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LSTC

The 10th International LS-DYNA® Users Conference

ABSTRACT DEADLINE Dec 15, 2007

ANSYS

FLUENT CFD Software from ANSYS Helps F1 Team More Than Double Point Tally

INTEL

Intel Celebrates Expanding Opportunities for 1 Million Chinese Teachers, 100 Million Students

FEA Information Announcement:

The 10th International LS-DYNA® Users Conference

June 8-10, 2008 - Hosted by Livermore Software Technology Corp.
Abstract Deadline: Dec. 15, 2007

New Feature:

d3VIEW and LS-DYNA® Blog by Suri Bala

Welcome Friedman Research Corporation

Friedman Research Corporation (FRC) conducts finite element analyses.
See article for complete information.

Sincerely,

Art Shapiro art@feainformation.com - Editor

Marsha Victory mv@feainformation.com - President

www.feainformation.com - www.ls-dynaconferences.com

Graphic Design: Wayne L. Mindle
Business Mgr: Anthony Giaccana

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November Featured Paper

Modeling Carpet For Use In Occupant Crash Simulations

http://www.dynalook.com/documents/6th_European_ls-dyna/5.1.4.pdf

Authors: Dylan Thomas – Honda R&D Americas

Abstract:

Prediction of occupant injury using crash simulations can require numerical representation of materials that are not normally included with the structural model. Intuitively, it makes sense that the carpet would be required to predict the tibia index during frontal crash events; however, there appears to be little published on the topic. The tibia index is an injury criteria that needs to be predicted during IIHS frontal offset occupant simulations, but is also looked at during unbelted FMVSS 208 simulations. Since carpet behaves quite differently durin compressive and tensile loading, a numerical representation that can stably capture both regimes during occupant modelling is needed.

This paper outlines a method to model the carpet using a specific meshing method and two material models.

Friedman Research Corporation (FRC)

Visit FRC For Complete Information

Friedman Research Corporation (FRC) conducts finite element analyses with the vision of supporting manufacturers and suppliers by applying our extensive multidisciplinary research to the development of new products and design approaches.

FRC provides world class finite element modeling on applications involving product design, impacts, blast, crashworthiness, aerodynamics, and rotating structures. Modeling may involve composite materials, steel, concrete, plastic, glass, rubber, paper, fabric, wood, fluids, gases, and biological materials.

Our team is supported by state-of-the-art computing and communications infrastructure through our California and Texas offices enabling rapid response to our clients design analysis needs, from model creation and validation through analysis results and design refinement.

HQ Contact Information:

Friedman Research Corporation

Tel: 512/247-2277

Fax: 512/727-5504

1508-B Ferguson Drive

Austin, TX 78754

www.friedmanresearch.com

d3VIEW and LS-DYNA Blog

Introduction

LS-DYNA® is a world-class multi-physics and multi-stage solver that is used by a wide variety of customers who make everything from aircraft and automobiles to golf balls and power tools. The software is exciting to use and helps companies design and produce better products. LS-DYNA is nicely complemented by LS-PrePost (a pre and post-processor) and LS-OPT (an advanced optimization tool). LS-DYNA, LS-PrePost, and LS-OPT are all developed and maintained by Livermore Software Technology Corporation (LSTC).

About d3VIEW (http://www.d3view.com)

d3VIEW started out as a hobby and grew into a web-based tool for processing LS-DYNA generated "d3hsp" files. The maturity of "AJAX" technology (a technique used for developing interactive web applications) made this possible since it allowed large models to be processed and viewed in an "on-demand" fashion. The next version of d3VIEW, scheduled for release before the end of this year, will provide simple data management and other tools dedicated to LS-DYNA. d3VIEW is powered by BLUEPORT, a native web development framework.

About the Blog (http://blog.d3view.com)

It is estimated that over 50 million active personal and corporate blogs currently exists, and the size of the "blogosphere" continues to grow at a staggering rate. The "blog" concept (an abbreviation of "web log") is nothing new since people have long maintained personal records of information that was likely to come in handy at a later date. The nicely maintained FAQs compiled by Mr. Jim Day are a prime example (ftp://ftp.lstc.com/outgoing2/jday/faq/). Modern blogging is simply an extension of this concept but differs in that it can be served via the web (using standard http) and maintained from anywhere. The d3VIEW blog was established to provide useful information about LS-DYNA in a simple format to help users worldwide.

Credits

- d3VIEW and the blog would not be possible without the encouragement and support of Dr. John Hallquist and all my colleagues at LSTC.
- Special thanks to Marsha Victory of FEA Information for providing sponsorship that enables professional hosting of the site.
- Jacob Krebs, who works full-time at LSTC, is an active contributor to both d3VIEW and the blog.

INTEL - Participant Benchmarks on TopCrunch

TopCrunch.Org for complete information on all TopCrunch Participants

Submitted by Intel / Intel 10/24/2007

Computer/Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time/ Sec	Benchmark Problem
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	32 x 1 x 2 = **64**	288	neon_refined_revised
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	16 x 1 x 2 = **32**	439	neon_refined_revised
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	8 x 1 x 2 = **16**	771	neon_refined_revised
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	4 x 1 x 2 = **8**	1442	neon_refined
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	4 x 1 x 2 = **8**	1442	neon_refined_revised
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	32 x 1 x 2 = **64**	2782	3 Vehicle Collision
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	16 x 1 x 2 = **32**	4848	3 Vehicle Collision
S5000PAL/Infiniband	Intel® Xeon® Dual Core 5160 EM64T	128 x 2 x 2 = **512**	6343	car2car
S5000PAL/Infiniband	Intel® Xeon® Dual Core 5160 EM64T	64 x 2 x 2 = **256**	8691	car2car
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	8 x 1 x 2 = **16**	9495	3 Vehicle Collision

INTEL - Participants Benchmarks on TopCrunch

TopCrunch.Org for complete information on all TopCrunch Participants

Submitted by Intel / Intel 10/24/2007

Computer/Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time/ Sec	Benchmark Problem
S5000XSL/Infiniband	Intel® Xeon® Dual Core 5160 EM64T	32 x 2 x 2 = **128**	14897	car2car
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	32 x 1 x 2 = **64**	26129	car2car
S3000PAL/Infiniband	Intel® Core 2 Extreme X6800	16 x 1 x 2 = **32**	47850	car2car

Submitted by White Box / Intel SSG 11/08/2007

Computer/Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time/ Sec	Benchmark Problem
Xeon E5472/GigE	Intel(r) Quad Core 3.00Ghz	1 x 2 x 4 = **8**	1711	neon_refined
Xeon X5365/GigE	Intel(r) Quad Core 3.00Ghz	1 x 2 x 4 = **8**	2214	neon_refined
Xeon E5472/GigE	Intel(r) Quad Core 3.00Ghz	1 x 2 x 4 = **8**	23798	3 Vehicle Collision
Xeon X5365/GigE	Intel(r) Quad Core 3.00Ghz	1 x 2 x 4 = **8**	30198	3 Vehicle Collision
Xeon E5472/GigE	Intel(r) Quad Core 3.00Ghz	1 x 2 x 4 = **8**	217928	car2car

SGI - Participants Benchmarks on TopCrunch

TopCrunch.Org for complete information on all TopCrunch Participants

Submitted by SGI / Applications Engineering 10/24/2007

Computer/Interconnect	Processor	#Nodes x #Processors per Node x #Cores Per Processor = Total #CPU	Time/ Sec	Benchmark Problem
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	Intel 5160 Woodcrest DC 3.0GHz	16 x 2 x 2 = 64	310	neon_refined_revised
Altix 1200/Voltaire HCA 410Ex InfiniHost III Lx SDR, OFED v1.2	Intel 5160 Woodcrest DC 3.0GHz	16 x 2 x 2 = 64	2911	3 Vehicle Collision

LS-PrePost® On Line Documentation Support Site

LS-PrePost Support Site

LS-PrePost® was designed to provide the following core functionalities:

- Full LS-DYNA® keyword support
- LS-DYNA model visualization
- LS-DYNA model creation and editing
- Advanced post-processing

LS-PrePost's main post-processing capabilities include states result animation, fringe component plotting, and XY history plotting. LS-PrePost is also capable of importing and exporting data in a number of common formats. The figure on the right illustrates a sampling of those that a typical user might find most useful.

