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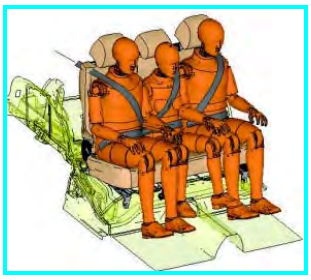
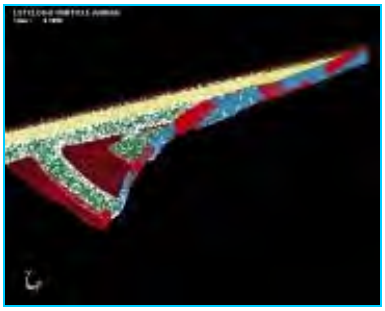
Engineering Journal and Website Resource

DECEMBER 2010



Faurecia Automotive Seating



Simulation of airbag inflation
Dec AVI

Platinum Particpant
DYNAmore GmbH

NCSS - China

Computer History Museum

TABLE OF CONTENTS

Announcements

We welcome a new platinum participant

DYNAmore GmbH - Dedicated to supporting engineers solve non-linear mechanical problems numerically. Our tools to model and solve the problems are the finite element software LS-DYNA as solver and LS-OPT for optimization. As German based company we mainly work in Germany, Italy, Austria, Spain, Portugal, Switzerland, Turkey and the neighboring eastern countries. The majority of our customers are from the automotive and aerospace industry.

FEA Inc. Staff Introduction:

Uli Franz, joins FEA Information Inc. Global News staff:

We are pleased to announce that Uli Franz will be taking an active role in FEA Information Inc. Global News, starting with this edition. Among the many tasks of FEA Information, Uli has taken on the responsibility of the AVI Library, Events and LS-DYNA related courses, in the EU and neighboring countries. In this issue a newly posted AVI is presented. You can send avi's, or questions regarding Avi's and LS-DYNA training courses you want included to uli@feainformation.com

Sincerely, Marsha J. Victory, President, FEA Information Inc

From engineering to horses - http://www.livermorehorses.com

Hero **Jack** **TimberCruiser**

FEA Information

Platinum Participants

OASYS Ltd: http://www.oasys-software.com/dyna/en/	**JSOL Corporation**: http://www.jsol.co.jp/english/cae	**SGI:** http://www.sgi.com
ETA: http://www.eta.com	**DYNAmore GmbH** http://www.dynamore.de	**ESI Group**: http://www.esi-group.com
BETA CAE Systems S.A.: http://www.beta-cae.com	**LSTC:** http://www.lstc.com	
MICROSOFT http://www.microsoft.com	**Panasas, Inc.** http://www.panasas.com	

Conference Paper Showcase
Paper available for download at:
DYNALOOK
http://www.dynalook.com/

FE Modeling of Innovative Helmet Liners

D. Hailoua Blanco, A. Cernicchi - Dainese S.p.a
U. Galvanetto - University of Padua

A key component of a safety helmet is the energy absorbing liner, which absorbs the greatest portion of impact energy during an accident. The aim of the present work was to study innovative structures for energy absorption that minimize the likelihood of head injuries for standard impact cases. The innovative helmet liner consists of an ABS plastic lamina with deformable cones on it....

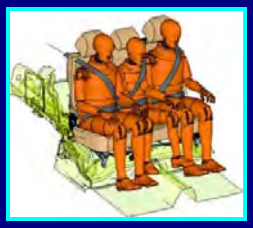
http://www.dynalook.com/international-conf-2010/Simulation-3-1.pdf

Usage of LS-DYNA in the Development of Professional Hammer Drills

A. Syma - Black & Decker GmbH
M. Hörmann - CADFEM GmbH

The development of modern electric power tools for professional use requires special attention. Characteristic aspects such as efficiency and user comfort along with robustness and durability are always of importance to the manufacturer. For the fulfillment of these attributes computer-aided simulation combined with the finite element software LS-DYNA® is a central point during the development process at Black & Decker GmbH,...

http://www.dynalook.com/international-conf-2010/Simulation-3-2.pdf



Faurecia Automotive Seating Chooses LS-DYNA as Main Crash Solver

Faurecia Automotive Seating Chooses LS-DYNA as Main Crash Solver

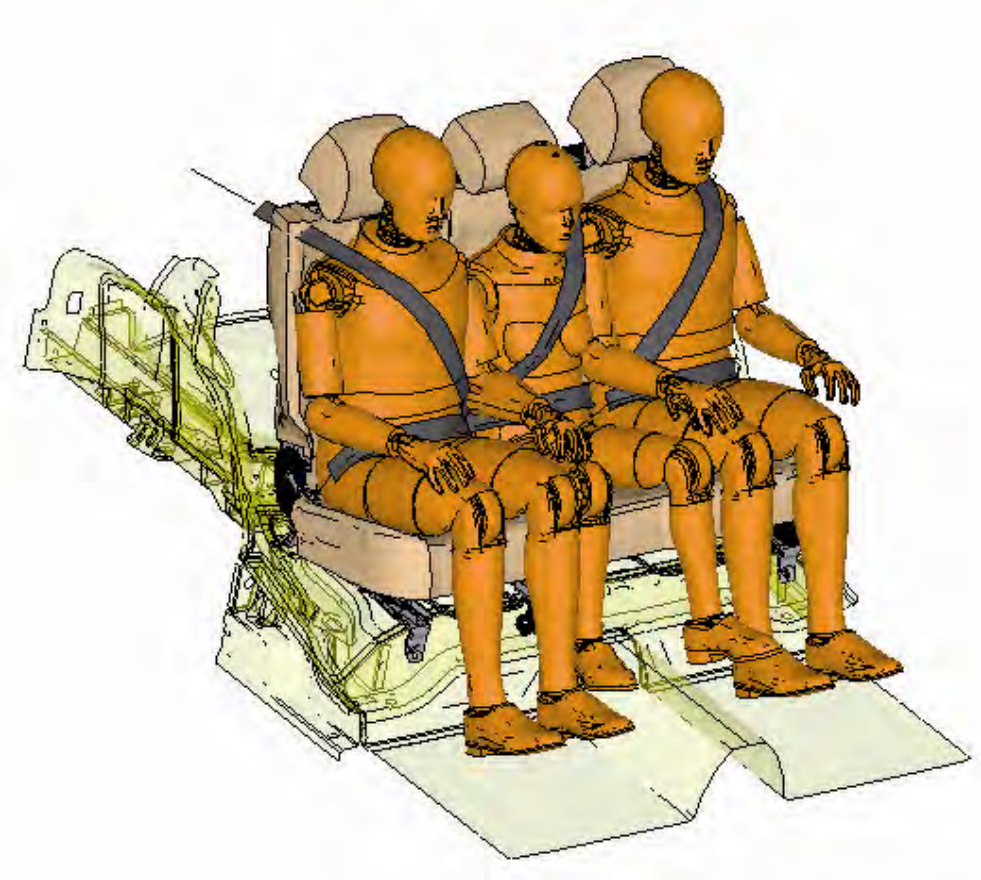
LSTC proudly announces that Faurecia decided to use LS-DYNA as main crash solver. The decision of Faurecia was announced earlier this year in a press release which is cited below. The motivation and benefit of working with a main solver was presented by the worldwide Director for Validation at Faurecia Mr. Lemaitre at the German LS-DYNA Conference. The presentation URL for the Faurecia Automotive Seating FEA Strategy will be available in the January issue:

Authorized Press Release:

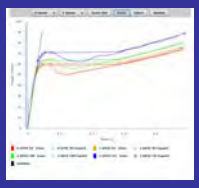
LSTC and DYNAmore announce the agreement for the worldwide usage of their crash simulation software LS-DYNA within the Faurecia group. Faurecia has decided to choose LS-DYNA as main simulation platform for crash, impact and passenger safety simulations. The new multi-year agreement allows all Faurecia sites worldwide to access the simulation software from a central license server based in Paris. The decision has been made based on both a technical and a financial basis. “We want a balanced relationship with our software providers”, said Mr. Eteneau, Chief Information Officer of the whole Faurecia Group. “Both the technical quality of the software, the support services provided by the distributors and the financial conditions must fit to the challenging goals we want to achieve with the help of simulation tools.”

