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LSTC Livermore Software Technology Corp.

Volume 8, Issue 2, February 2019

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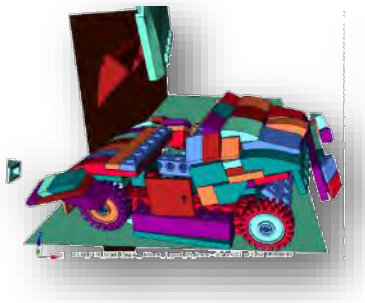
BETA CAE

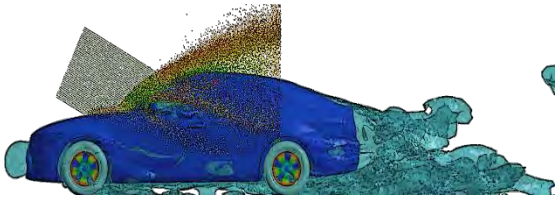
OASYS

UK Oasys LS-DYNA 16th Annual Users Meeting

Guest Showcase



LSTC



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

FEA Information Engineering Solutions

www.feapublications.com

The focus is engineering technical solutions/information.

FEA Information China Engineering Solutions

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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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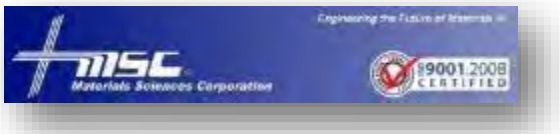
Platinum Particpants



Platinum Particpants

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Announcements

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

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

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

For more information and Register

12th European LS-DYNA Conference May 14 - 16 2019, Koblenz, Germany
Announcement and Call for Papers:

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

Conference Website: www.dynamore.de/conf2019

The 8th biannual BEFORE REALITY International Conference of BETA CAE Systems **May 20th- 22nd, 2019**

The 8th biannual BEFORE REALITY International Conference of BETA CAE Systems

will take place between May 20th and 22nd, 2019 at the Hilton Munich Park hotel, in Munich, Germany.

Submit your Abstract and Register today.

Follow this path to the event

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…

Achieving top quality and speed, in simulation for crash test dummies

Designing occupant friendly interiors that meet requirements in both safety and style, necessitates the extensive comprehension of models' behavior in crash. Today, we are able to study our models in detail with the aid of Engineering simulation, drastically reducing the physical tests with Anthropomorphic Test devices (ATDs), or "dummies". This shift has made simulation models' accuracy, quality, and set-up time, important cornerstones in designing highly competitive new products.

The combination of numerous Safety regulations, the various dummy models, and the different available solvers, make crucial the tools that speed up modeling processes, facilitate loadcase preparation, and provide easy and automated ways to handle and interpret the results.

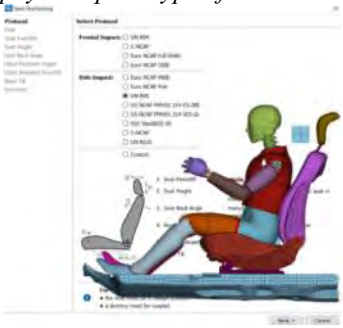
Examples of safety performance assessment programs

Such tools that compose a complete environment for crash and safety analysis, are those offered by BETA CAE Systems through the ANSA multipurpose pre- processor and the META post-processor.

Comparison of Simulation model and physical prototype of a Humanetics'

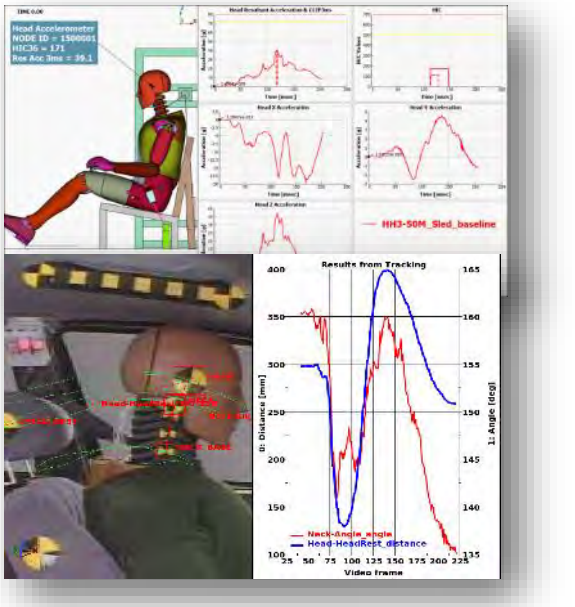
Within ANSA, dummy modeling is facilitated, from the positioning of the dummy on the seat, up until the output of the ready to run files for all mainstream solvers. ANSA supports the reading of LS-DYNA dummy models, and their hierarchy tree, from all high accuracy prototypes dummies, such as those of Humanetics and LSTC.

The Positioning Tool of ANSA, allows engineers to couple the dummy and the seat, in a fast and easy way. The models are easily manipulated and depenetration can run both in ANSA as well as in a solver. Coupled dummy-seat movements can also be performed within ANSA, with the use of the integrated Kinematics tool. Moreover, seatbelts can be quickly created wrapping around the torso of the dummy, while the output of all transformations and initial geometry information ensures safe dummy handling.



The Seat positioning tool

The Occupant Injury Criteria tool and the rest of the available functionality in the META post processor, makes it possible to automatically post- process results and create reports for the occupant injury and structural results of the vehicle. Same time, you can easily compare simulations with physical tests add videos of crash tests, correlate them with the simulation animations, and have synchronized views of the simulation, the physical test, graphs, and their corresponding time history results. The automation capabilities for all tools and for the report creation makes the job of CAE and Test engineers easier, allowing more time for productive work, and making the collaboration between them better.

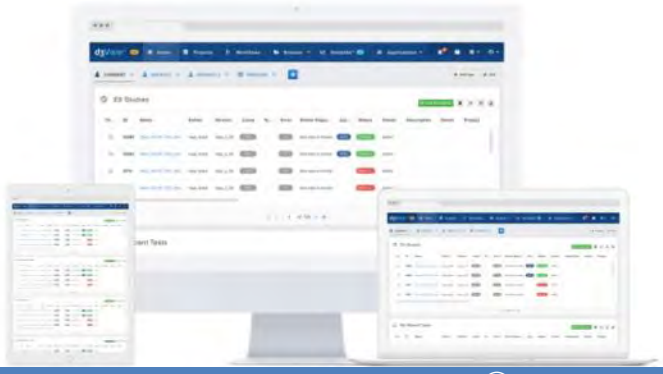


Results reporting and correlations in META

The ANSA pre- processor and the META post- processor offer a complete toolbox, developed to make your daily engineering working ways more effective generating models of high accuracy in almost no time, in a single environment.

BETA CAE Systems
www.beta-cae.com
ansa@beta-cae.com

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

Author: Christian Frech christian.frech@dynamore.de

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Conference Website: www.dynamore.de/conf2019

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

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

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

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

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

Participant fees
Industry speaker: 420 Euro
Academic speaker: 360 Euro
Industry: 640 Euro[1)] / 690 Euro
Academic: 490 Euro[1)] / 540 Euro
[1)] Registration before 1 April 2019. All plus VAT.

Exhibiting and sponsoring
Please request further information.

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

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

Placing Humans at the Heart of the Factory of the Future to Achieve Operational Excellence

5 Feb 2019 Paris, France

----ESI's immersive Virtual Reality Solutions will be at Manufacturing World Japan 2019

Paris, France – February 5, 2019 – ESI Group, leading innovator in Virtual Prototyping software and services for manufacturing industries, will exhibit at Manufacturing World Japan 2019, in Tokyo, February 6th to 8th. ESI will showcase its Virtual Reality solution for manufacturers to validate assembly and maintenance processes well ahead of production, to minimize design errors, reduce risks, and successfully scale up production.

Process engineers at FCA LATAM simulate human interactions with ESI IC.IDO to optimize assembly processes and maximize productivity

The digital transformation is profoundly reshaping the manufacturing industry, from product development to process engineering, structuring the factory environment and planning maintenance procedures. The implementation of digital innovations such as connected objects, robots/ cobots and Augmented Reality (AR) is bringing new value to the factory floor, along with sizable opportunities to maximize product quality and productivity. For engineering teams this often translates into new layers of complexity, creating potential inefficiencies that can impact product assembly, disassembly and maintenance. When these operations involve human interactions, new technologies can be a particular source of operational uncertainty that needs to be mitigated to assure successful production ramp-up and to achieve production targets.

To answer new challenges growing at the heart of the Factory of the Future, ESI has fostered a unique and powerful Virtual Reality solution; one that enables manufacturers to evaluate ahead of time the interaction of people with products and processes.

Virtual Reality represents a technology of the future that will have an impact on the efficiency of our developments. The factory of the future is already here,"

comments Nicolas Lepape, Virtual & Augmented Reality R&T Project Manager, Safran Nacelles.

Boasting real-time and real-scale capabilities powered by realistic physics, ESI's solution is the established leader in Virtual Reality for the industrial world. At Safran Nacelles, for example, manufacturing process engineers use IC.IDO to experience their process designs – without building full-sized prototypes. In the automotive industry,

Fiat Chrysler Automotive Latin America uses the solution to analyze assemblies at different workstations throughout the general assembly production line. They test the real conditions of the product within the process, without investing in physical tooling or a pre-production vehicle. IC.IDO allows them to address ergonomics, to gain visibility in hard-to-see locations, to learn how to access hard-to-reach places, and to validate assembly devices, transfer systems, and installation processes.

Using ESI IC.IDO as early as possible, manufacturing companies can experience, validate and communicate the production process risks across the requirements of multi-disciplinary teams. By

doing so, they can reduce risk and inefficiency to reach cost, quality and safety targets while scaling up production to successfully meet customer demand in a timely and cost-efficient manner.

At Manufacturing World Japan 2019, ESI will be located in the 3D & Virtual Reality Expo. Visitors will have the opportunity to experience live demonstrations of ESI IC.IDO running on Head-Mounted Displays (HMD) and powered by finger tracking.