What's New

27-Sep - Added Morph Interface

24-Sep - Updated the Blank Interface to make use of LS-PrePost's growing General Selection capabilities

14-Sep - Added some options (Sphe, Box, Prox, Circ) to the General Selection Interface

Review of the LS-DYNA Discussion Group at 78th Shock & Vibration Symposium

(The next discussion group will be held November 2008 near Orlando Florida.)

An LS-DYNA Discussion Group was held on Tuesday 6 November from 17:30 to 19:00 in conjunction with the 78th Shock & Vibration Symposium. www.saviac.org

This meeting provides an opportunity for engineers to meet with Livermore Software Technology Corporation (LSTC) personnel, learn of recent developments in LS-DYNA and LS-PrePost, discuss application of LS-DYNA to their problems, share best practices, and make requests for new features.

Approximately 30 people attended the discussion group which featured a presentation by Tom Littlewood (tslittlewood@lstc.com) on new and improved underwater explosion (UNDEX) capabilities in LS-DYNA. The Shock & Vibrations Symposium is a major annual meeting for the UNDEX community and the presence of Tom Littlewood attracted both LS-DYNA and USA users.

Tom has agreed to make his presentation slides available. For those interested in a copy of the presentation or licensing USA write to Marsha@lstc.com

Tom's presentation included topics related to LS-DYNA Version Release 2 & Release 3, and USA Version 6 developments with efforts planned for Version 7. Of particular interest for the UNDEX community was Tom's presentation of USA developments including:

- USA Version 6.51 released with LS971_R2
- New nonconformal DAA elements that don't share nodes with the structural model
- New cavitating spectral volume element (CASE) solver with combined shock-bubble model

The effectiveness of these new capabilities was illustrated by contrasting the usage of 1-to-1, conforming and nonconforming DAA elements and by comparing CASE results with test data.

This was the second LS-DYNA Discussion Group held in conjunction with the annual Shock & Vibrations Symposium. The popularity of this forum is encouraging and plans are being made to host another discussion group in November 2008 at the next Shock & Vibrations Symposium to be held near Orlando Florida.

The meeting is hosted by Livermore Software and Technology Corporation (LSTC) and moderated by Len Schwer of Schwer Engineering & Consulting Services. You may contact Len (Len@Schwer.net) for more information, comments, or suggestions.

LS-DYNA - orthotropic/anisotropic materials

LS-DYNA Support Site For Complete Information

For shells of orthotropic/anisotropic materials, there are 3 coordinate systems to consider: global, element, and material. PSI in *ELEMENT_SHELL_BETA and the BETA angles in *SECTION_SEHLL affect only the material coordinate system. The element coordinate system is determined by the connectivity (N1-to-N2 is x; z is normal to the shell).

Regarding output, if CMPFLG in *database_extent_binary is 0.0 (default):

d3plot database: stresses/strains are in the global coordinate system.

elout file: stresses/strains in shells are in the element local coordinate `system (note the word "local" in the elout file).

If CMPFLG is 1:

All stress and strain output for composite materials is in the material coordinate system.

Materials models dealing specifically with composites are:

22	composite_damage	use laminated shell theory if lamsht=1 in *CONTROL_SHELL
54,55	enhanced_composite_damage [1]	
58	laminated_composite_fabric [1,7]	
59	composite_failure(_shell, _solid)_model [1]	
114	layered_linear_plasticity	plasticity model that DOES use laminated shell theory
116	composite_layup	does NOT use laminated shell theory (not good for foam core/sandwich composites) requires *INTEGRATION_SHELL (allows each integration point to refer to a different set of mat_2 constants) resultant formulation (no stresses calculated)
117	composite_matrix	

118	composite_direct	resultant formulation (no stresses calculated) 21 coefficients of stiffness matrix are input stiffness coefficients in 117 given in material coord system stiffness coefficients in 118 given in element coord system (less storage req'd)
161		solid elements only MSC is Materials Sciences, NOT McNeal-Schwindler requires special license add-on only model to consider physics of delamination

Notes:

The paper "Crashworthiness Analysis with Enhanced Composite Material Models in LS-DYNA - Merits and Limits", Karl Schweizerhof et al, 5th International LS-DYNA User's Conference (1998) provides some insight into several composite material models in LS-DYNA, including mat_54, mat_58, and mat_59. Per Klaus Weimar, Figure 2 in the paper has a typo (the value 0.3 should be 0.03).

A set of examples that include mat_22 and mat_114 and which illustrate *integration_shell are assembled in sandwich.tar.gz The tar file contains the following:

- readme
- shell8.k
- shell8.lam22.k
- shell8.mat114.k
- solid8.k
- sandwich.gif

See also notes in the text files sandwich_composites and orthotropic_materials.

Stresses (and strains) will be written in the material coordinate system rather than the global coordinate system if CMPFLG (and STRFLG) is set to 1 in *DATABASE_EXTENT_BINARY.

Delamination is dependent on sig-zz and thus our shell elements aren't suitable for prediction of delamination (sig-zz is zero for our shells). Mat_022 and mat_059, when used with solid elements, include a delamination failure criterion.

Mat_161 offers delamination prediction using solid elements. According to Al Tabiei, tied contacts with failure or tiebreaks don't properly represent the mechanics of delamination. Tiebreaks perhaps do offer a first-order approximation of failure. Dr. Tabiei mentioned that use

of tiebreaks will generally trigger a nonrealistic chain reaction of failure (an 'unzipping') which can be tempered with mass damping or stiffness damping.

Dr. Tabiei has developed his own micro-mechanics-based composite material models which include delamination effects. None of these models are currently included in LS-DYNA. Dr. Tabiei has developed a two-day short course on Composite Modeling which is given periodically at LSTC in Livermore. Consult LSTC www.lstc.com for a class schedule. Dr. Tabiei can be contacted at atabiei@aol.com to arrange for on-site instruction or consulting.

A number of references on modeling of composites can be downloaded from www.dynalook.com.