Christophe Lemaitre, the worldwide Director for Validation at Faurecia adds: “Our major goal was to unify our CAE process to a single FEA chain with one single Pre/Post, one single solver, one set of material databases and one set of dummy models. This allows us to apply consistent FEA guidelines and work instructions throughout all different sites of the Faurecia worldwide operations, leading to a higher level of quality of the applied methods within the CAE groups. Also we have the opportunity to capitalize our investments into FEA tools & methods development, which was not possible within the former heterogeneous CAE solver environment. Moreover training classes can be delivered in an effective manner. Last but not least, our relationship to the OEM is not limited to the exchange of FEA models within the development process, but is based on FEA results delivered by Faurecia FEA chain, which gives us the opportunity to get better integrated and get more responsibility within the development process of the OEM.”

Prof. Uli Göhner from DYNAmore adds: “We are happy, that we could successfully position our software and support services within the Faurecia Group. Our open strategy has helped us to get a long-term agreement within the Faurecia Group. Together with LSTC and our partners Aloytech Technologies, Ove Arup Systems, Dynamax, Inc. and Engineering Research AB, we are willing to help Faurecia in their standardization process and will provide special software modules and services for data transfer purposes. This could be an example for other suppliers, who want to decrease their number of solver tools in order not only to minimize software costs, but also to optimize their development process.”



LS-DYNA MAT24 Crash Material Model Calibration



The Need for "Simulation-Quality" Material Data

Hubert Lobo
DatapointLabs, USA

Material testing for simulation is about understanding how to best describe a material's behavior as input for the CAE code. Such testing requires expertise and experience beyond testing performed in a typical test laboratory: while the test instruments may be the same, the knowledge of CAE and experience with diverse materials is increasingly important. FEA softwares such as ANSYS are being increasingly used for non-linear simulation such as listed below. We discuss how DatapointLabs' uncommon material expertise helps you avoid problems when the data is being generated for:

- Rubber hyperelastic modeling
- Foam / hyperfoam and crushable foam modeling
- Plastics: elastic-plastic modeling, visco-elasticity and stress-relaxation
- Metals: kinematic and isotropic hardening, cyclic plasticity
- Crash and drop testing: rate dependent stress-strain models
- Metal forming: forming limit diagram (FLD) and spring-back material modeling
- Process Simulation including injection-molding, blow-molding and thermoforming CAE

More than one method to get the data!

Obtaining material data for non-linear FEA is not easy because the testing can be highly complicated. Hyperelastic material modeling requires testing in different modes such as uniaxial, biaxial or shear. For use in FEA, DatapointLabs performs these tests with a calibrated load cell to measure the stress, and an extensometer to measure the local strain in the gauge region of the test specimen.

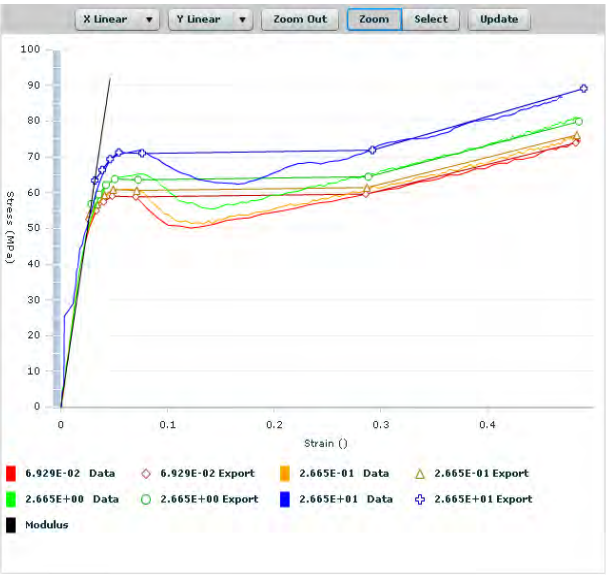
Some test labs measure strain using instrument displacement instead of extensometry but this brings error from the test into the FEA. Now, when tests are performed at high speeds for the calibration of crash material models, careful instrument design is needed to avoid noise and oscillation in the stress-strain data, as presented in our paper at the NAFEMS World Congress, 2009 [1]. If noise exists, the quality of the simulation is degraded. The error here is not due to wrong methodology of testing, but the wrong choice of instrumentation.

Understanding the region of interest for your FEA!

Rubber materials suffer damage by chain breakage during the first deformation (Mullins effect), which results in a considerably different stress-strain behavior seen between the first pull and the subsequent cyclic loadings [2]. DatapointLabs develops data and model calibration depending on whether the initial deformation is being simulated as compared to cyclic loading.

Understanding the impact of the environmental conditions of your product!

DatapointLabs maintains extensive facilities to test materials at elevated or cryogenic temperature, in saline (for in-vivo biomedical simulation), or other fluids-soaked environments.



LS-DYNA MAT24 Crash Material Model Calibration

Understanding how well the model accommodates the real-life simulation!

Visco-elastic and stress relaxation data acquisition requires understanding of the complex visco-elastic theory: it can be applied only for small strain simulation, but FEA of rubber and plastics is often performed at large strains. DatapointLabs has deep expertise in applying visco-elasticity to real-life simulation. In the modeling of foams, DatapointLabs assists clients with the selection of the material model that is most suitable for the type of foam: crushable, elastic, visco-elastic or hyperfoam. [3]. This service is included with the testing ordered.

Experience with diverse materials!

Products of today utilize an astonishing variety of materials ranging from metals, rubber, plastic, foam to films, fiber, composites, ceramics and glass. Being able to test each of these widely differing materials with the same high level of accuracy demands familiarity with such materials. DatapointLabs has tested over 18,000 materials over the past 15 years for physical properties such as tensile, compressive, shear, high strain rate, hyperelastic, visco-elastic, creep, stress relaxation, fatigue, thermal expansion and conductivity, viscosity, PVT.

Understanding material modeling and CAE!

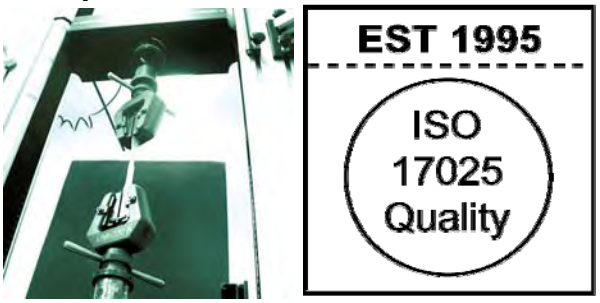
As we see in the above outlined cases, the material data requirements of the various material models used in CAE are often complex and unclear. It is not common for test laboratories to be familiar with CAE. With over a decade long focus on CAE, DatapointLabs has the unique credentials required to meet the exacting demands of new product development. DatapointLabs works in direct partnership with over 15 of the world's most prominent CAE software vendors to offer over 150 TestPaks®,

which are packages that include the material testing, material model selection, model calibration and validation processes. The CAE user simply requests a TestPak®, sends the material sample and then receives, 5 days later, a digital input file ready for the specified CAE. The digital test data are available for download at www.matereality.com in the client's Personal Material Database. The data can be converted into CAE-ready material models using Matereality CAE Modeler, and exported directly into many CAE programs.