ESI teams look forward to meeting you on booth West 2-73.

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

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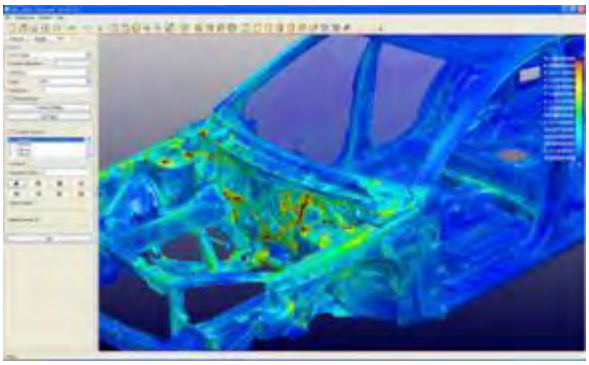
ETA has impacted the design and development of numerous products - autos, trains, aircraft, household appliances, and consumer electronics. By enabling engineers to simulate the behavior of these products during manufacture or during their use, ETA has been involved in making these products safer, more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

PreSys



PreSys is an engineering simulation solution for the development of finite element analysis models. It offers an intuitive user interface with many streamlined functions, allowing fewer operation steps with a minimum amount of data entry along the way. Using PreSys, the user can analyze product designs, view simulation results and analyze/predict how the product will perform in a given circumstance.

PreSys works the way you do.
The PreSys interface is fully customizable to suit user-specific needs. Also, a model explorer feature provides streamlined data navigation.

Menus, toolbars & many other user interface features can be customized by the user to streamline the guided user interface.

Developed by the leader in the creation & implementation of new CAE tools & methodology, PreSys is ETA's 4th generation Pre/Post Processor. It delivers the capability to handle finite element modeling with ease.

Why PreSys?

ETA's PreSys™ is a solver and CAD-neutral Finite Element modeling and analysis solution. A price/performance leader, the tool delivers precise modeling results with advanced graphics capabilities. With fewer steps, a customizable interface, streamlined functions and scripting access, the user can simulate and analyze designs quicker than ever. PreSys™ also offers vertical application toolsets which drill-down to application-specific requirements, including drop testing and fluid-structure interaction analysis.

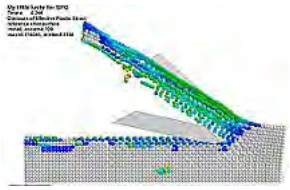
FEA Not To Miss, is a weekly internet blog on helpful videos, tutorials and other Not To Miss important internet postings. Plus, a monthly email blog.

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

Postings every Monday on what you have missed

www.feantm.com

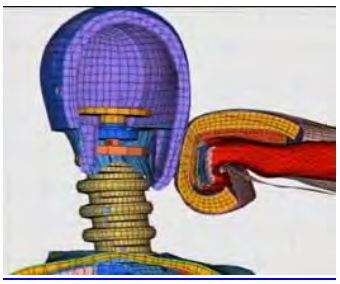
02/12/2019 - Don't forget your favorite person(s) on Valentine Day on the 14th with that special cup of coffee! Now on to our new metal coffee cups, NOT. We will keep metal cutting to LS-DYNA with SPG. My coffee cup covers you only need to pop off not cut off.



Metal cutting in LS-DYNA with SPG: Effective plastic strain

Yury Novozilov

02/03/2019 - At times I may want to punch something but I would NEVER do it holding my coffee cup! SO, I shall call this weeks coffee flavor Cafe-Mocha-You-Better-Duck.



Boxing glove foam simulation, side punch -LS-DYNA.

01/28/2019 -Below is how I will not drive my new 2019 Ford Ranger!!!! Now in process at Ford! I want to see it being shipped WITH a nice cup of chocolate flavored coffee and a chocolate chip cookie. Yes, that is very self serving of me! AND below is NOT what I will be doing with my truck.

This simulation is done with LS-DYNA

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

Shanghai Hengstar & Enhu Technology

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

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

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

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

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

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

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

Shanghai Hengstar Technology Co., Ltd

hongsheng@hengstar.com

http://www.hengstar.com

Shanghai Enhu Technology Co., Ltd

http://www.enhu.com

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

JSOL Corporation

Engineering Business Division

Product : J-OCTA

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

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

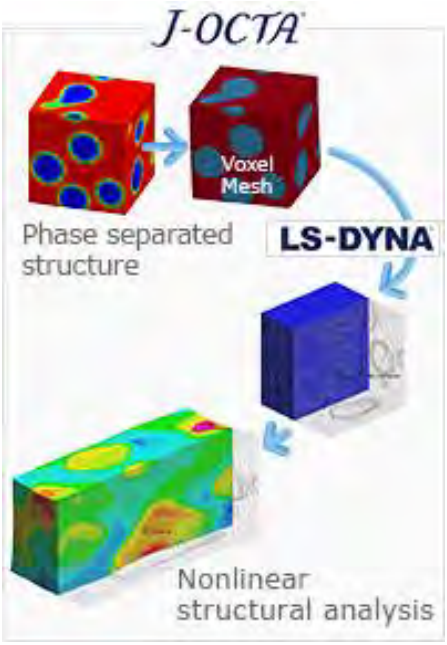
Interface for LS-DYNA supports large-deformation simulation

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

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

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

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



Example Case Study: Nonlinear Mechanical Properties of Composites

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

KAIZENAT

https://www.kaizenat.com/

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

Technologies Pvt. Ltd.

GROWING and MOVING!

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

Kaizenat's New Office:

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

The greatest benefits of moving:

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

New Address:

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

Contact us:

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

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

LS-DYNA® Advanced CFD Analysis

LS-DYNA® Incompressible CFD (ICFD) tool combines state-of-the-art numerical techniques that allow robust, scalable, and accurate simulations of fluid flows. Its ability to couple with the structural, thermal, and Discrete Element Method solvers make it an excellent option for multi-physics problems.

Applications:

- Ground vehicle aerodynamics
- Cooling analysis
- Resin Transfer Molding for manufacturing of composites
- Turbomachinery
- Fluid-Structure Interaction in the biomedical field

Features:

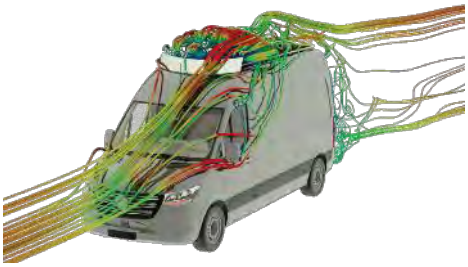
- FEM based
- Large library of RANS and LES turbulence models
- Automatic meshing and re-meshing
- Free surface flow
- Non-Newtonian flows
- Non-inertial reference frames
- Porous media models

Learn more at:

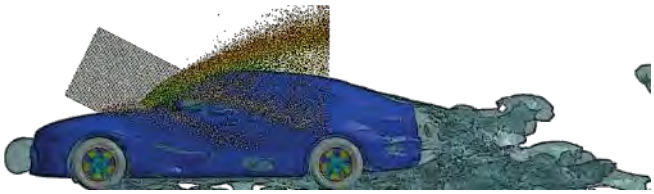
www.lstc.com/applications/icfd

YouTube:

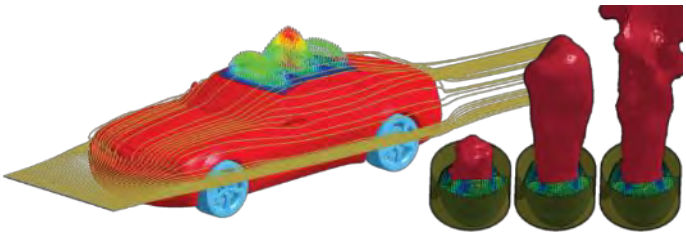
www.youtube.com/user/980LsDyna



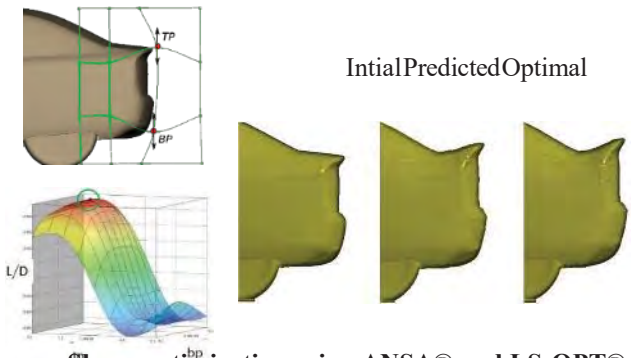
Accurate prediction of aerodynamic forces for turbulent flows



Coupling with Discrete Element Method (DEM) for water management simulations



Fluid-Structure Interaction analysis for a large number of applications including automotive and bio-medical industries



Shape optimization using ANSA® and LS-OPT®

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

LS-DYNA® Advanced FEM, Meshfree & Particle Methods

Intelligent Manufacturing, Advanced Material Design & Integrated Structural Analysis

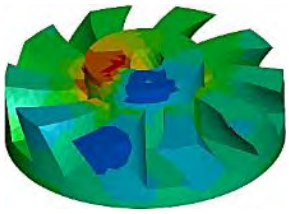
LS-DYNA® integrates the finite element, meshfree, and particle methods for solving some of the most challenging problems in manufacturing processes, material design, and structural analysis. Such problems typically involve large deformations, material failure, crack propagation, and composite materials.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

Applications

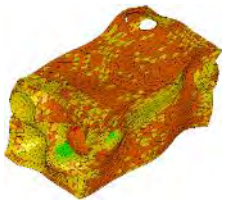
- Nondestructive manufacturing: forging, extrusion, 3D printing, compression molding
- Destructive manufacturing: cutting, drilling, grinding, machining, self-piercing riveting, flow drill screwing
- Material design: Representative Volume Element (RVE), reduced – order modeling
- Structural analysis: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