For mat_58, the rate at which tensile stress decreases relative to increasing strain is dependent on ExxT, the strain at tensile strength. The greater the value of ExxT, the more gradual the stress decrease. See element 1 in ftp://ftp.lstc.com/outgoing2/jday/composites/m58.k

For mat_58, the scalar quantity "effective strain" which is evaluated against the failure strain ERODS appears to be computed from 2 in-plane normal strains and the shear strain. This is not equivalent to the "effective strain" available for output in LS-PREPOST which is computed from the 6 global strain components. The 3 values of strain that go into computing the internally calculated effective strain for mat58 are available for output as extra history variables 10, 11, and 12 with 12 being the shear strain.

For mat_058 with rate effects, use mat_158.

Regarding what's available as extra history variables in mat_059 (shells)

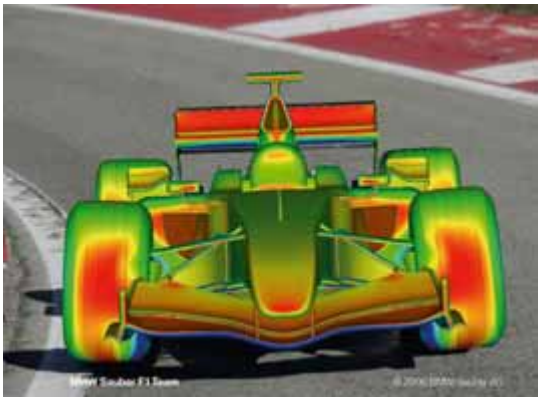
hist variable #	variable name in subroutine
"plastic strain"	ef (tensile fiber mode)
1	ec (compressive fiber mode)
2	em (tensile matrix mode)
3	ed (compressive matrix mode)
6	efail
7	dam (damage parameter)

A model with single shell elements comparing mats 2,22,54,55,58,59 are in ftp://ftp.lstc.com/outgoing2/jday/composites (see allin1_ortho*.k).
jpd 12/2002 - revised 3/26/03 (added note 5) - revised 6/25/03 (Tabiei contact info) - 4/1/04 added note 8 - 5/13/04 add note about mat_158
8/24/04 added mat22 and mat58 as applic for solids (delamination)
23/01/05 restructured and prepared for www.dynasupport.com

Attached files - sandwich.tar.gz - composite_paper.pdf

ANSYS NEWS - November 01, 2007 - BMW Sauber F1 Team

FLUENT CFD Software from ANSYS Helps F1 Team More Than Double Point Tally



The BMW Sauber F1 Team has more than double last year's points total in the 2007 Constructors' Championship. Using engineering software from ANSYS, Inc. with a new supercomputer, the team has been able to run increasingly complex simulations of race car aerodynamics, far quicker than was previously possible. This has enabled the BMW Sauber F1 Team to analyse and implement design changes more quickly. This composite image shows a BMW Sauber F1 racing car colored by pressure contours. Image ©2006 BMW Sauber AG.

SOUTHPOINTE, Pa., Nov. 1 /PRNewswire-FirstCall/ -- ANSYS, Inc. (Nasdaq: ANSS), a global innovator of simulation software and technologies designed to optimize product development processes, today announced that ANSYS engineering simulation software assisted the BMW Sauber F1 Team, who has more than double last year's points total in the 2007 Constructors' Championship.

Prior to the season, the BMW Sauber F1 Team signed an extended agreement with Fluent Deutschland, a subsidiary of ANSYS, Inc., to use FLUENT(R) computational fluid dynamics (CFD) software to run powerful engineering simulations on its new supercomputer -- one of the largest in Europe -- rather than invest in a second wind tunnel. This investment in CFD has allowed the team to run increasingly complex simulations of race car aerodynamics, far quicker than was previously possible. This has enabled the BMW Sauber F1 Team to analyze and implement design changes more quickly, which combined with other advances the team has made, has delivered the team's best performance in the Constructors' Championship to date.

"The launch of our latest supercomputer was a decisive reinforcement of our CFD capacity. Unlike other teams, we didn't plan to build a second wind tunnel. Instead, we have used the key relationship commitment with ANSYS to continue to develop and exploit the expanding potential for CFD that high-performance computing gives us," explained Mario Theissen, BMW Motorsport Director. He added that wind tunnel testing will continue as an important design element of their F1 racing car design because of validation of results and other areas of car development.

"The big difference with CFD compared to wind tunnels is that you not only get results, but also get an understanding of what goes on. Wind tunnel testing remains important with experimental work and CFD complementing each other," Theissen said.

To optimize the performance of the FLUENT CFD software, the BMW Sauber F1 Team invested in a custom-built

supercomputer called "Albert2," the successor to its original Albert supercomputer developed in 2004. Powered by 512 Intel(R) Xeon(R) 5160 dual core processors, Albert(2) is 5.5 times more powerful and three times faster than the first Albert computer. Albert2 was specifically designed and built to run CFD simulations using the latest version of FLUENT software. It has the capacity to make 12,288,000,000,000 calculations per second, which highlights the staggering pace of advance in the potential power available to perform CFD simulations. Theoretically, the BMW Sauber F1 Team could run simulations approaching and even exceeding the landmark figure of 1 billion cells. When FLUENT became the first CFD software tool to be used in F1 -- by the Benetton team of 1992 -- simulations of only 100,000 cells were possible, such as the analysis of a front wing. The possibility of FLUENT meshes of 1 billion cells or more demonstrates how the continued partnership between the BMW Sauber F1 Team and ANSYS is proving critical to driving CFD development and making the technology ever-more important in the design process.

"Working together with the BMW Sauber F1 Team, we are exploring how maximum benefit can be yielded in aerodynamic design," said Ferit Boysan, vice president and general manager at ANSYS, Inc. "Relationships such as this are genuinely pioneering the engineering simulation possibilities of the future, and they could well have implications far beyond F1 racing. We are working at the leading edge of the technology, with the exciting thing being that we don't even know what the limits are yet."

Computer-aided engineering and CFD simulations can be applied to many areas of the racing car, allowing team engineers to quickly and accurately test a number of design candidates before developing only the most promising for wind tunnel testing. The new compute power offered by the Albert2 supercomputer allows full-car simulations in addition to the aerodynamic testing of components such as the front and rear wings, turning vanes, brake ducts, fuel tanks and more.

About the BMW Sauber F1 Team - For complete coporate information visit BMW. The BMW Sauber F1 Team is a Formula One racing team with bases in Munich, Germany and Hinwil, Switzerland. The team came into existence on January 1st 2006 following the purchase of a majority share of the existing Sauber Formula One team by German car manufacturer BMW. For its first season in 2006, the team scored two podium finishes and placed fifth in the Constructors' Championship. The BMW Sauber F1 Team continues to use the facilities in Hinwil, mostly for chassis construction and improving aerodynamics, while BMW's headquarters in Munich is responsible for designing and building the entire powertrain and electronics.

About ANSYS, Inc. – For complete coporate information visit ANSYS Inc. ANSYS, Inc., founded in 1970, develops and globally markets engineering simulation software and technologies widely used by engineers and designers across a broad spectrum of industries. The Company focuses on the development of open and flexible solutions that enable users to analyze designs directly on the desktop, providing a common platform for fast, efficient and cost-conscious product development, from design concept to final-stage testing and validation.

ESI-GROUP VIBRO-ACOUSTICS Products & Events

VIBRO-ACOUSTICS PRODUCTS – http://www.esi-group.com/SimulationSoftware/vibro.html

AutoSEA2,
real-time broadband noise and vibration prediction, analysis and design.