Conclusion

It is clear that considerable thought and effort must therefore be paid to correct material modeling and that this part of CAE cannot be taken lightly. Certainly, universities and research institutes possess the scientific understanding to perform material testing. However, their instruments and test technicians are not dedicated to this kind of testing. Their laboratories are usually not ISO 17025 quality certified. The few cases above just serve to illustrate the nature of the problem which is quite wide-spread ranging from rate dependency [1] to process simulation [4]. The data must be clean and free from instrument artifact. It must be correct and appropriate for the simulation. Finally, the process of calibrating these material models is often error prone because, for a variety of reasons, the models cannot accommodate the observed material behavior. This lack of fidelity then results in a limitation in the ability of the model to describe the real life situation in FEA.

Ordering TestPaks® from DatapointLabs reduces these risks!



DatapointLabs: sophisticated instrumentation and expert technical staff.

References

1 "A Robust Methodology to Calibrate Crash Material Models for Polymers." Hubert Lobo and Brian Croop NAFEMS World Congress Crete, Greece. 2009.

2. "Practical Issues in the Development and Implementation of Hyperelastic Models." Hubert Lobo and Twylene Bethard. Abaqus User Conference. 2001.

3. "Selecting Material Models for the Simulation of Foams." Brian Croop and Hubert Lobo. 7th European LS-DYNA Conference, Austria. 2009.

4 "Closing the Gap: Improving Solution Accuracy with Better Material Models." Hubert Lobo. MUG2000. 2000.

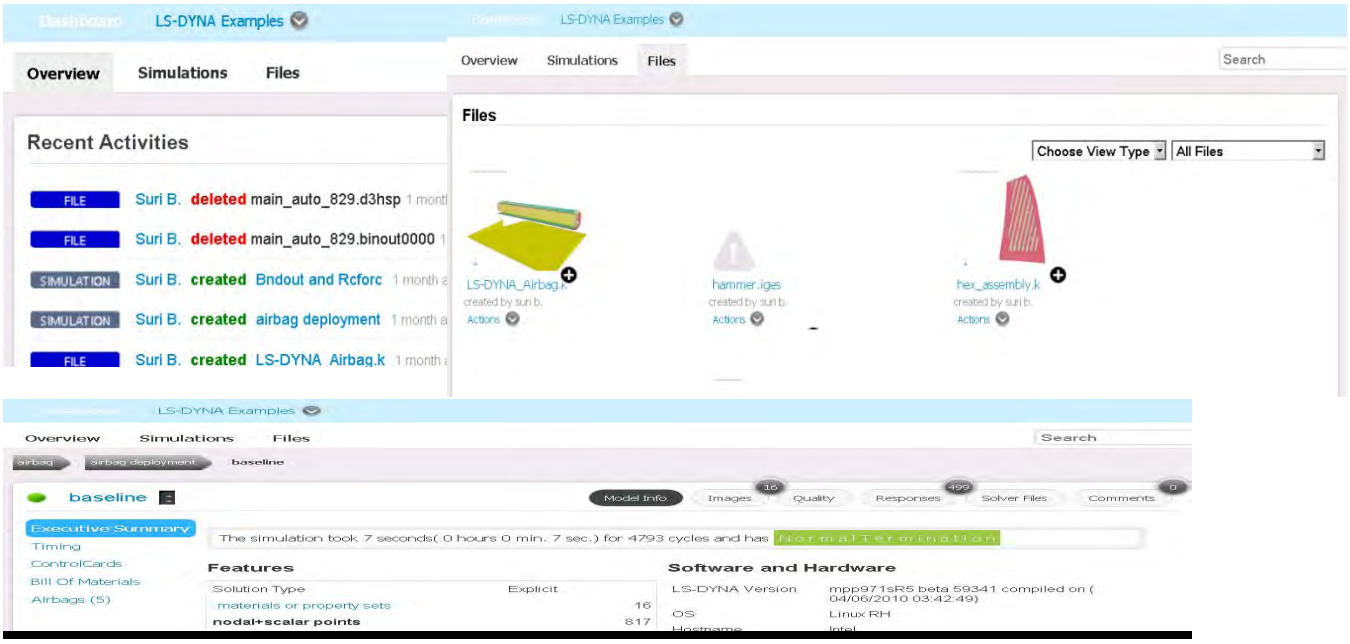
For more information about LS-DYNA *TestPaks*, visit our online catalog at **www.datapointlabs.com** or click **here**

d3VIEW

A Brief Introduction

What is d3VIEW?

d3VIEW is a web-based software that allows you to store, manage, collaborate on, and mine **LS-DYNA®** simulation results. **LS-DYNA®** is an advanced multi-stage, multi-physics and product independent solver that is widely used in virtual product development. **d3VIEW** enhances visualization of **LS-DYNA®** results by first eliminating repetitive post-simulation analysis and by providing an intuitive interface to mine and collaborate on the results using a standard web browser. In addition, **d3VIEW** helps to manage Projects, People, and Tasks to aid virtual product development including tools to manage Experimental and Material databases.



How does d3VIEW help in virtual product development?

d3VIEW solves several problems in the area of virtual product development that exists today in almost every organization. First, viewing and analyzing large datasets is repetitive and is heavily dependent on the Analyst.

d3VIEW solves this problem by taking a snapshot of a simulation using its SimLyzer technology. The primary advantage of SimLyzer is that it eliminates repetitive post-processing by extracting over 15,000+ responses (input and output) with virtually no user intervention. SimLyzer adds further value by "Analyzing" the extracted responses and talking to other post-processors, such as LS-PrePost, to generate relevant graphical information such as images and movies. This extraction and analysis of the extracted data saves a tremendous amount of the analyst's time and also provides a great deal of valuable data that is otherwise impossible to obtain.

The second problem **d3VIEW** solves is related to storage space. Simulation result databases are growing exponentially and will eventually reach 1-10 Gigabytes in the near future. Simlyzer's extraction mechanism results in a data set that is less than 50 Megabytes independent of the size of the simulation as opposed to many Gigabytes. This small data is not a result of compression methods but due to the fact that extracted data is stored in a concise format yes lossless format. Thus, storage is not only easier, but it can also be readily mined and statistically analyzed since it is saved in a well-structured Relational Database.

The third problem **d3VIEW** solves is related to collaboration. Currently, collaboration on simulation results between team members, in local or remote locations, is primarily done through file systems (Network Attached Storage) or using emails which result in duplication of data with no control on its distribution. **d3VIEW's** powerful document management system allows storage/retrieval of data, with access-control mechanisms, and collaboration on all document types. **d3VIEW's** built-in document processor for **LS-DYNA®** keyword files allows easy previewing and editing that you can walk to a meeting with virtually no preparation of data and yet access all relevant information.

Is d3VIEW a post-processor for LS-DYNA®? How is it different from other post-processors?

d3VIEW is an advanced post-simulation analysis tool and and actually works with other post-processors, such as **LS-PrePost,** to accomplish many of its post-simulation analysis.

How does d3VIEW understand LS-DYNA® simulation results?

d3VIEW understand **LS-DYNA®** simulation results through its SimLyzer technology which is designed to recognize and understand virtually all data output by **LS-DYNA®**.

What file types does d3VIEW's document management system support?

D3VIEW supports several files and is continuously being extended to support more. Its built-in document processing handles

How can simulation results be imported into d3VIEW?

There are four ways by which analysts can import simulation result into **d3VIEW**. All of the methods require less than 50Mb of storage space and can be configured to use "post-processing" templates to customize the extraction

- **The first** method is by manual upload. The analysts uses a simple web based form to choose the result files (such as D3PLOT, D3HSP, BINOUT, etc ..) neither individually or using a single compressed file (.tar, tar.gz, .bz2, .zip) from a previously run simulation. In a intranet environment, this method can be very fast but is time-consuming from the Analysts point of view since it is a manual process.