Features

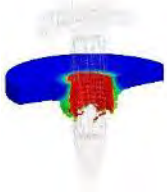
- Meshfree-enriched FEM, eXtended FEM (XFEM), adaptive FEM
- Element Free Galerkin (EFG), Peridynamics, adaptive EFG
- Smoothed Particle Hydrodynamics (SPH), Smoothed Particle Galerkin (SPG)
- Immersed particle algorithm for composites
- Particle contact for impact problems
- Brittle, semi-brittle, ductile,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



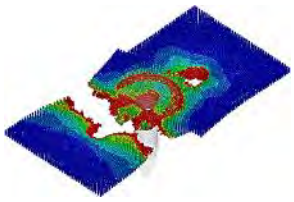
3D printing



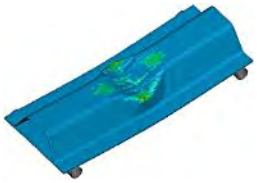
RVE for nano-particle reinforced rubber



Flow drill screwing (FDS)

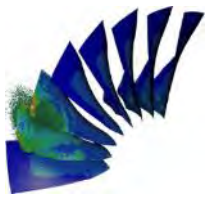


Lap-shear after FDS

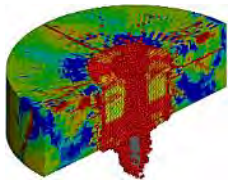


Carbon fiber reinforced polymer

Ductile cracking in shell



Bird strike



Perforation of concrete

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

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

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

Simulation Movie

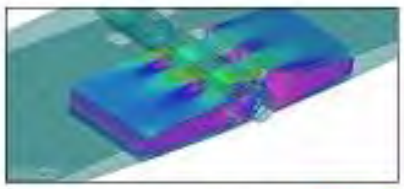
Penetration and Perforation of Moderately Thick Composites

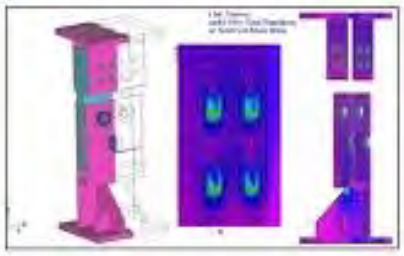
Examples are located at www.ccm.udel.edu/software/mat162/examples/

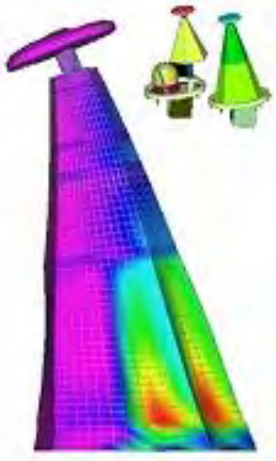
Example 1: Sphere Impact on a Composite Laminate
Example 2: Sphere Impact on a Perfectly Clamped Composite Plate
Example 3: Sphere Impact on Elliptical Carbon/Epoxy Tube

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

Engineering Services







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

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

Oasys LS-DYNA 12th Annual Update Meetings in India:

- **Pune – Monday, 18th March 2019 – Sheraton Grand Pune (formerly LeMerridien hotel), Raja Bahadur Mill Rd, Sangamvadi, Pune-411001**
- **Bangalore – Wednesday, 20th March 2019 – The Zuri Whitefield, ITPL Road, Whitefield, Bangalore- 560 048.**

Arup India Pvt Ltd is pleased to announce the 12th Oasys LS-DYNA Update meetings in India. First meeting shall be held at Pune on Monday 18th March 2019 at Sheraton Grand Pune (formerly LeMerridien hotel)and second meeting shall be held at Bangalore on Wednesday 20th March 2019 at The Zuri Whitefield.

Each of these is a full day free of charge event covering both LS-DYNA and Oasys software and is a perfect opportunity to find out about the current and future developments and how the software are being used in the engineering community.

The presentations will mainly cover LS-DYNA updates by Mr. Dilip Bhalsod of LSTC, Oasys suite updates by Arup team & technical lectures by Arup team and Industry (ARAI, Whirlpool & IISC).

Detailed agenda is available on our website http://www.oasys-software.com/dyna/en/events/ .

Registration

Please send your registration to this event by email to india.support@arup.com with your name (First Name, Last Name), company/affiliation, telephone number and your choice for the location of event. Last date for registration is 7th March 2019.

Venue

The event in Pune will be held at Sheraton Grand Pune hotel, which is close to Shivaji Nagar railway station. Sheraton Grand Pune (formerly LeMerridien hotel), Raja Bahadur Mill Rd, Sangamvadi, Pune-411001 Tel: +91 20 6641 1111	The event in Bangalore will be held at The Zuri, Whitefield, which is quite close to International Tech park, Bangalore. The Zuri Whitefield ITPL Road, Whitefield Bangalore - 560 048 India Tel: +91-806-665-7272

Contact Details: If you have any queries regarding this event you can contact:

Mr. Asif Ali,
Arup India Pvt Ltd,
Plot No. 39, Ananth Info Park, HiTec City-Phase 2,
Madhapur, Hyderabad-500081,India
Tel: +91 (0) 40 44369797/8 Email: india.support@arup.com

Oasys Post-Processing V15 Update

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

Please click below to view the webinar recording:
VIEW RECORDING

UK Oasys LS-DYNA Users' Meeting Tuesday 12th March 2019

16th Annual Users' Meeting - Ashorne Hill

OASYS announced the 2019 Oasys LS-DYNA Users' Meeting will be held at the Ashorne Hill conference center in Warwickshire on Tuesday 12th March 2019.

Last year the day brought together over 120 users of Oasys and LS-DYNA software and we expect the 2019 event to be as popular.

The agenda will be published on this page shortly, but we can already confirm that attendees will enjoy LS-DYNA updates from Dilip Bhalsod from LSTC and a variety of talks from the Arup team providing information on the forthcoming v16 release of the Oasys software.

The event will be followed by a complimentary meal at the Ashorne Hill restaurant.

Please register your attendance with dyna.support@arup.com or using the form on this page.

Register here

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

FINITE ELEMENT ANALYSIS
Predictive Engineering

Who We Are

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

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

Our History

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

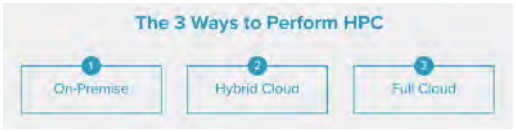
View our portfolio of:
+ FEA, CFD and LS-DYNA consulting projects

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

The Ugly, Hidden and Underestimated Costs of Building an On-Premise HPC System

Thomas Helmonds - January 17, 2019

The options for High Performance Computing (HPC) systems can be overwhelming with the different expenses and benefits associated with each system. The different systems currently available fall into the following categories: on-premise, cloud-enabled (full or hybrid), and bare-metal cloud.



Depending on your current and future HPC and organizational demands, each system offers benefits and limitations that need to be defined and compared. One of the main comparisons between systems is usually the Total Cost of Ownership (TCO). As I mentioned in a previous blog post, TCO not exactly a good fit for making buying decisions between fundamentally dissimilar alternatives. The TCO of on-premise HPC systems has been discussed for +30 years, even by our VP of Sales in his blog "The Real Cost of High-Performance Computing." For people who are considering buying on-premise HPC systems, there are some hidden expenses that are often overlooked when calculating the TCO of and on-premise HPC system.

A quick review on TCO

The broad definition of an on-premise HPC system's TCO is that you sum the amount of all direct and indirect expenses correlated with your prospective system. The more obvious expenses are hardware, software, staffing, and power. For hardware, you need the following: servers, wiring, ToR switches, aggregation switches, server racks, power distribution units, etc. Then you must buy software that coordinates the communication between each node to solve complex problems. In addition, you must buy licenses for the software you plan on using. A resource that can be extremely variable and hard to estimate is the staffing required to develop, deploy, and maintain the on-premise HPC system. Finally, on-premise HPC systems require a lot of power and cooling capabilities: it is essential to calculate your energy consumption and how it will affect your operational expenses. Take the sum of the expenses for the items above and you have the basic TCO for your on-premise HPC system; however, there are some hidden costs that can heavily affect the TCO of your on-premise system.

Real-world, Hidden Costs

#1 The facilities hosting your HPC systems have cost dependencies that reach further than at first glance. Ensuring your facility has the proper cooling and power provisions necessary to support the current system and its potential scalability can save a lot of expenses down the road. Power is a major expense and can be extremely impactful on your overall operating expense. Depending on cluster location and utilization, your power costs can vary greatly. Due to your location, you may also see highly variable power prices that will heavily affect how you operate your HPC system to minimize expenses. In some cases, power can become over 1/3 of your operating expenses. Facilities and energy are important to consider when calculating your TCO and, for a large facility, should be considered a primary concern.

#2 Staffing will cost and vary more than you think, with performance and uptime suffering if neglected. One of the most variable and elusive expenses to define is the staffing for on-premise HPC systems. It can be very difficult to find, hire and train good Operations and IT Managers that can perform the development, deployment, and maintenance of an HPC system. Designing an HPC system requires expensive specialists to match the best

hardware and software for your computing demands. The procurement of the system alone can cost as much as 5% of the total HPC system and takes at least 6 months. During this time, you must continue paying specialists to assemble the cluster while receiving no reward for the HPC system. Once deployed, the systems require very specific IT staffing to ensure its' maintenance and operation. These employees require specialized skills to test and protect your HPC system's longevity and performance. Finding the right employees to perform these functions can be cumbersome and costly, but is a priority when considering deploying an on-premise HPC system.

#3 Underutilization costs more than just the idle time, the associated overhead is substantial as well. An idle HPC system not only lowers your ROI, but can have devastating impacts on your product development cycle. Back-up systems can be overlooked because they are not considered necessary expenses to have an operating HPC system; however, the consequences for not having them can be dire. Generators, switches, gas, and maintenance of your backup energy system are all necessary to ensure that your systems are protected from power outages. Comparable to back-up energy provisions, back-up hardware is extremely important to mitigate an idle HPC system. Spare hardware is important to have on hand in case there is an issue; without backup hardware, you can find your system sitting idle while the part is repaired or bought. If you fail to plan, you should plan to fail; this is especially true for running an on-premise HPC system.