AutoSEA2 LT,
fast and easy assessment of broadband noise and vibration for analysis and design

FOAM-X,
acoustic property identification for foam and fiber materials

RAYON,
low-frequency noise prediction, analysis and design.

NOVA,
multi-layered material acoustic simulation and design.

VA One,
the One simulation environment for full frequency spectrum analysis

EVENTS

VA One FE/BEM/Hybrid Training Course	December 3-5, 2007 Bloomfield Hills, Michigan - USA
VA One Seminar – Santa Clara, CA	December 13, 2007 Santa Clara, CA - USA
Training: PAM-STAMP 2G, full stamping value chain	December 10-14, 2007 Rungis, France
Training: PAM-CRASH 2G and Visual-Crash for PAM	December 17-21, 2007 Rungis, France

Intel Celebrates Expanding Opportunities for 1 Million Chinese Teachers, 100 Million Students

Intel CEO and China's Ministry of Education Also Honor 15 Top Educators

Intel Products

- Intel® Core™2 Duo
- Intel® Core™2 Quad
- Intel® Xe**on**®

BEIJING, Nov. 1, 2007 – The 11-year-old Tibetan students of Ah Mi now find the world a smaller place. Before Ah Mi learned how to incorporate the use of computers and the Internet into his teaching, students were exposed only to two-dimensional photos in a textbook. Today, they use the Internet to research the evolution of transportation in Tibet and showcase their findings in advanced multimedia presentations.

Three years ago, Ah Mi, took a course called the Intel® Teach Program that turned him into a self-described global tour guide. The teacher training program was offered by the Ministry of Education (MOE) and Intel Corporation, and it taught him how to use technology to improve student learning.

While visiting Beijing No. 2 Middle School, Intel Corporation President and CEO Paul Otellini today announced a significant milestone for this teacher training program. One million teachers – nearly 10 percent of China's teachers – have completed the Intel Teach Program since it started in 2000. An estimated 100 million students have benefited from the program, and China is the first of 40 countries where the program is available to reach these milestones. Intel expects that 10 million teachers worldwide will complete the training program by 2011.

"The foundation of tomorrow's innovation is education," said Otellini. "That's why making quality education available to more students around the world – with the help of technology – has inspired Intel's commitment to education for 40 years. Intel is committed to empowering teachers and students in China with the tools to navigate the opportunities the global economy offers."

"We at the Ministry of Education are extremely thankful that the Intel has introduced world-class educational concepts, training models and management methods into our education system," said Chen Xiaoya, vice minister of China's MOE. "The Intel Teach Program was established 7 years ago, reaching over 31 provinces in China. In recent years, the program has evolved into the largest education program for teachers in primary and secondary schools in China. Through our collaboration with Intel, the Intel Teach Program has enabled numerous teachers to apply information technology to improve teaching. As a result, our students gain valuable knowledge and skill sets through research-based learning concepts. The dedicated educational efforts Intel has provided to China are truly in line with our objectives of 'Building an Innovative Country.'"

At the celebration, Intel also honored the 15 teachers who won the teaching and

application awards of the 2007 Intel® Teach Program National Implementation Contest. The contest honors teachers who have demonstrated exceptional proficiency in implementing curriculum from the Intel Teach Program. These teachers' classes submitted projects that visibly demonstrated creative thinking, team work and how technology was used to solve problems.

"The 15 teachers we're honoring today are great examples of what Intel has accomplished jointly with China's MOE in the past 7 years," said Otellini, who also visited a geography class where students were preparing multi-media computer presentations for a class research project.

The teachers honored included WangLiXin from Beijing; Meng Ran from Tianjin; Zhou YanHe, PengJie and Nie Jianping from Shanghai; and Yuan ZhenHong from Hebai. Other teachers recognized were Liu LiYan from Heilongjiang; Ye XueLan and Wu LiuSi from Guangdong; Zhou Yali and Zhong Jianhua from Guangxi; and XieShaobin and Liang Zhengfa from Hainan. In addition, Wan Yan from Xinjiang and Ah Mi from Tibet were honored.

With support from the MOE, Intel China and the National Center for Educational Technology (NCET) kicked off the contest last October across all 31 provinces. More than 600 entries were submitted across three award categories: Teaching and application, management, and outstanding teamwork.

The Intel Teach Program and other education programs are key elements of Intel's commitment to be a socially responsible company. Through continued partnership with the MOE, Intel will train 700,000 more teachers in China's primary and secondary schools by 2011. They'll also continue funding 100 joint university research programs and help 100 universities establish labs to instruct engineering students about multi-core processor and software design.

About Intel: Intel, the world leader in silicon innovation, develops technologies, products and initiatives to continually advance how people work and live. Additional information about Intel is available at www.intel.com/pressroom and blogs.intel.com.

DEP Product Design Services / Meshworks Morpher

For Complete Information Visit

Detroit Engineered Product's (DEP) Meshworks Morpher is a path breaking software that enables the user to rapidly change an existing FE / CFD Mesh into a new target shape without having to redraw it in the CAD system. This disruptive new technology saves significant time and money for new product development. Major Automotive, Aerospace and Consumer Electronics companies are early adopters of this technology by licensing our product since 2000. The MESHWORKS MORPHER tools can be used through out the product development phase of any product.

The Meshworks Morpher 4.0 is available for both WIN 32 and WIN 64 platforms. On both platforms, the Morpher 4.0 provides a rich set of capabilities and features that ours can rapidly implement design changes and to gain more insight in the behavior of their design and to get better design directives. DEP continues to innovate and offer powerful tools.

PRODUCT DESIGN SERVICES: DEP is a competent automotive engineering services provider in several areas of product design using all major CAD tools including Catia, Unigraphics, Pro/E. The skill set is drawn from dedicated people with experience in the areas of automotive and industrial design. DEP has the capability to design and develop basic component designs and also sub system assemblies and has undertaken several projects over the last 5 years.

In the area of modeling: · Modeling: The Group's complex 3D geometrical models express built-in design intent, and behavioral modeling is used to optimize the design. The models can be completely parametric, with interdependent dimensions driven by relations. The best possible techniques are used to obtain the optimal CAD model.

Drafting: The Group generates engineering production drawings or assembly layout drawings to match customer specifications. International drafting standards set by ISO, DIN, JIS, ANSI, BIS or other user-specified standards are followed.

Assembly: This involves creation of initial layouts and top-down assemblies with modular methodology is our specialty.

Tolerance analysis, Interference checks and Mass property calculation: The Group performs tolerance analysis for assemblies using the latest software. Assemblies are modified to improve stability, using information about center of gravity and moment of inertia.

Cabling, wire harness and piping: This includes optimum 3D routing and calculation of the best cable routing paths is done with due consideration to required design parameters like magnetic and thermal interference.

Fabrication drawings and Bill of Material (BOM) generation: From the component model/drawing, the Group generates fabrication drawings with reference to the fabrication process. All required dimensional tolerances and surface finish data are added wherever necessary.