- **The second** method is by running a "Crawler" that operates in a directory specified by the user. The "Crawler" recursively looks for LS-DYNA® results, automatically processes them, and imports them into d3VIEW database.

- **The third** method which requires by far the least amount of time and effort is by injecting a single line in the job submission and staging scripts that activates the SimLyzer technology in the directory containing the final analysis results.

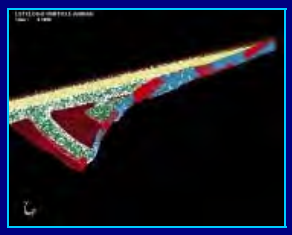
- **The fourth** method utilizes d3VIEW's ability to schedule simulations to a High Performance Cluster (HPC) using any scheduling software. When the job is submitted, d3VIEW remembers the working directory and processes the results once they return.

How can d3VIEW be integrated in a corporate environment?

d3VIEW is a web-based application and runs on any operating system that supports a web server, such as Apache (an open source web server). It stores persistent data using a relational database, such as MYSQL, in conjunction with a file system based Vault. Any modern computer with at least 2 GB of RAM and a 100 GB of disk space is sufficient to install and configure d3VIEW.

Whom should I contact for information on d3VIEW ?

You can contact Marsha Victory by writing to marsha@lstc.com for any addition information with regards to d3VIEW.



AVI For December

Simulation of airbag inflation

Parties interested in sending an AVI for inclusion in the library, or to receive an input for the following simulation send e-mail to uli@feainformation.com

AVI Library #2-01

The presented avi file shows the deployment of a side airbag simulated with the corpuscular (particle) method in LS-DYNA.

There are several methods in LS-DYNA to simulate the inflation of airbags.

A) Uniform Pressure
(e.g *AIRBAG_HYBRID)

This method is recommended when a realistic unfolding is not essential. It assumes a uniform pressure distribution in the bag, which is determined by thermodynamic relationships for a lumped parameter control volume. It is the most frequently used method for standard airbag applications like in-position passenger airbag in a frontal impact. The computational effort of the method is very small.

B) ALE

This method works with a Lagrangian mesh for the fabric and an Eulerian mesh for the gas. It is a very general method for coupled fluid structure interaction phenomena. It captures many physical effects in detail and is highly accurate. For airbag applications it is only recommended to investigate very specific problems, like local effects close to the gas generator. The computational effort is high compared to the other methods.

C) Corpuscular Method
(e.g. *AIRBAG_PARTICLE)

This method works with a Lagrangian method for the fabric and the gas. The method is particularly tailored for airbag inflation simulation. It is recommended for problems when a realistic modeling of the unfolding is required, like for many out-of-position load cases.

Advantages of the method:

- Simple and very robust
- Straight-forward treatment of venting, porous leakage and gas mixing
- Computationally very effective
- Robust method
- No mesh for the CFD part is needed
- Model set similar to the frequently used uniform pressure method
- Can be combined with the uniform pressure method

Disadvantages of the method:

- Noisy
- Diffusion is overestimated
- More difficult to describe the actual flow field

D) Other schemes for fluid structure interaction

The CSE solver or the SPH method are also available in LS-DYNA to investigate fluid structure interaction. For for airbag inflation problems these methods are not recommended since not all phenomena of an inflation process can be modeled.

Highlights

December 2010,
Volume 4, Number 2

ETA Newsletter

Training

Modeling of Blast & Penetration with LS-DYNA®

February 21-24, 2011

Paul Du Bois,
Beratender Ingenieur &
Len Schwer, Ph.D.,
Schwer Engineering & Cons. Svcs.

Course Description: This course focuses on the application of LS-DYNA® for the simulation of high energy events. The analysis methods and modeling are illustrated through case studies.

Introduction to DYNAFORM:
January 4th & 5th

Introduction to LS-DYNA®:
January 25th & 26th

Introduction to PreSys:
January 27th

DYNAFORM 5.8 Released:

DYNAFORM is an excellent tool for analyzing the entire die system and allows organizations to bypass soft tooling, reducing tryout time, lowering costs, and improving cycle times and productivity. Version 5.8 offers many new and improved features, as well as enhanced Pre- and Post-Processing capabilities for a more streamlined and robust user experience.

A notable addition in this version is the new explicit incremental INC Solver, for rapid die face design and analysis of formability concerns. It offers a solution for customers looking for an easy-to-master rapid die design and virtual tryout tool that generates quick results without sacrificing accuracy.

PreSys 2010 R1 Released

Available immediately through ETA and its world-wide distribution network, the PreSys 2010 R1 release delivers new features which enhance the software's ability to quickly and efficiently create complex simulation models and visualize simulations results.

A core solution for finite element analysis engineers, PreSys is an efficient, cost-effective software tool, which interfaces with popular CAD software products such as CATIA, Unigraphics, ProEngineer, Solidworks and AutoCAD. It allows product development engineers and simulation specialists to access design data and quickly create simulation models.

EMU / ETA Collaboration:
ETA announces a new collaboration with Eastern Michigan University (EMU), as part of its Academic Program. The new Academic/Industry partnership is effective immediately.

ETA will provide mechanical engineering software valued at $300,000, as well as in-depth training for EMU's College of Technology faculty members. The collaboration aims to create additional practical and productive learning experiences, beyond the College's already comprehensive curriculum, to further prepare students for real-life engineering challenges.

ACP Process Whitepaper

A whitepaper entitled The ACP Process: The Future of Product Development is now available online.

The paper explains the Accelerated Concept to Product (ACP) Process, a holistic product design & development method based on design optimization. The methodology provides solutions addressing the challenges facing product development engineers. It achieves this by synchronizing the individual facets of the product development process, resulting in an overall reduction in development costs and time to market. Material selection and utilization, product performance requirements and manufacturing and assembly processes are all considered as early as possible in the design cycle.

For Information on the newsletter contact: etainfo@eta.com.

Review By
Marsha Victory

15th Korean LS-DYNA® Users Conference 2010

November I had the opportunity to attend the 15th Korean LS-DYNA® Users Conference, hosted by THEME Engineering Inc. It was easy to notice, that every year, the conference attendance grew. This year it was attended by many engineers from diverse industries, and many university professors and students.

The conference opened with Welcoming Remarks by Woo Sik Chung, THEME Engineering Inc. President. Growing internationally in popularity for its conference technical excellence Mr. Chung introduced Mr. Ulrich Franz, DYNAmore GmbH presenting Development of the PDB WorldSID Dummy Model – A Joint Project of German Car Manufacturers. This was followed by a presentation from the US by Mr. Tim Palmer, ETA Inc., presenting Newly Developed Features/Functions of Inventium & PreSYS™

The conference presentations were interesting and brought the experience of well known industry leaders. Among the presenters were:

- Mr. Dong Ho Park,
  Hyundai Motor Co.
- Mr. Jung Ho Kim,
  GM Daewoo Auto & Tech.
- Mr. Ill Kyung Park,
  Korea Aerospace Res. Inst.
- Dr. Jong Hyun Lee,
  Nautilus Hyosung Inc.
- Dr. John O. Hallquist,
  LSTC

Lunch offered the opportunity to meet the presenters in an informal atmosphere and catch up with people I met at last year's conference.

The afternoon presenters were:

- Mr. Du Su Park,
  Hyundai Hysco
- Mr. Hong Sun Kim,
  GM Daewoo Auto & Tech.
- Dr. Hyun Sok Pang,
  Humanetics Innovative Solutions, Inc.
- Mr. Yo Han Choi,
  Huyndai Mobis Co. Ltd.
- Mr. Hyuck Moon Gil,
  SL Corporation
- Dr. Sung Joon Kim,
  Korea Aerospace Res. Institute
- Mr. Chang Wok Ha,
  Hyundai Motor Co.