#4 Finally, on-premise technology is a constant uphill (and usually losing) battle. This is the harm caused by not utilized the best technology, and having to spend enormous efforts and capital to race to keep up. When comparing HPC systems, you have to acknowledge the costs and rewards, and their effect on each other. Not using the best technology can create expenses that stem from forfeiting rewards that are given by the best system. The expenses correlated to not using the best HPC solution are: lost productivity, missed innovation, longer time-to-solution, technology refresh cost, IT risk management, and increased IT debt and commitment. The most harmful forfeited reward is inefficiency in the research pipeline which creates a plethora of expenses correlated to the increase in time-to-market, delay in innovation, and increase in researcher idle time. The lack of HPC technology can cause your organization to have irreparable implications such as not being able to research larger problems and missing innovations that can make your organization uncompetitive. These expenses are often difficult to calculate because you have to assess how much more efficient your team will be with a better HPC solution and then work backwards to calculate the expenses correlated to inefficiency.

In summary, finding the true TCO of an on-premise HPC system can prove very difficult when considering all the hidden costs: staffing, facilities, power consumption, backup provisions, and forfeited rewards. I argue that one of the most important expenses to consider when comparing HPC systems is the expenses caused by forfeited rewards; however, these prove to be the most difficult to calculate and predict. The topic of TCO comparisons between cloud-enabled and on-premise HPC systems has been discussed regularly and is still not clearly defined. It is a comparison that we are working to improve, so if you have any comments or questions on this blog post or TCO, we would love to hear what you think.

Sara Jeanes. (2017, June 19). Cloud vs. Datacenter Costs for High Performance Computing (HPC): A Real World Example. Retrieved from: https://www.internet2.edu/blogs/detail/14114

Tony Spagnuolo. (2015, January). The Real Cost of High Performance Computing. Retrieved from: https://blog.rescale.com/the-real-cost-of-high-performance-computing/

Wolfgang Gentzsch. (2016, March 6). A Total Cost Analysis for Manufacturers of In-house Computing Resources and Cloud Computing. Retrieved from: https://community.theubercloud.com/wp-content/uploads/2016/04/TCO-Study-UberCloud.pdf

This article was written by Thomas Helmonds.

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

Seminar on LS-DYNA and Its Application in the Field of Aerospace

LS-DYNA, developed by LSTC, has been the leader software in explicit dynamics programs. In recent years, LS-DYNA has made rapid progress and development in implicit analysis, SALE fluid-structure interaction analysis, DEM (discrete element method), NVH analysis, SPH (Smoothed Particle Hydrodynamics) method, EFG meshfree method, ICFD (incompressible fluid and fluid-structure interaction) analysis, CESE high-speed compressible fluid simulation and Peri-Dynamic algorithmsand other fields.

LS-DYNA has been widely used and recognized in the field of engineering simulation in China. In order to further help users to use LY-DYNA better, LS-DYNA China will continue to intensify the presentation of new features and technologies regarding the LS-DYNA software, supporting users in China to make scientific research innovation based on LS-DYNA.

The field of aerospace includes bird strike, bird strike of turbo-fan engine, FBO and force transfer, airplane ditching, crash, seat ejection, parachute, etc.

Schedule:

Time	MainTopic
13:30~15:00	● Solid Engine drop ● Fluid Engine Sloshing ● Parachute Deploy ● Return Cabin Water Landing ● Separation Nuts and Protection
15:00~16:00	Discussion

Date: 21st March, 2019
Venue: No. 2 Meeting Room, 3rd Floor, International Exchange Center, Beijing Institute of Technology
Address: No. 5 South Street, Zhongguancun, Haidian District, Beijing
Contact: Elva Yu Tel: 15001986675
Xixi Fei Tel: 13482272672

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.

Article courtesy of defense-aerospace

Future Combat Air System Described by its Designers (excerpt)

For the New-Generation Fighter component of FCAS, Dassault favors a tailless, vectored-thrust design with conformal antennas mounted around the airframe. (Dassault image)

The Future Combat Air System, or FCAS, is entering a new phase. It has been launched last April by Germany and France, and Eric Trappier, the CEO of Dassault Aviation, just announced that a new contract would be signed by the end of January.

The aim would be to fly a demonstrator for a piloted aircraft by 2025. FCAS is a major project, a symbol of the strengthened defence cooperation between the two countries, which should be reaffirmed by a new treaty to be signed on January 22.

Beyond politics, the French and German aim to replace their current fleets of combat aircraft by a new system capable to overcome the most modern air defence systems, with an introductory date around 2040. Contrary to previous European defence projects like the Tornado or the Eurofighter aircrafts, FCAS will not be restricted to designing a single fighter jet.

Rather, it will design a force structure, comprising fighters, drones, tankers, advanced early warning aircrafts and complex weapons, each one of them being linked up to a common network to share information and react instantly to enemy threats, which are envisioned to become increasingly connected as well. Indeed, ground radars, command centres and surface to air missiles will probably be networked with jam-resistant links.

Future air warfare should consequently see the air defence network face the FCAS offensive network.

The project is currently in definition phase, and is headed in France by French Air Force General Breton. As it is a very technical endeavour, the French defence procurement agency, DGA, is strongly involved, under the leadership of Chief Armament Engineer Koffi. Both were present at the forum “Innovation Défense” which was held in Paris at the end of November, and gave a conference on the role of innovation in the FCAS project.

Here is a transcript: General Breton:

The Future Combat Air System FCAS is due to come into service in 2040, 2040 is a long way off. It is therefore necessary to be flexible and agile to be able to constantly adapt to the unexpected.

One way to do this is to use an app model like on smartphones: you can install a new application in a few clicks, which is currently impossible on a fighter aircraft because you have to check that any new software does not have an impact on the flight system for example, while these two softwares must communicate together. FCAS will therefore have to be architected to be able to integrate new applications by ensuring that they do not consume all the memory or battery, to use the smartphone example.

Another way to innovate is through new uses of existing systems: for example, by using the management equipment for the link16 datalink that equips our aircrafts, we can divert it from its initial role as a pure data link by using it for training, by injecting dummy targets to make pilots work on the reaction to be given to them.

An important aspect of innovation on FCAS will be networking: currently on the Rafale, the pilot mainly uses his own sensors and some of the information provided by the network. In FCAS, the proportion will be reversed. The management of the data transfer by the network will be done independently of the pilot, who will see the data merged and will supervise the process.

The analyses we conducted on FCAS are as follows: the missions will be more or less the same as today's missions. Threats, on the other hand, will have changed significantly. Long-range air defences and denial of access will have spread, enemy aircraft will be stealthy, the enemy will have swarming and collaborative UAVs, hypersonic missiles, integrated land/sea/air/space manoeuvre, and cyber capabilities. If these capacities are the prerogative of a few states today, tomorrow any actor, even a private one for cyber, will have some or all of these capacities.

Faced with this, FCAS provides a system response, with different components. A cruise missile component will deal with high value targets. The highly defended threats will be engaged by remote carriers – drones capable of performing reconnaissance, jamming or even striking. Depending on the defences encountered by the system, it will send either its fast components or its stealth components to counter it by adapting.

AA interception and defence will be carried out by a manned fighter aircraft, as well as specialized missions [nuclear strike--Ed]. The pilot will bring his intelligence to the system, and will be the captain of this football team whose wingers will be drones and remote carriers. (end of excerpt)

The cooperative car: Intuitively knowing what the car is planning

Stuttgart. Autonomous driving is going to be an integral part of mobility in the future. Mercedes-Benz considers empathy and trust to be central factors for the acceptance of self-driving vehicles. Because for people to have trust in the machine, they must immediately and intuitively be able to recognize what an autonomous vehicle intends to do. Mercedes-Benz conducts research into this "informed trust" with the help of the "cooperative car".

The cooperative car is based on an S-Class, and features 360-degree light signaling. Turquoise lights on the roof indicate autonomous driving mode, and provide information on what happens next.

·Continuous light shows that the vehicle is in autonomous driving mode, whether moving or stationary.

·Slow flashing means that the vehicle is braking.

·Rapid flashing announces that the vehicle will shortly be moving off.

Alternative light display concepts are also being tested with this vehicle: turquoise light strips in the windscreen, the radiator grille, the headlamps, the exterior mirrors and the lower area of the windows indicate to pedestrians and other road users that the vehicle is operating in autonomous mode. Short rows of illuminated dots on the roof tell other road users that they have been recognized. In the process, only those pedestrians or cyclists whose path coincides with that of the vehicle are given a light signal. In doing so, the cooperative car recreates the natural eye contact that would have taken place between the driver and pedestrians.

The cooperative S-Class also informs its surroundings that it is about to go into operation while it is still at the side of the road. The light strips around the vehicle emit an appropriate light signal. The exterior mirrors fold out, and first the rear then the front of the vehicle lifts up. These movements resemble a living being that is waking up and stretching. People can understand this communication intuitively.

Studies have shown that pedestrians prefer 360-degree communication in turquoise. 360-degree light signaling is particularly important when it comes to keeping pedestrians informed. These are the findings from several light studies that Mercedes-Benz carried out in Sindelfingen and on the Immendingen test site, which was opened in September 2018. The research examined how pedestrians react to differently signalized autonomous vehicles in various traffic situations

.

It became clear that light signaling has a strong effect on the acceptance of autonomously driving vehicles, as well as on how safe pedestrians feel.

In particular, people want light signaling in situations where there was hitherto interaction with the driver. For example, people are used to seeking eye contact with a driver when they want to cross a road. If light signaling is communicating that a vehicle is in the autonomous driving mode, pedestrians can feel safe even if the vehicle occupants are obviously not paying attention to the traffic situation.