SUN Constellation System

Excerpt – for complete article visit **Sun Microsystems Inc.**

November 12, 2007 Sun Microsystems, Inc. (NASDAQ: JAVA) today announced two new systems designed to address the extreme computation, scale and storage requirements of today's HPC customer. The Sun Constellation System - the world's first open petascale computing environment - combines ultra-dense, high performance compute, networking, storage and software into an integrated general purpose system. Running the Solaris Operating System (OS), Linux and Windows, the Sun Constellation System is capable of scaling from departmental clusters to the largest supercomputer configurations to help customers to solve complex computational problems. The Sun StorageTek 5800 System is designed to help ensure long-term preservation, protection and integrity of massive data stores with extensive metadata facilities.

"With today's announcements, we've designed and are delivering the next big thing – open compute and storage platforms in an extremely scalable architecture that brings the power of industrial grade computing to department level clusters and all the way up to the petaflop environments," said John Fowler, executive vice president, Systems Group, Sun Microsystems.

Sun Constellation System

The Sun Constellation System is the world's most scalable HPC computing architecture based on open standards and industry standard components. Scaling from departmental level clusters to systems capable of petascale level computing, the system features ultra-dense compute nodes, ultra-dense Infiniband switching and high performance storage.

Sun Constellation System comprises the following innovative components, bringing production-ready capabilities to petascale computing:

Sun Blade 6048 Modular System - An ultra dense blade server platform which supports SPARC, AMD Opteron and Intel Xeon processors and runs industry standard OS'es including Solaris and Linux.

Sun Datacenter Switch 3456 - world's first single chassis switch designed for petascale, delivers 12x the capacity of the largest Infiniband switch available today, enables the Sun Constellation System to require 1/6 the number of cables of competitive systems and simplifies the design and management of high performance clusters by reducing the number of Infiniband switching elements by up to 300:1.

High-throughput, high-density storage and high capacity tape archive in a unique end-to-end hierarchical storage solution with automated and seamless transfer supporting optimal placement of data.

New Sun Datacenter Express Services for HPC that can be combined with factory integration services and design through Sun's Customer Ready program provide a comprehensive, all-in-one systems and services solution that takes the cost and complexity out of HPC infrastructure procurement and management.

To learn more about the Sun Constellation System go to: www.sun.com/sunconstellationsystem

Sun StorageTek 5800 System

The Sun StorageTek 5800 System is a new category of storage system designed for large-scale storage of fixed data. The first commercially available fixed content storage system with a commitment to open source its code, the Sun StorageTek 5800 System helps ensure long-term accessibility to data and delivers simpler deployment and management capabilities than traditional file/block-based storage. The Sun StorageTek 5800 System allows customers to scale seamlessly, saving millions in administrative costs. Designed for long-term preservation and protection of data assets, the system helps protect against data corruption and loss with advanced data integrity functionality and assurances.

http://www.sun.com/aboutsun/pr/2007-11/sunflash.20071112.2.xml

To learn more about the Sun StorageTek 5800 System: http://www.sun.com/storagetek/disk_systems/enterprise/5800/index.xml

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About Sun Microsystems, Inc.

Sun Microsystems develops the technologies that power the global marketplace. Guided by a singular vision -- "The Network is the Computer" -- Sun drives network participation through shared innovation, community development and open source leadership. Sun can be found in more than 100 countries and on the Web at http://sun.com

Seminars Organized by CARHS gmbh

Managing Director: Rainer Hoffmann

Introduction to Passive Safety of Motor Vehicles	TrainingCenter Alzenau	Tuesday, 04 Dec 2007 9:00 am
Knee Mapping Workshop	TrainingCenter Alzenau	Tuesday, 29 Jan 2008 9:00 Uhr
Einführung in die Passive Sicherheit von Kraftfahrzeugen (in Alzenau)	TrainingCenter Alzenau	Tuesday, 01 Apr 2008 9:00 Uhr
Introduction to Passive Safety of Motor Vehicles	TrainingCenter Alzenau	Wednesday, 28 May 2008 9:00 am
Euro NCAP and worldwide Tests for Consumer Information on Active and Passive Safety	TrainingCenter Alzenau	Monday, 23 Jun 2008 9:00 am
Frontal-Restraint Systems according to FMVSS 208 and Euro NCAP	TrainingCenter Alzenau	Wednesday, 25 Jun 2008 9:00 am
Side Impact - Requirements and Development Strategies	TrainingCenter Alzenau	Tuesday, 01 Jul 2008 9:00 am

Yahoo Group Yammerings

Note: LS-DYNA Yahoo Group is neither owned nor operated by LSTC, and LSTC has no control over the content.

Jim Kennedy
KBS2 Inc.
jmk@kbs2.com

Len Schwer
Schwer Engineering & Consulting Services
Len@Schwer.net

The LS-DYNA Yahoo Group archive contains a wealth of information that can be helpful to any LS-DYNA user. We suggest you review the archives when you are seeking help on any topic related to LS-DYNA. *NOTE: Questions and responses may have been edited for clarity & brevity.*

This installment of "Yahoo Yammerings" features several questions and responses from the past month of postings to the LS-DYNA Yahoo Group:

1. *MAT_015 Johnson Cook Failure Parameters?*
2. *Definition of the parameter FS for MAT_111?*
3. *Restart with residual stresses and strains?*
4. *How to introduce imperfections?*

MAT_015 Johnson Cook Failure Parameters?

I do not understand the Johnson-Cook failure parameters. If I put in D1, D2, and D3 failure parameters, for a specific aluminum with an effective plastic strain at failure of 20%, during the simulation the material fails at 35% plastic strain. If I only use the D1 parameter, then the material fails at a plastic strain of 20%.

Reply by Jim Kennedy: D1 defines the plastic strain at failure without considering the potential effects of pressure, strain rate, temperature, etc., which can be addressed in the damage function via the other "D" parameters.

Perhaps the following papers will provide some help in understanding the damage parameters:

Johnson, G. R., and Cook, W. H., "Fracture Characteristics of Three Metals Subjected to Various Strains, Strain Rates, Temperatures and Pressures," Engineering Fracture Mechanics, Vol. 21, Issue 1, pp. 31-48, 1985.

Loikkanen, M.J., Buyuk, M., Kan, C.D., and Meng, N., "A Computational and Experimental Analysis of Ballistic Impact to Sheet Metal Aircraft Structures," 5th European LS-DYNA User's Conference, Birmingham, United Kingdom, May, 2005.
http://www.dynalook.com/documents/5th_European_lsdyna/Methods_Techniques_I/Buyu\k.pdf

Definition of the parameter FS for MAT_111?

What is the meaning of the parameter FS in the MAT_JOHNSON_HOLMQUIST_CONCRETE material model?

Reply by Jim Kennedy: I have been advised that the following are the correct FS options for MAT_111:

Fail the element if too weak due to damage, three possible cases:
The parameter FS controls element failure. The 3 options are:
(1) FS=0: fail if p* + t* <0
(2) 0<FSFS>0: fail if strain > FS
(3) FS<0: fail if damaged strength <= 0

Restart with residual stresses and strains?

I need to use the results from a previous analysis as the starting condition of a new analysis. Using the original geometry and mesh, I need to apply the previously determined residual stresses and strains, and remove some elements from the model to simulate a milling operation.