And with the closing remarks the Best Paper Award was awarded to The analysis technique development of new IIHS simple model using DFSS by Mr. Chang Wook Ha from Hyundai Motors Co.

The Lucky Grand prize winner was
Mr. Ki Suk Lee
Honam Petrochemical Co.

JSOL
LS-DYNA & JSTAMP
Forum 2010

Review By Marsha Victory

JSOL, distributor of software among them being, LSTC's LS-DYNA and their own JSTAMP held their 2010 Forum on Wednesday, December 01 with workshops on Thursday December 02, 2010 in Tokyo Japan.

One of the many courtesies, at this conference, is the simultaneous translations of the presentations, so I am able to understand the presentations spoken in Japanese.

The attendance is higher each year with this Forum reaching 330 attendees. I feel the continued growth in attendees and sales proves the expertise with LSTC's software and JSOL's ability at training, support, knowing what the customers needs are in Japan and quickly being able to meet those needs.

The Keynote Presentation

The keynote presentation, Presented Development of *Next Generation Human FE Model Capable of Organ Injury* was presented by:

Mr. Tsuyoshi Yasuki,
Toyota Motor Corporation.

It is well known that the THUMS version 4 is the most advanced vehicle crash test dummy ever engineered, developed by Toyota Motor Corporation and Toyota Central R&D Labs. Version 4 enables us to better understand injury mechanisms in crashes that have historically been difficult to analyze with current crash test dummies.

Version 4 includes the geometry of organ parts, their location in a living human body and their connections to surrounding tissues.

It is clear that Toyota's vision for Total HUman Model for Safety (THUMS) is an enduring commitment to improving all our safety.

Among the many presentations, to note one from each category:

New Technology:

LS-DYNA in the prior design of the flying distance performance of the golf club

Mr.Yukihiro Teranishi,
MIZUNO CORPORATION

Analysis Technology:

Analysis of Deformation and Pressure of Contact Surface of Rubber Block Joints for the XLPE Cables

Dr.Tomohiro Keishi,
Sumitomo Electric Industries, Ltd.

Automotive:

Construction of SAFE: Crash Analysis Model Construction System

Mr.Tomokazu Suzuki,
FUJI HEAVY INDUSTRIES LTD.

LS-DYNA New Features:

Recent developments in LS-DYNA

Dr.John Hallquist,
Livermore Software Tech. Corp.

JSOL is clearly dedicated to their customers, and the continued growth for LS-DYNA, JSTAMP and THUMS.

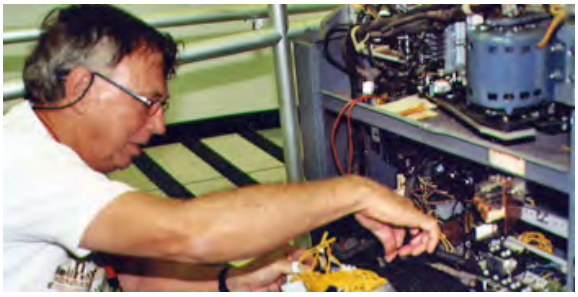
Computer History Museum
Silicon VAlley

http://www.computerhistory.org

For those of you not familiar with the Computer History Museum, it is located in Silicon Valley, 1401 N. Shoreline Boulevard, Mountain View, CA

It offers information, exhibits reasearch, and a catalog search. The museum houses over 100,00o items. Among the items are hardware, photograhs, and documents to name a few of the many items. The museum houses on of the largest international collections of computing artifacts in the world.

Restoration



The restoration program was created to restore and better understand historic hardware and software environments. The collection provides a way to view and understand the machines in their original operating conditions and what they were capable of for their era.

The Computer History Museum was formally established as a non-profit 501(c)(3) organization in 1999. The Museum is dedicated to the preservation and celebration of computing history.

If you are on travel to California whether for software, hardware, engineering or training/events, it is a must place to enter on your travel plans.

In the beginning of 2011 the museum will host an exhibit featuring: " Revolution is Coming: Computer History Spanning - The First 2000 Years of Computing." in Early 2011

The exhibition will feature everything from the abacus and slide rules to robots, Pong, the Internet, and more.

You can experience picking up a 24-lb Osborne computer and playing vintage computer games like Pong, Spacewar!, Adventure and Pac-man to surfing the Web in the 1990's.

Viewing includes the Abacus, Hollerith Tabulator, Nordsieck Differential Analyzer, ENIAC, UNIVAC, SAGE, IBM System/360, IBM RAMAC disk drive, Cray-1, PDP-8, Moore's Law, Shakey the Robot, Xerox Alto, Utah Teapot, Pong Prototype, Apple II, IBM PC, Palm Pilot, Google Server Engine and more.

This particular exhibit is being made possible through the generosity of William H. Gates III, who gave the establishing gift for Revolution. Additionally over 75 donors have given donations to the Museum's long-term capital campaign.

And, of course, you can also follow progess of the museum on Facebook, and follow @computerhistory on Twitter.

China News

3rd National Supercomputer Center And Central China's Hunan Province Take Center Stage

China has started construction of their third National Supercomputing Center (NCSS) which will be located in located in Changsha, central China's Hunan Province and expected completion is toward the end of the year 2011 at Hunan University in Changsha, capital of Hunan.

Tianhe-1A, (pronounced “tee-awn-hoo-wa”) is anticipated to be the fastest supercomputer, when fully installed.

Tianhe-1A is being designed to handle one quadrillion computing operations per second, and will handle such diverse services as weather forecasting, scientific research, biological pharmaceuticals, animation design and other complex work, as well as military research.

The computer has advantages in performance/size/power. By using a proprietary interconnect to couple massively parallel GPUs with multi-core CPUs, it takes advantage of 7,168 NVIDIA Tesla M2050 GPUs, 14,336 CPUs, and 262 Terabytes of distributed memory.

China has built two supercomputing centers. One is located in Tianjin and the other is located in Shenzhen, respectively. The Tianjin location computer (Tianhe-1A) was certified as the world's fastest supercomputer. It is capable of 2.57 quadrillion computing operations per second.

http://top500.org/list/2010/11/100

National Supercomputing Center
Tianjin China
Tianhe-1A
NUDT TH MPP, X5670 2.93Ghz 6C,
NVIDIA GPU, FT-1000 8C / 2010
NUDT

The 36th edition

TOP500 SuperComputers

http://top500.org/list/2010/11/100

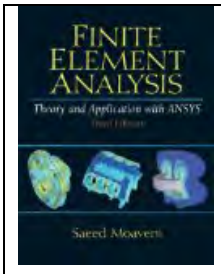
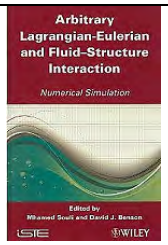
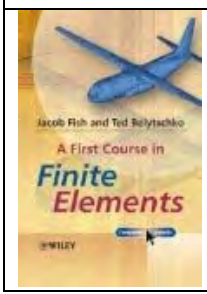
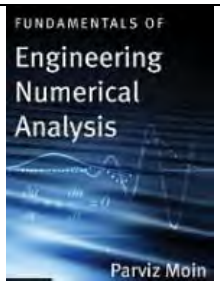
The 36th edition of the closely watched TOP500 list of the world's most powerful supercomputers confirms the top spot by the Chinese Tianhe-1A system at the National Supercomputer Center in Tianjin