The majority of participants in the study preferred turquoise as the signaling color, and all participants favored a 360-degree display. Mercedes-Benz is contributing its findings from these studies to assist work being carried out on autonomous driving by SAE International, an international engineering association that is developing norms and standards in the field of mobility. There Mercedes-Benz recommends the use of turquoise, a color which has not previously been used in the automotive sector, to enable 360° signaling.

Visions of the future: the vehicle body as a means of communication: Going beyond the studies and the light signaling demonstrated based on the cooperative car, Mercedes-Benz is already concerning itself with longer-range visions which are intended to allow "informed trust" between humans and machines. This is where informed trust contrasts with blind trust. Here the entire outer skin of the vehicle becomes a communication medium for 360-degree communication. The classic body is transformed into a "Digital Exterior".

Mercedes-Benz already took an initial step in this direction back in 2015, with the F 015 research vehicle. Among other features, this has a digital grille which can be used as a communication medium. In the following year this motif was also taken up by the Vision Van, a study for an electrically powered van with integrated delivery drones for last-mile parcel delivery. This features digital LED displays at the front and rear. The vehicle can, for example, warn following traffic with messages such as "Vehicle stopping". In 2018 the Vision URBANETIC, a mobility concept for on-demand, efficient and sustainable mobility, took this design further. The concept of an autonomous driving platform with exchangeable modules for goods and passenger transport, can communicate with its surroundings via "digital shadowing" on the body. The shadow of a pedestrian, for example, is depicted here if the vehicle's 360-degree sensors have registered it in the immediate vicinity. Based on this interaction, the pedestrian can be sure that they have been detected and then act accordingly.

Building on these innovations, Mercedes-Benz is now working on other solutions which provide vehicle occupants and passers-by with the same information about the vehicle's perceptions and subsequent actions. The vehicle occupants should also be able to decide what the vehicle communicates to the outside world. This facilitates a cocooning effect in the vehicle, making it feel like a protected space for its occupants.

Not To Miss Announcement - ESI Group CEO

mv@feainfomation.com

[ESI Group nominates its new Chief Executive Officer Cristel de Rouvray]

ESI Group (FR0004110310 – ESI), pioneer and leading innovator in Virtual Prototyping solutions, announces the appointment of Cristel de Rouvray as Chief Executive Officer, effective the 1st February 2019. Cristel de Rouvray, age 42 and previously Board Leader of the Group and an Executive at an American Non-Profit Organization, succeeds Alain de Rouvray, founder of the company who remains Chairman.

Cristel de Rouvray has a long track record with ESI Group and has been an ESI Board member since 1999. Appointed Board Leader, she served as Chairwoman of the Compensation, Nomination & Governance Committee, as project leader for succession planning, and as head of an operational committee for critical Human Resources related topics. She has been a key driver in building and supporting ESI's talent development and management decisions. Through this experience, Cristel has gained both a deep understanding of ESI 's expertise, market, people and culture, and has successfully established a productive working relationship with the industrial ecosystem, the Board, the Group Executive Committee and key managers.

Alain de Rouvray, Founder and Chairman, comments: *"Reaching the conclusion of a multi-year process of managing my succession as CEO of the company, the Board has decided that Cristel is the best candidate to take the CEO position. Her deep knowledge of our company, her commitment over the past 18 years, her remarkable management and business intelligence skills, and her successful relationship with the leadership team are major and decisive assets as we move the company forward and capitalize on the huge opportunities in front of us. I will actively support Cristel to ensure that our culture of innovation, as well as our business and social ethics, are preserved in this challenging period. I am committed to aiding our new leadership team to navigate the accelerated and changing landscape in which we find ourselves and our business."*

Cristel added: *"I am fully energized to take on this CEO role in the midst our transformation as we position our company as the essential partner for industrialists aiming for zero real tests, zero real prototypes. ESI Group, over decades, has built a solid foundation of amazing talent, customer credibility and inspiring solutions, with consequent and wide recognition from our peers, partners and customers. My job, and that of our next-generation leadership, is to unleash, with the active support of the Board and its Chairman, this legacy on the strategic and socially responsible mission of enabling industry to innovate in the face of mounting expectations of the safety, sustainability and relevance of the products they develop, manufacture and support."*

The complete Article can be read on the ESI-Group Website.
[ESI Group nominates its new Chief Executive Officer Cristel de Rouvray]

mv@feainformation.com

The LS-DYNA® Aerospace Working Group (AWG) is a partnership of federal agencies, corporations, and universities working together to develop and publish aerospace test cases and modeling guidelines for finite element analyses with LS-DYNA®. The actions of the AWG serve to support the use, development, and reliability of LS-DYNA® for aerospace numerical analyses.

Some participants are partially or fully funded by the Federal Aviation Administration (FAA) in the National Aviation Research Plan 'Aircraft Catastrophic Failure Prevention Research' program, or by the National Aeronautics and Space Administration (NASA), or associated with the participants as LS-DYNA® users.

Among the commercial participants are: The complete participant list is on the website.

Airbus - Boeing - B/E Aerospace
General Electric Aviation -
Gulfstream Aerospace - Cessna -
Federal Aviation Administration (FAA) -
Honda Aircraft Engine -
Livermore Software Technology Corporation
Nat'l Aeronautics and Space Admin. (NASA) -
Naval Air Warfare Center Aircraft Division -
Northrop Grumman - Pratt & Whitney -
Rolls-Royce - Stelia Aerospace -
United Technologies Aerospace Systems -
Williams International - Zodiac Aerospace.

Mission:

The mission of the Aerospace Working Group (AWG) is to develop and publish on the AWG Website aerospace test cases and modeling guidelines for Livermore Software Technology Corporation's (LSTC) non-linear analysis program LS-DYNA®. The mission is achieved through the partnering of industry, government agencies, academia, and LSTC. The goal is to improve consistency and reliability of aerospace impact simulations with LS-DYNA®, thereby gaining regulatory agency acceptance of these simulations.

Background: (excerpt)

Since becoming commercially available, LS-DYNA® has continued to evolve and has become widely accepted in the aviation industry for performing non-linear transient analyses of high energy impact events such as fan-blade release, engine foreign object ingestion, aircraft shielding, and bird strike. To improve regulatory agency acceptance of these analyses in lieu of tests, the Aerospace Working Group (AWG) has been developing modeling guidelines and test case models for these events. A significant amount of the data to support this work comes from ongoing research performed under the Federal Aviation Administration's (FAA) Aircraft Catastrophic Failure Prevention Program and the National Aeronautic and Space Administration (NASA) Aviation Safety Program.

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

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

Instructor: Imtiaz Gandikota
1 Day - $200, Students $100 w/student ID
Includes on-site continental breakfast, lunch, breaks and class notes Includes 30-day demonstration license for practice

Prerequisite: An introductory class, or equivalent knowledge in LS-DYNA is recommended

Description: This 1 day class provides an introduction to the use of the topology optimization and shape computation code (LS-TaSC) for design. It covers both theoretical concepts and practical aspects of topology optimization. The course includes workshop sessions in which the theoretical topics of the day are applied. The LS-TaSC graphical user interface is used to teach input preparation and post-processing.

Contents:
• Introduction to topology optimization using industrial examples
• LS-TaSC features
• Theory:
• Optimization formulation
• SIMP penalization
• Global and local optimization
• Design filtering
• Constrained optimization using multi-point method
• Termination criteria
• Setting up and running a simple topology optimization example
• Design parts with solids and shell elements
• Topology optimization using multiple load cases and multiple parts
• Free surface design
• Post-processing of results

https://www.predictiveengineering.com/blog

FINITE ELEMENT ANALYSIS
PredictiveEngineering

Next Generation CFD - Blog February 12th	Discover how your company can innovate to the next generation. March 21st 8:30am PT / 11:30am ET

The way we think of the design process is changing. Join us as we host an online seminar covering where CFD & engineering design trends are headed. We'll help you explore STAR-CCM+, the integrated multiphysics solution for CFD engineers.

Attendees will see how to evaluate the design space though the use of parametric CFD studies and design exploration. The presentation consists of three parts: an overview of the design challenge, setting up of the design space, and an evaluation of the parametric results.

Register on the website for the Next Generation CFD with STAR-CCM+
https://www.predictiveengineering.com/blog

This online seminar will be led by:

George Laird
CAE Director, Principal
Applied CAx and Predictive Engineering

Clay Hearn
STAR-CCM+ lead, Staff Mechanical Engineer
Applied CAx and Predictive Engineering
Webmaster's blog

mv@feainformation.com

LS-DYNA Multiphysics YouTube

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

FAQ LSTC

ftp.lstc.com/outgoing/support/FAQ

LS-DYNA Support Site

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LS-DYNA EXAMPLES

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OASYS	www.oasys-software.com/training-courses/
Predictive Engineering	www.predictiveengineering.com/support-and-training/ls-dyna-training

Author: Christian Frech christian.frech@dynamore.de

Seminars 2019

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

Selection of trainings for February/March

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

Information days (free of charge)

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

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

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

www.lstc.com

February 2019

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

March 2019

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

DynaS+

Complementary tools

LSTC Livermore Software Technology Corp.

OUT-06

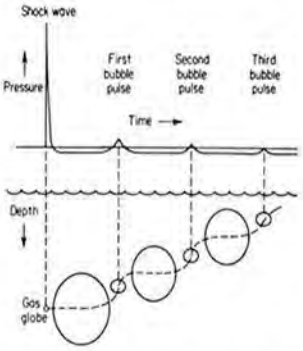
Underwater Shock Analysis with USA/LS-DYNA

Goal

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

Contents

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



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

Audience

CAE Engineers / Researchers

Prerequisites

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

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

Duration

3 days

Trainers

External expert
(Tom LITTLEWOOD–LSTC)

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

Training provided in English, English course material

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

Contact information:

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

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

Address: 5, avenue Didier Daurat - 31 400 TOULOUSE

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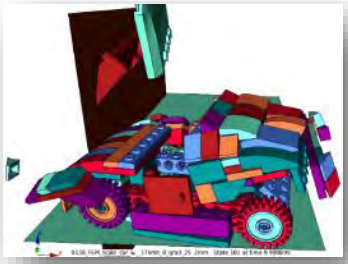

Investigation of the crash behavior of a LEGO car

Playing with LEGO bricks is something many engineers might have enjoyed during their childhood. And to some extend the creativity and complexity that LEGO allows when building any kind of mechanical construction might have contributed to their fascination and finally in their decision of becoming engineers. It's interesting to see how many of them still stick with their fascination with LEGO even in their adult live. In order to teach about mechanical engineering and FEA using LEGO as a motivator might be a good idea. It could help young students to grasp some of that fascination and also aid them to see the fun of physics seems a logical thought.