Reply by Conrad Izatt: The stress and strain state at the end of an analysis can be written to the DYNAIN file. This will contain the new nodal coordinates (in *NODE format), and the stress and strain tensors for the elements (in *INITIAL_STRESS and *INITIAL_STRAIN format). The data contained in the DYNAIN file can then be used as the basis for a new analysis model with the residual deformations, stresses and strains from the previous analysis.

The DYNAIN file can be written at the end of an analysis by specifying the *INTERFACE_SPRINGBACK keyword.

How to introduce imperfections?

I have a tube impacting a rigid wall and I wish to introduce imperfections in the tube. How do I induce imperfections of 0.5 mm in some of the nodes?

Reply by Jim Kennedy: In the user manual you will find the harmonic options offered as *PERTURBATION_NODE and *PERTURBATION_SHELL_THICKNESS data entries on pages 26.2 and 26.5, respectively, of the latest LS-DYNA Version 971 User's Manual.Imperfections can be modeled using the *PERTURBATION_(option) keyword in LS-DYNA version ls971. See the User Manual for a description of the necessary input.

LS-DYNA Yahoo Groups: There are over 2400 subscribers from all over the world, and this list seems to grow by a hundred new subscribers ever few months; no small testament to the rapidly growing popularity of LS-DYNA. The group currently averages about 270 messages per month, i.e. about 10 messages per day. You can subscribe to the group by sending an email request to LS-DYNA-subscribe@yahoogroups.com or by visiting the Yahoo Groups web site http://groups.yahoo.com

Generally, the quickest/best responses are to those questions posed with the most specifics. General questions such as "How do I use XXX feature?" either go unanswered, or are answered by Jim Kennedy with links to appropriate references in the growing LS-DYNA related literature, e.g. see the archive of LS-DYNA Conference proceedings at www.dynalook.com

Oasys LS-DYNA UK Update Meeting
Wednesday 16th January 2008

Arup are pleased to announce the fifth in a series of update meetings for Oasys LS-DYNA Users which will take place at our office in Solihull, UK

This 1-day free of charge event will be an ideal opportunity for users from throughout the UK to share and discuss their experiences, to obtain information on up-coming features of Oasys and LS-DYNA and to learn more about new application areas.

The event is being supported by Microsoft and OCSL/HP, along with GRM Consulting Ltd and Warwick Manufacturing Group with Advantage West Midlands.

For more details and to register for this event please contact Hazel Partridge (hazel.partridge@arup.com)

This event is sponsored by

Microsoft OCSL

Arup Contacts for Oasys Software:

UK - Hazel Partridge
Arup Group Ltd - UK
+44 (0) 121 213 3399
dyna.sales@arup.com

China - Kimbal Virdi
Arup Group Ltd - China
+86 (0) 21 6126 2875
china.support@arup.com

India - Lavendra Singh
nHance Engineering Solutions (P) Ltd
Indian Operation - Oasys Ltd (Arup)
+91 (0) 40 235 444 20
lavendra.singh@arup.com

USA - Simon Iregbu
Arup Group Ltd - Detroit
+1 248 822 5050
us.support@arup.com

Other Worldwide Distributors of Oasys Software:

Alyotech (France) – www.alyotech.fr
Dynamore (Germany) – www.dynamore.de
ERAB (Scandinavia) – www.erab.se
JRI Solutions Ltd (Japan) – www.jri-sol.co.jp
THEME engineering (Korea) – www.lsdyna.co.kr

Book: Practical Stress Analysis with Finite Elements

Available at Amazon.com: Practical Stress Analysis with Finite Elements

Overview Excerpt: "….This chapter will show you why FEA is used and exactly what it is. Rather then giving a one line definition of what the term "finite element analysis" actually is, we will look at an example which will clearly illustrate the main points of FEA…."

Author:

Dr. Bryan Mac Donald
B.Eng. M.Sc. Ph.D. C.Eng. MIEI
School of Mechanical Engineering
Dublin City University
Dublin 9, Ireland

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The 10th International LS-DYNA® Users Conference

June 8-10, 2008

Hosted by Livermore Software Technology Corp. (LSTC)

To be held at The Hyatt Regency Dearborn, MI, USA

Abstract Deadline
Dec. 15, 2007

Email your Abstract to:
papers@lstc.com

Notification: 01/10/08

Paper Deadline: 03/05/08

Conference Papers: The presenter of each accepted paper will receive free admission to the conference, provided that the presenter registers for a room at the Hyatt Regency Dearborn under the LSTC Conference

Application Areas Being Accepted for Paper Submission:

- Aerospace
- Automotive Crashworthiness
- Ballistic and Penetration
- Biomechanics
- Civil Engineering
- Compressible Fluid Dynamics
- Electro Magnetics
- Heat Transfer
- Impact and Drop Testing
- Manufacturing Processes
- Metal Forming
- Modeling Techniques
- Nuclear Applications
- Occupant Safety
- Seismic Engineering
- Ship Building
- Transportation
- Virtual Proving Ground

Abstract Length:	Approximately 300 words, please include figures, if possible
Paper Length:	Maximum of 3000 words, single-spaced, on 8-1/2" x 11" paper
Format:	A MS Word template will be provided
Contact:	papers@lstc.com

Livermore Software Technology Corp.
(925) 449-2500
www.lstc.com
www.ls-dynaconferences.com

Chinese New Year Spectacular

Detroit Opera House - 1526 Broadway

Detroit, MI 48226 - Jan 22, 2008; 7.00PM
www.BestChineseShows.com

Chinese New Year Spectacular is the largest and most breathtaking celebration of the Chinese New Year in the world. Inspired by over 5000 years of history and tradition NTDTV Chinese New Year Spectacular is considered the most authentic cultural observance in the country.

Creating one of the most visually stunning experiences on stage the Spectacular will feature brilliant traditional dances, songs and symphony.

If you are looking for a truly diverse and culturally enriching experience, The Chinese New Year Spectacular at **Detroit Opera House Theatre** can't be beat.

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Ticket price: $28 - $128

Click here To buy tickets - See you at the show

LSTC California & Michigan Training Classes

2008 – 1st Quarter Additional times and classes will be posted shortly

A complete list of dates can be found on the LSTC website

Class Registration Form (PDF Format)

January 21-22	Troy, MI	Advanced Options
February 05-08	Livermore, CA	Intro to LS-DYNA
March 18-21	Troy, MI	Intro to LS-DYNA
March 27-28	Troy, MI	Contact
April 08-11	Troy, MI	LS-OPT
May 06-09	Livermore, CA	Intro to LS-DYNA
June 11-12	LSTC Conference	Advanced Crashworthiness ALE Heat Transfer Analysis Implicit Analysis LS-OPT LS-PrePost Metal Forming Concrete & Geomaterial Modeling
June 17-20	Troy, MI	Intro to LS-DYNA
June 23-24	Livermore, CA	Implicit
June 25-26	Livermore, CA	Composite Material
June 30-July 01	Livermore, CA	Material Modeling Using User Defined Options
July 22-25	Livermore, CA	Intro to LS-DYNA
Aug 12-13	Livermore, CA	Advanced Options
Aug 14-15	Livermore, CA	Contact
Sept 09-12	Troy, MI	Intro to LS-DYNA
Sept 09-12	Livermore, CA	LS-OPT
Sept 16-17	Troy, MI	Contact
Sept 25-26	Livermore, CA	Concrete & Geomaterial Modeling
Nov 11-14	Livermore, CA	Intro to LS-DYNA

