAT	Simuform	Simpack
	AxStream	TrueGrid	FEMZIP	

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

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

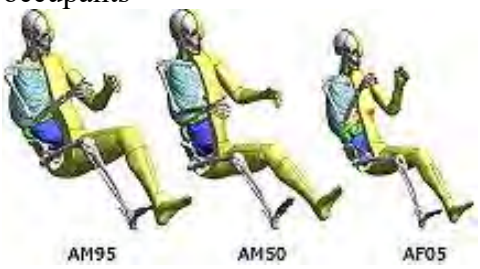
Taiwan	**SiMWARE Inc..**			
	www.simware.com.tw			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

TOYOTA - Total Human Model for Safety – THUMS

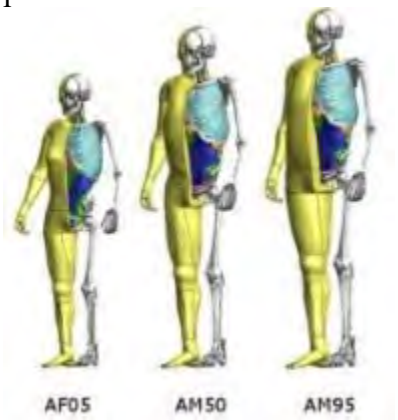


The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons,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

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



and as standing model to represent pedestrians.



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

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

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

For information please contact: THUMS@lstc.com

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

LSTC – Dummy Models

LSTC Crash Test Dummies (ATD)

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

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

e-mail to: atds@lstc.com

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

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

Models In Development

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

Planned Models

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

LSTC – Barrier Models

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

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

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

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

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

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

Social Media

FACEBOOK

BETA CAE Systems
CADFEM
ESI Group
Lenovo

TWITTER

BETA CAE Systems
ESI Group
ETA
CADFEM
Lenovo

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
Lenovo	

GOOGLE+

BETA CAE Systems