Looking through the internet one can find seemingly endless resources of pictures, videos, construction instructions and also 3D CAD models on sites such as ldraw.org or bricklink.com. These 3D models are commonly made with special LEGO CAD software and there is not just one but a whole bunch of different options to choose from. Among other LEGO CAD softwares, there are LDCad, leocad, studio and complementary tools such as LDView just to name a few of them. Also there is a vivid community at ldraw.org maintaining a library of CAD Data for all the numerous bricks that are available by LEGO.

However before starting to create a model in CAD it might be advisable to build the real thing with real LEGO bricks. Especially with children, this is half the fun and gives room for fantasy and motivation. So the first prototype of my attempts before going virtual actually looked like this:

Figure 1: first physical prototype

This model definitely suffered from the fact, that one never has all the desired bricks of right colors but it gives a good first impression of how the model could work.

In order to get started with a CAD model, the software studio from BrickLink might be a good choice and even young children of age 10+ are easily able to understand the concept of this software and build easy models. For more advanced models or those preferring open source, LDCad might be the preferred choice. My first attempt to recreate the simple prototype resulted in the following model:

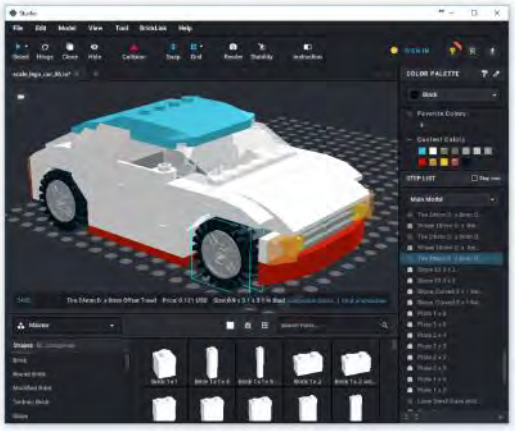

Figure 2: model opened in studio LEGO CAD software

Figure 3: photorealistic rendering generated with studio

The good thing about these LEGO CAD programs is that you have an endless supply of all the bricks that ever existed. Because of which I was able to already apply some improvements. The model is publically available and can be downloaded at bricklink.com. So if you want to take a look, just go ahead and try yourself. You will also find models on bricklink.com, as well as on the OMR (Official Model Repository) in ldraw.org many other models of the same kind, just to investigate and play with.

Also on bricklink.com you can create a cart with all the needed physical bricks for the uploaded model and BrickLink will give you the possibility to order used or new bricks from numerous online stores that are specialized in selling LEGO bricks. This is quite a convenient thing to do and in the end the actual physical model for my car looked like this:

Figure 4: final build of scale car model

When trying to get from the ldraw format to actual LS-DYNA simulation models, in order to have some virtual fun with crashing LEGO models, it seemed natural to use a similar approach as in the ldraw format. In this format basically every line is just providing the transformation information, a color and a reference to one brick in the standardized ldraw brick library.

The idea is, when having a library of meshed bricks in the same positions as the bricks in the ldraw library, it would be easy to create simulation models from any of the countless downloadable ldraw models. Maybe at some point even easy enough for young students. With this approach each brick would have to be meshed only once and can then be used over and over again by using `*INCLUDE_TRANSFORM` cards to import the brick to their various locations.

Since I wanted to use the models also as a show case and later maybe as class example for our Simulation Data Management system LoCo, I wrote a small script for using LDCad directly from within LoCo and returning the individual bricks of the ldraw file as individual parts (components) in LoCo. This also allows me to structure the car model hierarchically and create a part structure just as I would probably do with real car models. In LoCo this looks like this:

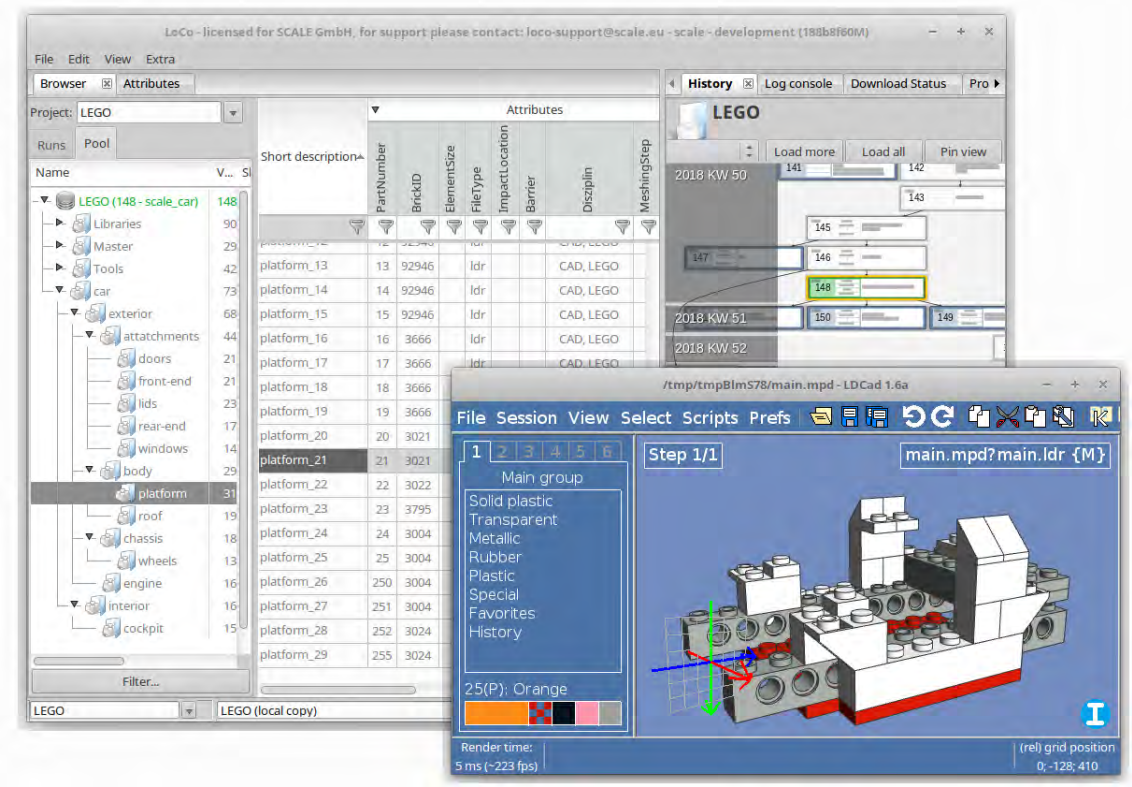

Figure 5: working with CAD data in LDCad directly in Simulation Data Management system LoCo

The different substructures of the model can be opened and worked with directly from LoCo in the CAD system (here LDCad) and upon saving the changes will be stored back to LoCo. New versions of all files and folders are created and synchronized automatically to all other team members working on the project. LoCo acts here also as a collaboration platform giving the possibility to try out different versions of the actual LEGO model or create a model in cooperation with others.

Apart from the CAD data also the LS-DYNA models for each brick are stored in LoCo and mounted as a library:

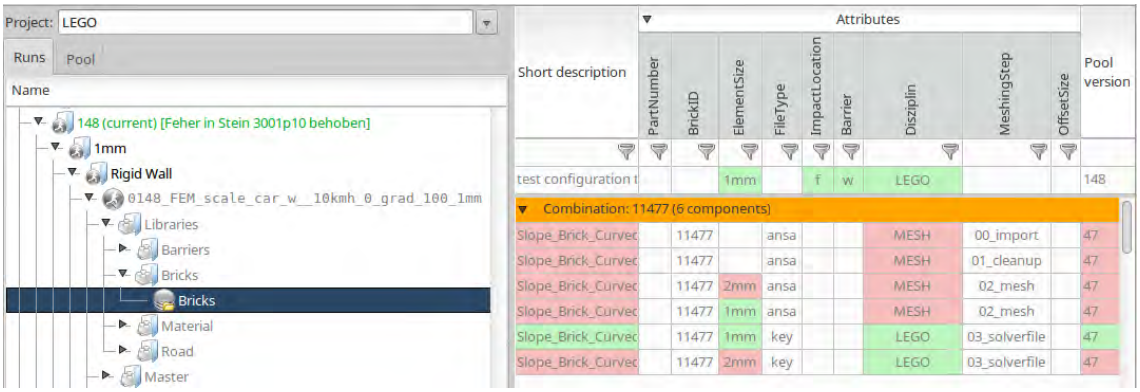

Figure 6: managing the library of meshed bricks in LoCo

Other files needed such as a master file containing all the control cards, barrier models, files with material cards and so on are also stored and maintained through LoCo.