For Complete Class Details:

www.lstc.com

2007/2008 Worldwide Events

Now accepting posting for 2008 send your events to Anthony Giaccana

Dec 5-7	**China International Simulation Industry Exhibition & Conference – Shanghai, China**
Dec.6-8	**The 3rd Auto Engineers Conference & "Industry Design and R&D Session"**
Events 2008	
April 28-29	**2008 VR&D Users's Conference**
June 8-10	**10th International LS-DYNA® Users Conference -The Hyatt Regency, Dearborn, MI, USA - hosted by LSTC**
May, 28-30	**The 4th International Conference on Advances in Structural Engeering and Mechanics(AWAS'08) in Jeju, Korea**

FEA Information China Participants

Arup China: LS-DYNA sales, support, training	Name: Li YuQiang Email: Yu-qiang.li@arup.com Tel 021 5396 6633 extn 151
Tsinghua University	Qing Zhou, PhD. – Professor Department of Automotive Engineering Beijing, 100084, China
Engineering Technology Associates (China) Inc.	Martin Ma Tel: + 86-21-64385725 Contact: support@eta.com.cn

China Company Listings

Ansys-China, Inc.	Tel: 86-10-84085558 Website: www.ansys.com.cn Contact: China@ansys.com.cn
Hewlett-Packard Asia Pacific Ltd.	Jerry Huang Tel: +86-10-65645261 Contact: J.Huang@hp.com
IBM China	Ms. Ling WANG - Tel: +86-10-6539-1188 x4463 (T/L:901-4463) Website: http://www.ibm.com/cn/ Contact: wangling@cn.ibm.com
MSC. Software Corp.	Tel: +86-10-6849-2777 Website: www.mscsoftware.com.cn Contact: mscprc.contact@mscsoftware.com
SGI China	Carl Zhang Tel: +86 -10 - 65228868 Ext. 3362 Contact: carl@sgi.com
Zhong Guo ESI Co., Ltd	Yang Xiaojum Phone: +86 (020) 8235 6272 Contact : Yang Xiaojun

BOOKS Available at Amazon

Practical Stress Analysis with Finite Elements
Dr. Bryan Mac Donald/published 2007

The Finite Element Method: Linear Static and Dynamic Finite Element Analysis
Thomas J.R. Hughes (Sept. 2000)

Vibration Simulation Using MATLAB and ANSYS
Michael R. Hatch -(Sept. 2000)

Nonlinear Finite Element Analysis for Continua and Structures
Ted Belytschko, et al/Hardcover/Published 2000

Nonlinear Finite Element Analysis for Continua and Structures
Ted Belytschko, et al/Paperback/Published 2000

LS-DYNA Resource Page

FEA Information Inc. Participant's (alphabetical order)

Fully QA'd by Livermore Software Technology Corporation

TABLE 1: SMP	
HP PA-8x00	HP-UX 11.11 and above
HP IA-64	HP-UX 11.22 and above
HP Opteron	Linux CP4000/XC
HP Alpha	True 64
IBM Power 4/5	AIX 5.1, 5.2, 5.3
IBM Power 5	SUSE 9.0
IBM Power PC 970	AIX 5.3
INTEL IA32	Linux, Windows
INTEL IA64	Linux
INTEL Xeon EMT64	Linux
NEC SX6	Super-UX
SGI Mips	IRIX 6.5 X
SGI IA64	SUSE 9 with ProPack 4 Red Hat 3 with ProPack 3
SUN Sparc	5.8 and above
SUN Opteron	5.8 and above

TABLE 2: MPP and MPI Interconnect			
Vendor	O/S	HPC Intereconnect	MPI Software
HP PA8000	HPUX		
HPIA64	HPUX		
HP Alpha	True 64		
IBM Power 4/5	AIX 5.1, 5.2, 5.3		
IBM Power 5	SUSE 9.0		LAM/MPI
IBM Power PC 970	AIX 5.3	MyriCom	MPICH-gm
INTEL IA32	Linux, Windows	InfiniBand (Voltaire), MyriCom	LAM/MPI, MPICH, HP MPI, SCALI
INTEL IA64	Linux		LAM/MPI, MPICH, HP MPI
INTEL Xeon EMT64	Linux	InfiniBand (Topspin, Voltaire), MyriCom, QLogic InfiniPath	LAM/MPI, MPICH, HP MPI, INTEL MPI, SCALI
NEC SX6	Super-UX		
SGI Mips	IRIX 6.5	NUMAlink	MPT
SGI IA64	SUSE 9 w/ProPack 4 RedHat 3 w/ProPack 3	NUMAlink, InfiniBand, (Voltaire)	MPT, Intel MPI, MPICH
SUN Sparc	5.8 and above		LAM/MPI
SUN Opteron	5.8 and above		

LS-DYNA Resource Page - Participant Software

Interfacing or Embedding LS-DYNA - Each software program can interface to all, or a very specific and limited segment of the other software program. The following list are software programs interfacing to or having the LS-DYNA solver embedded within their product. For complete information on the software products visit the corporate website.

ANSYS - ANSYS/LS-DYNA

ANSYS/LS-DYNA - Built upon the successful ANSYS interface, ANSYS/LS-DYNA is an integrated pre and postprocessor for the worlds most respected explicit dynamics solver, LS-DYNA. The combination makes it possible to solve combined explicit/implicit simulations in a very efficient manner, as well as perform extensive coupled simulations in Robust Design by using mature structural, thermal, electromagnetic and CFD technologies.

AI*Environment: A high end pre and post processor for LS-DYNA, AI*Environment is a powerful tool for advanced modeling of complex structures found in automotive, aerospace, electronic and medical fields. Solid, Shell, Beam, Fluid and Electromagnetic meshing and mesh editing tools are included under a single interface, making AI*Environement highly capable, yet easy to use for advanced modeling needs.

ETA – DYNAFORM

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

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

MSC.Software - MSC.Dytran LS-DYNA

Tightly-integrated solution that combines MSC.Dytran's advanced fluid-structure interaction capabilities with LS-DYNA's high-performance structural DMP within a common simulation environment. Innovative explicit nonlinear technology enables extreme, short-duration dynamic events to be simulated for a variety of industrial and commercial applications on UNIX, Linux, and Windows platforms. Joint solution can also be used in conjunction with a full suite of Virtual Product Development tools via a flexible, cost-effective MSC.MasterKey License System.

MSC.Software - MSC.Nastran/SOL 700

The MSC.NastranTM Explicit Nonlinear product module (SOL 700) provides MSC.Nastran users the ability access the explicit nonlinear structural simulation capabilities of the MSC.Dytran LS-DYNA solver using the MSC.Nastran Bulk Data input format. This product module offers unprecedented capabilities to analyze a variety of problems involving short duration, highly dynamic events with severe geometric and material nonlinearities.

MSC.Nastran Explicit Nonlinear will allow users to work within one common modeling environment using the same Bulk Data interface. NVH, linear, and nonlinear models can be used for explicit applications such as crash, crush, and drop test simulations. This reduces the time required to build additional models for another analysis programs, lowers risk due to information transfer or translation issues, and eliminates the need for additional software training.