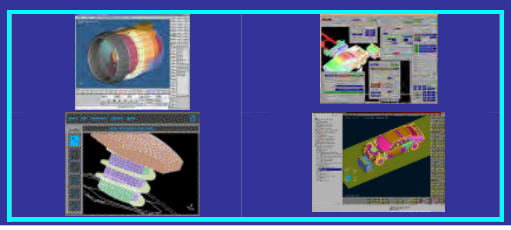
Among the top 11 listing are the following:

National Supercomputing Center in Tianjin **China**	Tianhe-1A - NUDT TH MPP, X5670 2.93Ghz 6C, NVIDIA GPU, FT-1000 8C / 2010 NUDT
DOE/SC/Oak Ridge National Laboratory **United States**	Jaguar - Cray XT5-HE Opteron 6-core 2.6 GHz / 2009 Cray Inc.
National Supercomputing Centre in Shenzhen (NSCS) **China**	Nebulae - Dawning TC3600 Blade, Intel X5650, NVidia Tesla C2050 GPU / 2010 Dawning
GSIC Center, Tokyo Institute of Technology **Japan**	TSUBAME 2.0 - HP ProLiant SL390s G7 Xeon 6C X5670, Nvidia GPU, Linux/Windows / 2010 NEC/HP
DOE/SC/LBNL/NERSC **United States**	Hopper - Cray XE6 12-core 2.1 GHz / 2010 Cray Inc.
National Institute for Computational Sciences/University of Tennessee **United State**s	Kraken XT5 - Cray XT5-HE Opteron 6-core 2.6 GHz / 2009 Cray Inc.
DOE/NNSA/LANL/SNL **United States**	Cielo - Cray XE6 8-core 2.4 GHz / 2010 Cray Inc.
NASA/Ames Research Center/NAS **United States**	Pleiades - SGI Altix ICE 8200EX/8400EX, Xeon HT QC 3.0/Xeon Westmere 2.93 Ghz, Infiniband / 2010 SGI

Reading Reference Library

Available From Amazon

	Finite Element Analysis Theory and Application with ANSYS (3rd Edition)		Arbitrary Langrangian-Eulerian and Fluid Structure Interaction.
	Isogeometric Analysis: Toward Integration of CAD and FEA		NURBS for Curve & Surface Design: From Projective Geometry to Practical Use
	A First Course in Finite Elements		Engineering Numerical Analysis



Pre-Processing

Post Processing

Model Editing

A preprocessor is a program that processes its input data to produce output. This data is then used as input to another program.

BETA CAE Systems S.A.

http://www.beta-cae.gr/

Provides complete CAE pre- and post-processing solutions. ANSA, the world wide standard pre-processor and full product modeler for LS-DYNA, with integrated Data Management and Task Automation. µETA, with special features for the high performance an effortless 3D & 2D post-processing of LS-DYNA results.

Engineering Technology Associates, Inc.

http://www.inventiumsuite.com

PreSys is an advanced Pre/Post Processor. PreSys is a full-featured, core solution that can be used on its own or with a variety of available add-on applications. The system offers advanced automeshing tools to provide the highest quality mesh with little CAD data preparation. It also features a scripting interface and model explorer feature for in-depth data navigation.

Oasys, Ltd

http://www.oasys-software.com/dyna/en/

Oasys Primer is a model editor for preparation of LS-DYNA input decks. - Oasys D3Plot is a 3D visualization package for post-processing LS-DYNA analyses using OpenGL® (SGI) graphics.

JSOL Corporation

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

JVISION is a general purpose pre-post processor for FEM software. Designed to prepare data for, as well as support, various types of analyses, and to facilitate the display of the subsequent results.

Livermore Software Technology Corporation

http://www.lstc.com

LS-PrePostis an advanced interactive program for preparing input data for LS-DYNA and processing the results from LS-DYNA analyses.

LS-DYNA Distributors

LS-DYNA is delivered with
LS-OPT - LS-PrePost
LSTC Dummy & Barrier Models

Alpha Order by Country

Australia	Leading Eng. Analysis Providers - LEAP http://www.leapaust.com.au/ info@leapaust.com.au
Canada	Metal Forming Analysis Corp - MFAC http://www.mfac.com/ galb@mfac.com
China	ETA China http://www.eta.com.cn/ lma@eta.com.cn
China	OASYS Ltd. (software house of Arup) http://www.oasys-software.com/dyna/en stephen.zhao@arup.com
France	ALYOTECH TECH. http://www.alyotech.fr nima.edjtemai@alyotech.fr
France	ALLIANCE SVCE. PLUS - AS+ http://www.asplus.fr/ls-dyna v.lapoujade@asplus.fr
Germany	CADFEM http://www.cadfem.de/en lsdyna@cadfem.de
Germany	DYNAmore http://www.dynamore.de/ uli.franz@dynamore.de
Greece	PhilonNet Engineering Solutions http://www.philonnet.gr stavroula.stefanatou@philonnet.gr

LS-DYNA Distributors

LS-DYNA is delivered with
LS-OPT - LS-PrePost
LSTC Dummy & Barrier Models

India	OASYS Ltd. (software house of Arup) http://www.oasys-software.com/dyna/en lavendra.singh@arup.com
India	EASi Engineering http://www.easi.com/ rvenkate@easi.com
India	CADFEM Eng. Svce India http://www.cadfem.in/ info@cadfem.in
Italy	EnginSoft SpA http://www.enginsoft.it/ info@enginsoft.it
Japan	JSOL Corporation http://www.jsol.co.jp/english/cae cae-info@sci.jsol.co.jp
Japan	ITOCHU Techno-Solutions Corp. http://www.engineering-eye.com/ ls-dyna@ctc-g.co.jp
Japan	FUJITSU http://jp.fujitsu.com\solutions\hpc\app\lsdyna\

LS-DYNA Distributors

LS-DYNA is delivered with
LS-OPT - LS-PrePost
LSTC Dummy & Barrier Models

Korea	Theme Engineering http://www.lsdyna.co.kr/ wschung@kornet.com
Korea	Korea Simulation Technologies http://www.kostech.co.kr young@kostech.co.kr
Netherlands	Infinite Simulation Systems, BV http://www.infinite.nl/ j.mathijssen@infinite.nl
Sweden	Engineering Research AB http://www.erab.se/ sales@erab.se
Taiwan	Flotrend Corporation http://www.flotrend.com.tw/ gary@flotrend.tw
Russia	State Unitary Enterprise –STRELA info@ls-dynarussia.com

LS-DYNA Distributors

LS-DYNA is delivered with
LS-OPT - LS-PrePost
LSTC Dummy & Barrier Models

United Kingdom	OVE ARUP & PARTNERS http://www.oasys-software.com/dyna/en/ dyna.sales@arup.com
USA	Livermore Software Tech. Corp. - LSTC http://www.lstc.com/ sales@lstc.com
USA	Engineering Tech. Assc. Inc. – ETA http://www.eta.com/ sales@eta.com
USA	DYNAMAX http://www.dynamax-inc.com/ sales@dynamax-inc.com

Finite Element Analysis

North America Consultants & Engineering Services

FEA Consultants use a wide range of software simulation programs. Their expertise using specific programs for their customers offers the ability for controlling the modeling and analysis of structures, systems, products and many other applications. Consultants and Engineering Services are used by government, homeland security, court trials, and a number of industries needing to have outside sources for expertise in FEA

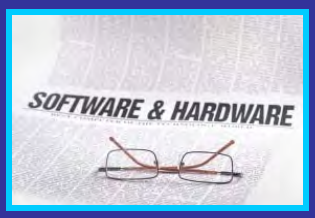
http://www.fea-consulting.com

North America

Located: Texas **KBEC** **Khan Bui** (512) 363-2739	**Located: Connecticut** **CAE Associates** **http://www.caeai.com** (203) 758-2914
Located: Oregon **Predictive Engineering** **http://predictiveengineering.com** George Laird, Ph.D., P.E (503) 206-5571	**Located: California** **Schwer Engineering** **http://schwer.net** Len Schwer (707) 837-0559
Located: Illinois **APACS Services, Inc.** **https://sites.google.com/site/apacsservicesinc/** Alex Pinsker, Ph.D., P.E. Phone: 847-317-1910	**Located: Ohio** **AEG Product Engineering Svce.** **http://engineering-group.com** **support@enginering-group.com**