Finally a script is kept together with all the other components of the model, which runs when assembling an actual LS-DYNA solver deck from LoCo. This script takes the transformation information for each brick and translates them to LS-DYNA ***INCLUDE_TRANSFORM** and ***DEFINE_TRANSFORMATION** cards such that each ***.key** file is imported over and over again.

```
$#########################################################################
$ Include - Transform for:
$ dashboard2_-_nnn_____________558_3070b_000000_----_3b16a7a2.ldr
$#########################################################################
$
*DEFINE_TRANSFORMATION
  20115001
$
$  rotation and translation from *.ldr file:
$
$  1 0 -0.567 -200 -274.567 -1 0 0 0 0 -1 0 -1 0 3070b.dat
$_______________________________________________________________________
$
$  Rotation:
$
    ROTATE       1.0       0.0       0.0       0.0       0.0       0.0      90.0
$
$ um X
    ROTATE       1.0       0.0       0.0       0.0       0.0       0.0       -90
$ um Y
    ROTATE       0.0       1.0       0.0       0.0       0.0       0.0        -0
$ um Z
    ROTATE       0.0       0.0       1.0       0.0       0.0       0.0       180
$
$_______________________________________________________________________
$
$  Translation:
$          x         y         z
    TRANSL   -0.2268       -80  -109.827
$
$ final rotations
$
    ROTATE       1.0       0.0       0.0       0.0       0.0       0.0     -90.0
    ROTATE       0.0       0.0       1.0       0.0       0.0       0.0     -90.0
$
$_______________________________________________________________________
$
*INCLUDE_TRANSFORM
Tile__1_x__1_with_Groove_____________________3070b_1mm03_.key
$#  idnoff    ideoff    idpoff    idmoff    idsoff    idfoff    iddoff
  20115000  20115000  20115000         0  20115000  20115000  20115000
$#  idroff
  20115000
$#  fctmas    fcttim    fctlen    fcttem    incout

$#  tranid
  20115001
$
```

Figure 7: automatically generated solver cards for including bricks with transformation on different positons

The same script also creates session files for LS-PREPOST, Animator and META for correct coloring when looking at the crash animations.

Having such a setup in place it makes it easy to apply changes to the LEGO CAD model by using e.g. LDCad or importing other LEGO models and run these as new simulations, provided the meshed bricks already exist for the bricks used in the model. And meshing these bricks is actually the most elaborate part when setting up such models.

The original CAD data for each brick from the ldraw brick library is mostly in the form of a simple mesh made out of triangles representing the surface of the brick. This can easily be converted to ***.stl** or ***.obj** files using leocad or LDView and imported to ANSA or Hypermesh. However these meshes are not suitable at all for conducting simulations. So they can only be used as a basis for creating meshes suited for FEA. Initial experiments trying to use the simple original STL meshes as rigid bodies have not been very promising and therefore we decided to create mostly tetrahedral volume meshes with a target edge length of 1mm and 2mm. However even with 1mm it is sometimes not possible to capture every detail of some bricks which however is crucial for the behavior when two bricks separate.

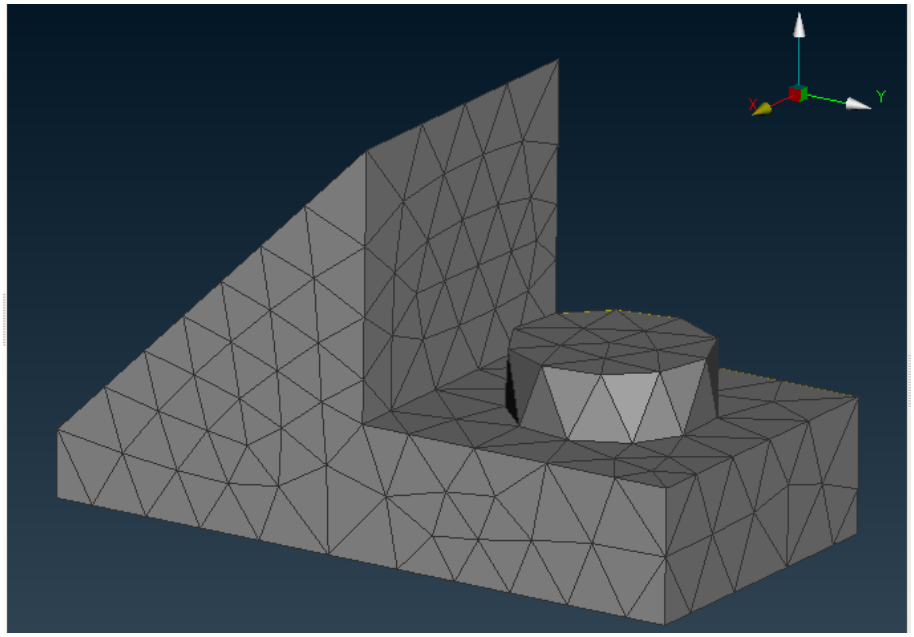

Figure 8: 1mm mesh for brick with ldraw ID:92946

For the moment the models are held together solely by contact and friction which is not quite capturing the physical truth because in reality the bricks are also hold together by some kind of clamping force. We are still investigating how to use tied break contacts to improve this behavior but even without it simulation results already look interesting.

In LoCo I set up many different load cases with different velocities, impact angles, and barrier offsets. This is actually quite easy once all the bricks where meshed. The results of a 17km/h 25% offset barrier crash can be seen in this video on YouTube.

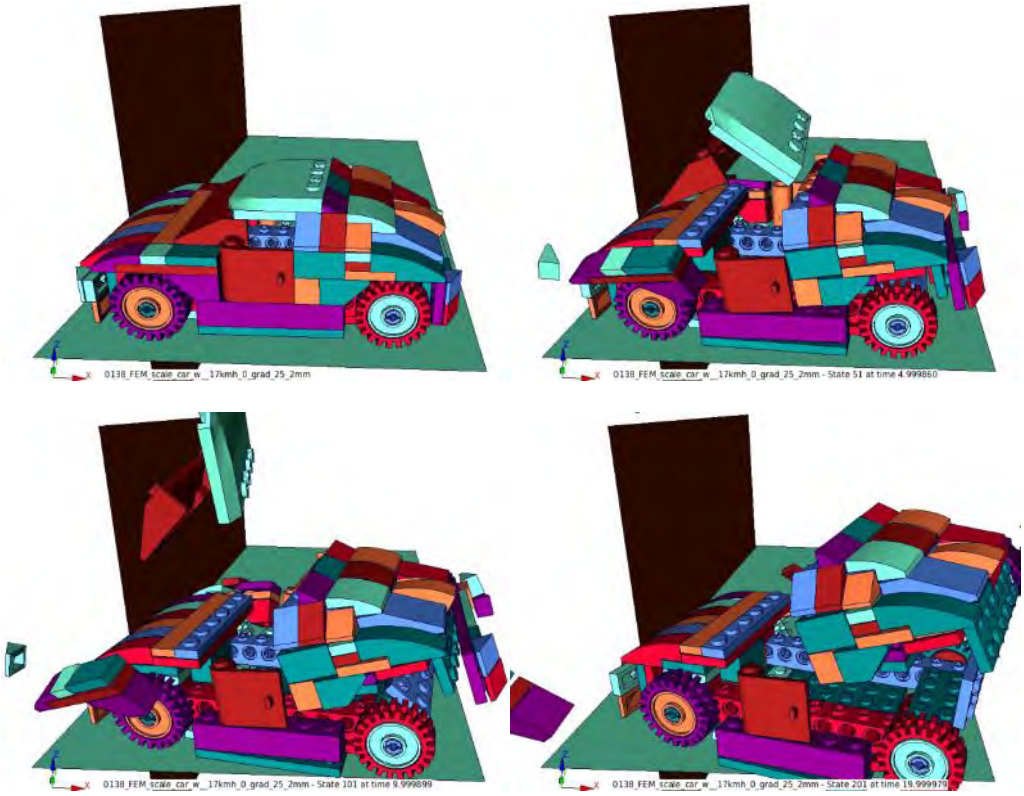

Figure 9: 25% offset crash visualized in LS-PrePost at 0, 5, 10 and 20ms

When seeing these results I've not been very convinced about them since the car is heavily bouncing backward. I expected that it would get a lot more spin when hitting the barrier only with one edge of the car. So I decided that it would need physical validation and I spend a weekend to actually construct a small wooden crash sled.

Figure 10: crash sled (left) and positioned car for 25% overlap frontal crash (right)

The sled is driven by a slingshot and can accelerate the car to approximately 15-20km/h which is way higher than one would think and made the bricks of the car fly all over the place. That's why I had to construct a little housing in front of the sled such that the bricks couldn't hurt anyone (especially my kids) and also I would be able to find all the bricks after each crash easily.

Figure 11: crash sled from below with slingshot mechanism

The barrier is made out of hard wood and can be placed in different positions to represent different load cases.

- 100% frontal
- 50% frontal offset
- 25% frontal offset
- 30° rotated 100% frontal

The test than is filmed using the slow motion mode of two smart phones. One was placed on top of the housing to create a video showing the crash from above. The other was placed on the left side of the crash sled to provide a side view video. Both cameras (Samsung S7 and Pixel 2) have been able to capture video at 240fps and produced reasonable results for such a low budget setup. The videos mostly where suffering from the vibrations in the sled but also from a heavy rolling shutter effect, which is actually also fun to explain to the kids.

Two videos comparing the side view results from simulation and crash as well as the top view are also posted on YouTube. And for a simulation with such little tweaking for validation it is already impressive how well the results of the simulation and the test compare.