MSC.Software – Gateway for LS-DYNA

Gateway for LS-DYNA provides you with the ability to access basic LS-DYNA simulation capabilities in a fully integrated and generative way. Accessed via a specific Crash workbench on the GPS workspace, the application enhances CATIA V5 to allow finite element analysis models to be output to LS-DYNA and then results to be displayed back in CATIA. Gateway for LS-DYNA supports explicit nonlinear analysis such as crash, drop test, and rigid wall analysis.

Gateway products provide CATIA V5 users with the ability to directly interface with their existing corporate simulation resources, and exchange and archive associated simulation data.

Oasys software for LS-DYNA

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.

EASi-CRASH DYNA

EASi-CRASH DYNA is the first fully integrated environment for crashworthiness and occupant safety simulations with LS-DYNA, and covers the complete CAE-process from model building and dataset preparation to result evaluation and design comparisons.

EASi-CRASH DYNA can be used for concept crash, FE crash and coupled rigid body/FE crash simulations in conjunction with MADYMO.

Full capability to handle IGES, CATIA V4, CATIA V5, UG and NASTRAN files

APTEK

The MMCD is a graphics-based and menu-driven program that interfaces with the LS-DYNA library of material models and the LS-OPT optimization code. The core of the MMCD is the driver, which calculates the stress-strain behavior of material models driven by combinations of strain increments and stress boundary conditions, i.e. pure shear stress, and combinations of uniaxial, biaxial, and triaxial compression and tension. MMCD input and output is accessed via pre- and post-processors; graphical user interfaces (GUIs) for easily selecting the material model parameters and load histories, and for plotting the output in both two (stress-strain curves) and three (yield surfaces) dimensions. The pre-processor, driver, and post-processor are combined into a web downloadable software package that operates seamlessly as a single code.

FEA Information Participants – Company name takes you directly to Website

Oasys, Ltd: Markets engineering software products. Consulting engineers, planners and project managers working in all areas of the built environment.

JRI Solutions Limited: Specializing in Research & Consulting; System Consulting, Frontier Business, System Integration and Science Consulting.

Hewlett Packard: Personal computing, mobile computing, network management, 3-D graphics and information storage.

ANSYS, Inc.: Develops, markets, supports and delivers collaborative analysis optimization software tools.

SGI: Silicon Graphics, Inc., is a leader in high-performance computing, visualization, and storage.

MSC.Software: Information technology software and services provider.. Products & services used to enhance & automate the product design/manufacturing process.

NEC Corporation A history of more than 100 years of leadership/innovation in the core high-technology sectors of communications, computers/electronic components

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Intel: For more than three decades, Intel Corporation has developed technology enabling the computer and Internet revolution that has changed the world.

Engineering Technology Associates, Inc: Provides engineering & IT services & has created the streamlined simulation software packages DYNAFORM and VPG

ESI Group: A software editor for the numerical simulation of prototype and manufacturing process engineering in applied mechanics.

Microsoft: For customers solving complex computational problems, Microsoft Windows Compute Cluster Server 2003 accelerates time-to-insight.

BETA CAE Systems S.A., Specialized in the development of state of the art CAE pre- and post-processing software systems.

Sun Microsystems Inc.,provides network computing infrastructure solutions that include computer systems, software, storage, and services.

Detroit Engineered Products: a Michigan based engineering consulting and software products firm specializing in the area of Product Development products and solutions.

APTEK Among the software developed APTEK develops and licenses an interactive program for driving LS-DYNA material models - the Mixed Mode Constitutive Driver (MMCD).

PANASAS High performing Parallel Storage for scalable Linux clusters. Delivering exceptional scaling in capacity and performance for High Performance Computing (HPC) organizations.

Intelligent Light is a world leader in the development and delivery of software for computational fluid dynamics (CFD) users. We help the world's best engineering and research organizations maximize the productivity and impact of their CFD capabilities

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Software Distributors

Alphabetical order by Country

Australia	Leading Engineering Analysis Providers
Canada	Metal Forming Analysis Corporation
China	ANSYS China
China	Arup
China	MSC. Software – China
Germany	CAD-FEM
Germany	DynaMore
India	Oasys, Ltd.
India	Altair Engineering India
India	Cranes Software International Limited (CSIL),
Italy	EnginSoft Spa
Japan	The Japan Research Institute
Japan	ITOCHU Techno-Solutions Corporation
Korea	Korean Simulation Technologies
Korea	Theme Engineering

Software Distributors (cont.)

Alphabetical order by Country

Netherlands	Infinite Simulations Systems B.V.
Russia	State Unitary Enterprise - STRELA
Sweden	Engineering Research AB
Taiwan	Flotrend Corporation
USA	Engineering Technology Associates, Inc.
USA	Dynamax
USA	Livermore Software Technology Corp.
USA	APTEK
UK	ARUP

International Consulting and Engineering Services

(continued on next page)

Alphabetical Order By Country

Australia Manly, NSW	Leading Engineering Analysis Providers (LEAP) Greg Horner info@leapaust.com.au 02 8966 7888
Canada Kingston, Ontario	Metal Forming Analysis Corp. Chris Galbraith galb@mfac.com (613) 547-5395
Germany Alzenau	CARHS 49 6023 96 40 60 info@carhs.de
Italy Firenze	EnginSoft Spa info@enginsoft.it 39 055 432010
UK Solihull, West Midlands	ARUP Brian Walker brian.walker@arup.com 44 (0) 121 213 3317

USA Consulting and Engineering Services

(continued)

USA Austin, TX	KBEC L.C Khanh Bui kdbui@sbcglobal.net (512) 363-2739
USA Windsor, CA	SE&CS Len Schwer len@schwer.net (707) 837-0559
USA Troy, MI	Engineering Technology Associates, Inc: (248) 729-3010
USA Corvallis, OR	Predictive Engineering George Laird (1-800) 345-4671 george.laird@predictiveengineering.com
USA Troy, MI	Detroit Engineered Products
USA Troy, MI	Engineering Technology Associates, Inc. (248) 729-3010 sales@eta.com
USA Austin, TX	Friedman Research Corporation (512) 247-2277

Educational & Contributing Participants

Alphabetical Order By Country

China	Dr. Qing Zhou	Tsinghua University
India	Dr. Anindya Deb	Indian Institute of Science
Italy	Professor Gennaro Monacelli	Prode – Elasis & Univ. of Napoli, Frederico II
Russia	Dr. Alexey I. Borovkov	St. Petersburg State Tech. University
USA	Dr. Ted Belytschko	Northwestern University
USA	Dr. David Benson	University of California – San Diego
USA	Dr. Bhavin V. Mehta	Ohio University
USA	Dr. Taylan Altan	The Ohio State U – ERC/NSM
USA	Dr. Ala Tabiei	University of Cincinnati

Informational Websites

The LSTC LS-DYNA Support site: www.dynasupport.com

LSTC/DYNAmore LS-DYNA Support Site	FEA Informationwebsites
LSTC/DYNAmore LS-DYNA Examples (more than 100 Examples)	LS-DYNA Conference Site
TopCrunch – Benchmarks	LS-DYNA Publications to Download On Line
LS-DYNA Publications	LSTC LS-PrePost Tutorials
CADFEM GmbH Portal	