EUROPE

DENMARK	FaurConAps Contact: faurholdt@faurcon.com
FRANCE	ALYOTECH TECHNOLOGIES Contact: nima.edjtemai@alyotech.fr
FRANCE	ALLIANCE SERVICES PLUS Contact: v.lapoujade@asplus.fr
Germany	CADFEM GmbH Contact: ls-dyna@cadfem.de
Germany	DYNAmore Contact: uli.franz@dynamore.de
ITALY	DYNAmore Contact uli.franz@dynamore.de
ITALY	EnginSoft SpA Contact: info@enginsoft.it
Netherlands	Infinite Simulation Systems, B.V Contact: j.mathijssen@infinite.nl
Sweden	Engineering Research AB Contact: sales@erab.com
UK	OVE ARUP & PARTNERS Contact: brian.walker@arup.com



Software & Hardware Alliances

Software Solutions
SMP / MPP Hardware & OS
MPP & Interconnect MPI

ETA – DYNAFORM & VPG

http://www.eta.com

Includes a complete CAD interface capable of importing, modeling and analyzing, any die design. Available for PC, LINUX and UNIX, DYNAFORM couples affordable software with today's high-end, low-cost hardware for a complete and affordable metal forming solution.

ETA – VPG

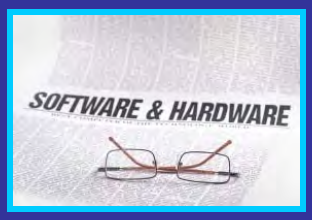
http://www.eta.com

Streamlined CAE software package provides an event-based simulation solution of nonlinear, dynamic problems. eta/VPG's single software package overcomes the limitations of existing CAE analysis methods. It is designed to analyze the behavior of mechanical and structural systems as simple as linkages, and as complex as full vehicles.

OASYS software for LS-DYNA

http://www.oasys-software.com/dyna/en/

Oasys software is custom-written for 100% compatibility with LS-DYNA. Oasys PRIMER offers model creation, editing and error removal, together with many specialist functions for rapid generation of error-free models. Oasys also offers post-processing software for in-depth analysis of results and automatic report generation.



Software & Hardware Alliances

Software Solutions
SMP / MPP Hardware & OS
MPP & Interconnect MPI

ESI Group Visual-CRASH For DYNA

http://www.esi-group.com

Visual-Crash for LS-DYNA helps engineers perform crash and safety simulations in the smoothest and fastest possible way by offering an intuitive windows-based graphical interface with customizable toolbars and complete session support. Being integrated in ESI Group's Open VTOS, an open collaborative multi-disciplinary engineering framework, Visual-Crash for DYNA allows users to focus and rely on high quality digital models from start to finish. Leveraging this state of the art environment, Visual Viewer, visualization and plotting solution, helps analyze LS-DYNA results within a single user interface.

BETA CAE Systems S.A.– ANSA

http://www.beta-cae.gr

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

BETA CAE Systems S.A.– μETA

http://www.beta-cae.gr

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

CRAY XD1	Linux
HP PA-8X00	HP-UX 11.11 and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
SGI Mips	IRIX 6.5 X
SGI IA64	SUSE 9 w/Propack 4 RedHat w/Propack 3

MPP and Interconnect and MPI For LS-DYNA®

Vendor	O/S	HPC Interconnect	MPI Software
CRAY XD1	Linux		
HP PA8000	HPUX		
HPIA64	HPUX		
SGI Mips	IRIX 6.5 X	NUMAlink	MPT
SGI IA64	SUSE 9 w/Propack4 RedHat w/Propack 3	NUMAlink, InfiniBand (Voltaire)	MPT, Intel MPI, MPICH

Crash Test Dummy Models

Anthropomorphic Test Devices
Crash Test Devices
Websites / Information

FEA Information

http://www.ls-dynadummymodels.com

LSTC's Models

http://www.lstc.com/models/

Arup Cellbond Barrier Models

http://www.oasys-software.com/dyna/en/fe-models/barrier.shtml

Arup Pedestrian Impactor Models

http://www.oasys-software.com/dyna/en/fe-models/pedestrian.shtml

Arup RCAR Barrier Model

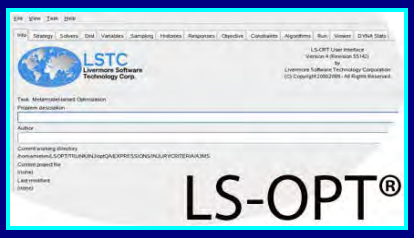
http://www.oasys-software.com/dyna/en/fe-models/rcar.shtml

DYNAMore Models for

http://www.dummymodels.com

LS-DYNA Dummy Mailing List

sarba@lstc.com



The Official LS-OPT Support site

http://www.lsoptsupport.com

SUPPORT SITES FOR LS-DYNA

LS-OPT User's Group on Google

The intention of this group is to support LS-OPT users and to provide useful information according to LS-OPT. In addition, the user group provides the possibility to get in contact with other users and to share experience on the application of LS-OPT.

In order to subscribe to the group, please use the following (external) link:
https://www.google.com/accounts/ServiceLogin?service=groups2&passive=1209600&continue=http://groups.google.com/group/lsopt_user_group&followup=http://groups.google.com/group/lsopt_user_group

The Official LS-OPT Support site
[http://www.lsoptsupport.com] is jointly monitored by DYNAmore GmbH (Germany) and LSTC (US)

The LS-OPT support site was jointly developed to keep you updated with current information. During January 2010 the site will be updated with

"Getting Started"
A first place to stop for new users to view the LS-OPTui and the basic procedures of optimization with LS-OPT.

How To's
A collection of information and examples for several tasks with LS-OPT

Documents
A collection of documents related to LS-OPT, Optimization and Stochastics

Examples
This Section demonstrates LS-OPT capabilities by means of a series of examples

Glossary
Alpha order to view definitions such as Anova, Bias error, Iteration and other technical terms.

Downloads
Downloads specific to LS-OPT

FAQ's
Questions related to Optimization, Robustness and Reliability Analysis
Answers are posted on the LS-OPT Support Site
http://www.lsoptsupport.com/faqs

News
Latest news relation to, or about LS-OPT

UK - Oasys

NEW COURSE OFFERING
JavaScript for Oasys
PRIMER and D3PLOT

Contact: Katherine Groves 0121 213 3399 - katherine.groves@arup.com .
NO FEE – January 20, 2011

http://www.oasys-software.com/dyna/en/training/oasys_software/oasys_javascripting.shtml

Duration: 1 Day
This course aims to familiarise attendees with the JavaScript language and teach them to write JavaScripts for Oasys PRIMER and Oasys D3PLOT. No previous experience of JavaScript is required but it is strongly recommended that attendees have some experience of programming or scripting in other languages.