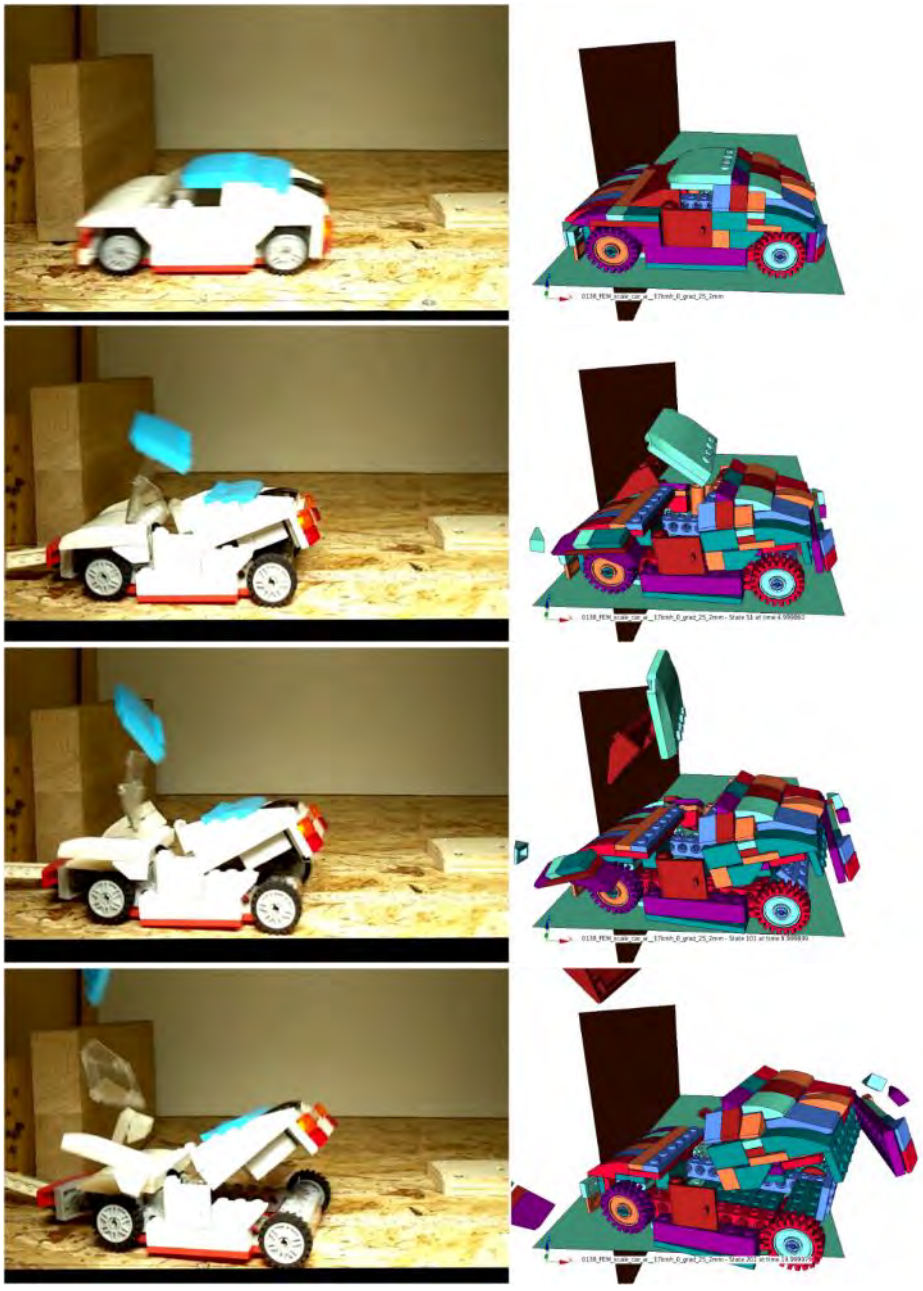

Figure 12: physical test compared to simulation for 25% offset crash at 0, 5, 10 and 20ms

The current setup with LoCo makes it now relatively easy to setup a simulation model from LEGO models. However the usability of all this is not quite there yet such that young students can handle it. The final goal would be that they could download models from the OMR of Ldraw or bricklink.com, define easily some boundary conditions and run crash simulations. This will require further improvements of our Simulation Data Management System LoCo which we might achieve in our current development of LOCOX, which will be the successor of LoCo. At least this will be the benchmark for the usability and ease of use for the new user interface.

In the end… simulation has to become a child's play in order to influence new generations and pass on the fascination of physics and simulation.

(marko.thiele@scale.eu)

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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.

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Products made of composite materials - Analysis Tools -
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etainfo@eta.com

Inventium Suite™

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

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

PreSys

Inventium's core FE modeling toolset. It is the successor to ETA's VPG/PrePost and FEMB products. PreSys offers an easy to use interface, with drop-down menus and toolbars, increased graphics speed and detailed graphics capabilities. These types of capabilities are combined with powerful, robust and accurate modeling functions.

VPG

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

DYNAFORM

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

ESI Group www.esi-group.com

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

Visual-Crash DYNA provides advanced preprocessing functionality for LS-DYNA users, e.g. fast iteration and rapid model revision processes, from data input to visualization for crashworthiness simulation and design. It ensures quick model browsing, advanced mesh editing capabilities and rapid graphical assembly of system models. Visual-Crash DYNA allows graphical creation, modification and deletion of LS-DYNA entities. It comprises tools for checking model quality and simulation parameters prior to launching calculations with the solver. These tools help in correcting errors and fine-tuning the model and simulation before submitting it to the solver, thus saving time and resources.
Several high productivity tools such as advanced dummy positioning, seat morphing, belt fitting and airbag folder are provided in **Visual-Safe,** a dedicated application to safety utilities.

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

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

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

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

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

JSOL Corporation **www.jsol.co.jp/english/cae/**

HYCRASH

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

JSTAMP/NV

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

JMAG

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

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

LS-DYNA

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

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

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

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

LSTC Dummy Models:

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

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

Material Sciences Corporation www.materials-sciences.com

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

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

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

MSC/LS-DYNA Composite Software and Database -

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

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

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

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

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

Oasys PRIMER

Key benefits:

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

www.oasys-software.com/dyna

Oasys D3PLOT

Key benefits:

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

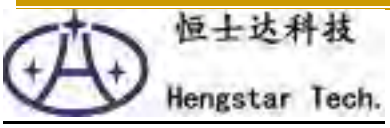
www.predictiveengineering.com

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

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

Our History

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



Shanghai Hengstar www.hengstar.com

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

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

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

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

Consulting

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

www.lenovo.com

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

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

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

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

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			

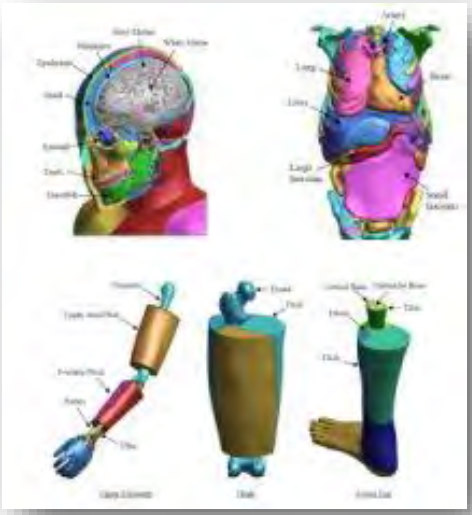
Korea	**KOSTECH**	young@kostech.co.kr		
	www.kostech.co.kr			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM
	eta/DYNAFORM	DIGIMAT	Simuform	Simpack
	AxStream	TrueGrid	FEMZIP	

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

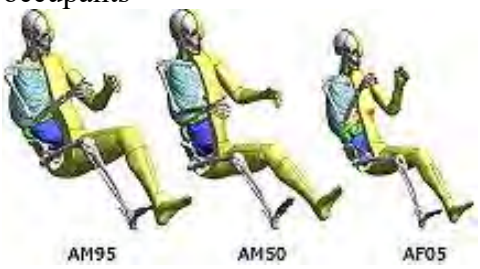
Taiwan	**SiMWARE Inc..**			
	www.simware.com.tw			
	LS-DYNA	LS-OPT	LS-PrePost	LS-TaSC
	LSTC Dummy Models	LSTC Barrier Models	eta/VPG	FCM

TOYOTA - Total Human Model for Safety – THUMS

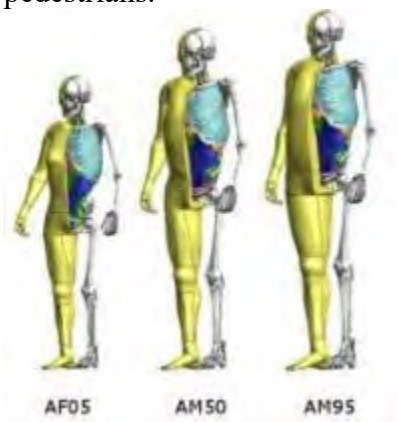


The Total Human Model for Safety, or THUMS®, is a joint development of Toyota Motor Corporation and Toyota Central R&D Labs. Unlike dummy models, which are simplified representation of humans, THUMS represents actual humans in detail, including the outer shape, but also bones, muscles, ligaments, tendons,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

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LSTC – Dummy Models

LSTC Crash Test Dummies (ATD)

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

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

e-mail to: atds@lstc.com

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

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

Models In Development

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

Planned Models

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

LSTC – Barrier Models

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

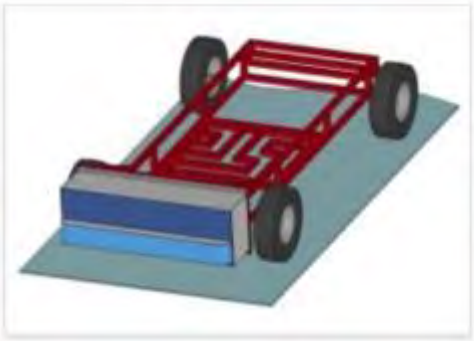
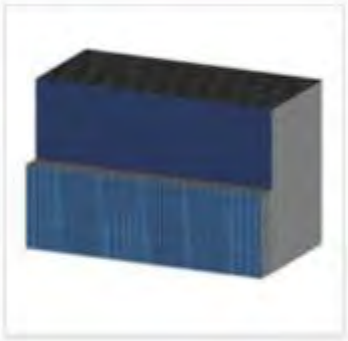
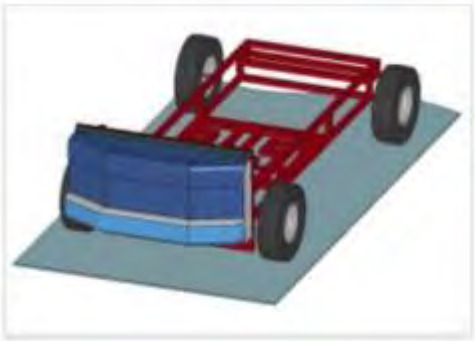
LSTC offers several Offset Deformable Barrier (ODB) and Movable Deformable Barrier (MDB) models:

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

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

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

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

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