The possible applications of JavaScript in Oasys software include the following (not all of these are covered in the course):

Oasys PRIMER:
- Creating a simple mesh, or test models with standard loading
- Data checking or correcting
- Geometric morphing functions
- Input or output translators, special-format spotweld or connections files
- Automating routine tasks

Oasys D3PLOT:
- Generating your own data components for plotting, calculated from any information already contained in the model or from external files

Course Outline:
- **Introduction –**
  - Aims of this course
  - Which Oasys products have JavaScript?
  - What is JavaScript?
  - Examples of use of JavaScript
- **PRIMER JavaScript – Part 1**
  - Basic concepts
- **D3PLOT JavaScripts**
  - Running an existing JavaScript, plotting the data
  - The process of writing and debugging scripts
  - Writing JavaScripts to calculate new data
- **PRIMER JavaScripts – Part 2**
  - Guidance on Core JavaScript capabilities
  - How to use the Oasys JavaScript extensions in PRIMER
  - Accessing, modifying and creating keyword data
  - Reading and writing external files
  - Interacting with PRIMER – picking and selecting
  - GUI: Using ready-made windows
  - Using command-line commands
  - Common errors and how to avoid them
- **PRIMER JavaScripts – Part 3**
  - Using Sets
  - Functions within a script
  - GUI: create your own menus
  - Other topics

BETA CAE Systems SA
4th ANSA & µETA Int'l Conference
June 1-3 2011
Makedonia Palace
Thessaloniki, Greece

For Complete Information and full conference announcement:
http://www.beta-cae.gr/conference04_announcement.htm

Being consistent to our biannual appointment, it is our pleasure to invite you to attend the 4th ANSA & µETA International Conference that will be held from June 1st to June 3rd 2011, in Classical Makedonia Palace Hotel, Thessaloniki, Greece.

The principal aims of this event are to bring the CAE Community together with BETA CAE Systems S.A. and to promote an international exchange of the latest concepts, knowledge and development requirements on our flagship software products, ANSA & µETA. Technical papers will be presented outlining the latest advances in CAE strategy, methodology, techniques and applications related to our products. Participants will have the opportunity to be informed about the latest software trends, demonstrate their concepts and achievements and present new development requirements.

Following the success of our previous events and after the request of the majority of the participants, the duration of our 4th conference will be of three days. The closer technical communication with the software developers' team of our products, within the framework of a technical forum, features this three-day conference.

Further discussions, sessions, meetings and events will allow the interaction between participants and organizers. Senior executives of our company, the engineers from the development and services teams and our business agents from around the world will be glad to meet with customers and users, to discuss the applications, the existing functionality, latest enhancements and future development plans of our software products. We expect that this will be a unique opportunity for you to share your success and for us to share our vision.

The attire of the event is business casual. The language of the event is English.

Important Dates:

Abstracts: February 25th 2011
Acceptance: March 11th 2011
Registration: April 15th 2011
Final manuscripts: April 29th 2011
Presentations files: April 29th 2011
Event: June 1st to June 3rd 2011

The 8th European LS-DYNA Users Conference hosted by ALYOTECH
May 23rd & 24th, 2011.
Strasbourg (France)

8th European LS-DYNA© Users Conference Strasbourg - France

The 8th European LS-DYNA Users Conference hosted by ALYOTECH with the support of ARUP, DYNAMORE, ERAB and LSTC. The conference will be an excellent occasion to meet LS-DYNA© users from all over the world and to share LS-DYNA© applications in different areas.

Presentations will cover various LS-DYNA© related topics, new developments and new applications from academic and industrial engineers. An exhibition area will allow to obtain information about the latest software and hardware developments related to LS-DYNA©.

Several training classes will be held immediately before or after the Conference:

- Crash & Impact Modeling
- FSI & ALE in LS-DYNA
- Material Modeling and User-Defined Materials in LS-DYNA
- Modeling & Simulation with LS-DYNA
- SPH & EFG Methods in LS-DYNA
- Optimization with LS-OPT
- Sheet Metal Forming with LS-DYNA & DYNAFORM
- LS-PrePost
- Using LS-DYNA for Heat Transfer with Hot Stamping Applications
- LS-DYNA Applications to Protective structures, blasts, vehicle mines, ...

Known as the European Capital, Strasbourg is home to the Council of Europe, the Human Rights Building and the European Parliament. It is a major hub, making for an easy access to the European LS-DYNA© meeting!

We hope to count you among our participants very soon!

Additional information/ registration:
www.lsdynaeuc.alyotech.fr

NEWS RELEASE

ESI Announces the Release of Visual-Environment 6.5

© ESI Website / News

An integrated and versatile virtual prototyping platform for improved productivity

Paris, France – December 21, 2010

Excerpt from the above the press release: Full Press Release

"..In a special release, Visual-Environment 6.6 is being simultaneously made available with version 6.5 for selected ESI customers. In version 6.6 the setup of Noise, Vibration and Harshness (NVH) simulations ranging from Structural Transfer Functions and Point Mobility Analysis to full Vehicle Interior Acoustics with road excitation, is possible. The 6.6 edition provides advanced tools to visualize acoustic coupling, create structural panels, as well as process automation for setting up NVH and Interior Acoustics models. ESI's Visual-Environment platform not only covers the complete sequence typically used in automotive NVH simulation, but also extends to the integration of Porous Elastic Materials (PEM) for improved predictability of the sound pressure level experienced by drivers and passengers.

"Our new NVH and Interior Acoustics module allows customers to improve their productivity by reusing data already available from other domains like Crash, Strength and Stiffness. Furthermore, the physical realism and accuracy of the NVH solution can be enhanced by bringing in the effects of the manufacturing and assembly history on the mechanical properties of the parts and assemblies," said Willem Van Hal, NVH Product Manager at ESI Group.

"Our customers are our coaches and their constant feedback has been instrumental in guiding us forward," said Anitha Nanjundaswamy Rao, Platform Product Manager at ESI Group. "With this latest release of Visual-Environment, ESI comes closer to delivering to its customers an integrated platform for End-to-End Virtual Prototyping."

ESI North America

(FEA Information Inc. Participant)

Training Courses

CADFEM GmbH

The Complete Training Courses Offered Can Be Found At: http://www.cadfem.de
Please check the site for accuracy and changes.
Among the many course offering are the following:

Explicit structural mechanics with ANSYS Workbench and LS-DYNA

Beside the trainings on all aspects of short time dynamics we offer also various seminars on new methods available in LS-DYNA.

- Seminar: Introduction to explicit structural mechanics with ANSYS LS-DYNA and LSTC LS-DYNA
- Seminar: Material modeling with LS-DYNA
- Seminar: Simulation of composites with ANSYS Composites PrepPost and LS-DYNA
- Online-Seminar: Contact modeling with LS-DYNA
- Online-Seminar: Modeling joints with LS-DYNA
- Seminar: Crash simulation with LS-DYNA

optiSLang

Parametric simulation and optimization with optiSLang
optiSLang is one of the most popular solver for optimization and robust design analyses

Online-Seminar: Advanced parametric simulation with ANSYS Workbench and optiSLang

AnyBody

With AnyBody it is possible to simulate the kinematics of a human body like computing muscle forces for example.

- Seminar: Introduction to simulation of joint- and muscle- forces with AnyBody
- Seminar: Efficient coupling of AnyBody with ANSYS Workbench

Training Courses

Engineering Research AB
ERAB

The Complete Training Courses Offered Can Be Found Athttp://www.erab.se/courses/
Please check the site for accuracy and changes.
Among the many course offering are the following:

LS-PrePost 3, introduction
March 7, 2011

LS-DYNA, Introductory
March 8, 2011

ANSA & Metapost, Introductory
March 15, 2011

ANSA CFD Meshing
March 17, 2011

LS-DYNA, implicit analysis
March 22, 2011

LS-DYNA, Simulation of sheet metal forming processes
May 3, 2011

LS-DYNA, Material modeling
May 10, 2011

LS-PrePost 3, introduction
September 12, 2011

LS-DYNA, introductory
September 13, 2011

LS-DYNA, Adv. training in impact analysis
September 20, 2011

LS-DYNA, implicit analysis
October 11, 2011

ANSA & Metapost, Introductory
October 25, 2011

LS-OPT, Optimization and robust design
November 14, 2011