Anniverary Issue

October 2003

Leaders in Cutting Edge Technology
Software, Hardware and Services for The Engineering Community
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Articles

This month we'd like to thank our Major Global Participants starting on page 14. Additionally, on page 12 we've added a section for you to share the URL's of your personal websites to share with the engineering community. Finally we welcome Distributor Participant MSC China and Consulting Participant SE&CS.

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EFILM Delivers Picture-Perfect Movies with SGI® InfiniteStructure™ Solution
Complete Article: http://www.sgi.com/features/2003/aug/efilm/

Recent blockbusters, including the Academy Award®-winning *Frida*, along with *Down with Love*, *Charlie's Angels: Full Throttle*, and *Blue Crush*, are among the first feature films ever to be entirely digitally mastered. The digital masters were created by EFILM LLC, a cutting-edge digital film laboratory in Hollywood, California, which is a subsidiary of Panavision and wholly owned by Panavision and Deluxe Laboratories.

EFILM is using SGI® equipment to create digital intermediates, which include high-resolution scanning, color correction, laser film recording, and video mastering, and to create high-resolution digital distribution masters that can be used for film output, digital cinema releases, and home video/DVD

EFILM President Joe Matza has used SGI computers in the film industry for more than 15 years. He chose the SGI InfiniteStructure solution for EFILM's digital laboratory, which for EFILM includes:

- Three 16-processor SGI® Onyx® 3000 series visualization systems
- HD-GVO (high-definition, graphics-to-video option)
- 30TB of SGI® Total Performance 9400 (TP9400) storage
- Four SGI® Origin® 300 servers
- Thirteen Brocade® Fibre Channel switches
- SGI® CXFS™ shared filesystem

In this configuration, EFILM gains great productivity by sharing files between applications running on different operating systems without replication of data--saving time and money.

Feature Films Go Digital: EFILM delivered the first feature film to be entirely digitally mastered in the United States in 2002. Since then, the company has digitally finished these Hollywood Movies:

- *Charlie's Angels: Full Throttle*
- *Down with Love*
- *Daredevil*
- *Frida*
- *80mile*
- *We Were Soldiers*
- *Blue Crush*
- *25th Hour*
- *Spy Kids 2*
- *Crocodile Hunter*
- *XXX*
- *Intolerable Cruelty*

"Our technology team selected SGI because it's the only supercomputing company that can provide a robust development environment and handle our high-speed data requirements. The graphics

processors in the Onyx 3000 system allow us to display our images at up to 2K resolutions and in real time," says Matza.

"We need to move a lot of data extraordinarily fast to meet our clients' needs. SGI systems, in combination with our proprietary Elab software and hardware, allow EFILM to design and configure multiple systems for multiple tasks. We are not trying to build a single suite but rather multiple systems, each working on a different project with a number of parallel processes all happening at the same time. SGI met the spec we needed."

The most important aspect of digitally mastering feature films with this new technology, according to Matza, is that, "It presents a new visual palette to the director of photography and the director. Primaries, secondaries, multilayered windowing, and a multitude of other powerful visual processes all become part of the tool set for the feature filmmaker. Creatives and producers can now bring better content to the screen. The SGI visualization systems and storage and the fundamental flexibility of the SGI architecture play an important role in helping EFILM make all this happen."

Breaking Digital Ground on *We Were Soldiers*

Last year, using a Silicon Graphics® Onyx2® system and proprietary color-correction software, EFILM became the first digital laboratory in the United States to digitally color-time a film entirely on a computer--Paramount Pictures' *We Were Soldiers*.

"We scanned the film at a true 2K," recalls Matza. "In fact, the film was double oversampled at 4K and then converted to 2K images, which is the best way to actually acquire film images and digitize them. This helps assure higher-quality 2K scans without causing the storage and I/O obstacles that come with working with features scanned at 4K."

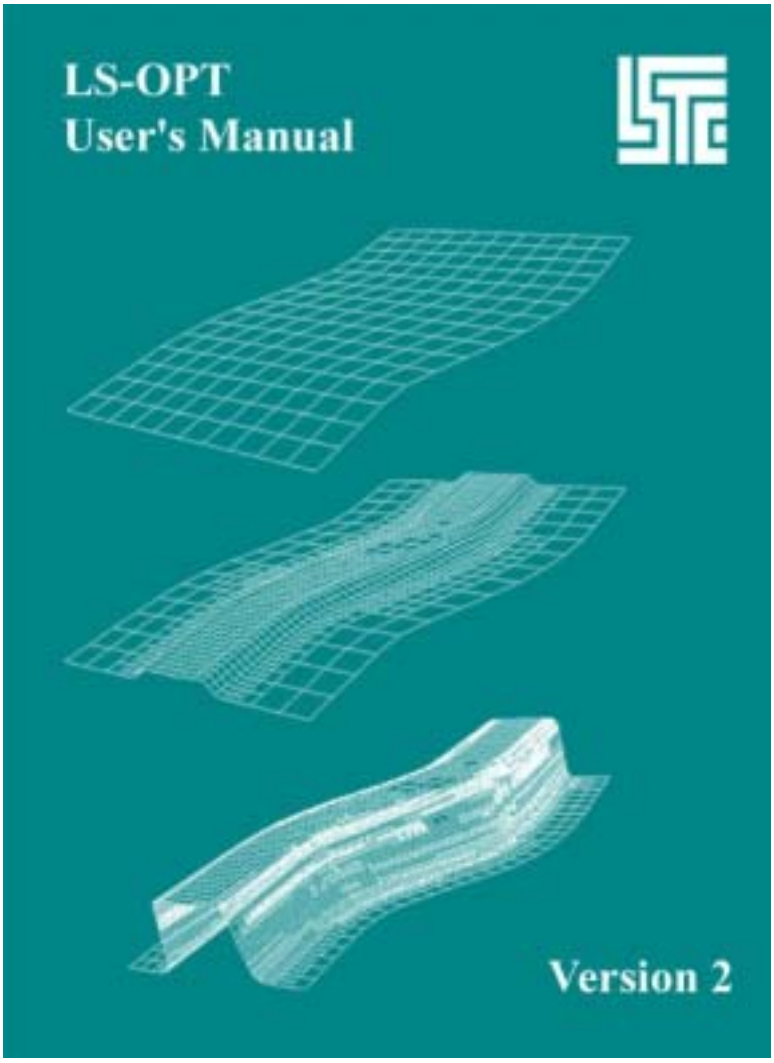
The film was delivered to EFILM as cut negative and then placed onto one of the lab's three IMAGICA® IMAGER XE® scanners. Scanning the film took about five days. The next step was to put the frames on EFILM's proprietary color-timing system, a system designed for supercomputer use that EFILM, in collaboration with ColorFront, has been developing on the SGI® IRIX® OS for more than two years. *We Were Soldiers* Director of Photography Dean Semler worked with EFILM artists to color-time the film, which was then output directly to three Kodak® Estar® negatives.

"It was the first time in the history of the world, I believe, where a digital negative was created onto Estar," says Matza. "From that Estar negative, Deluxe Film Laboratories made first-generation prints for release. And then, finally, we created digital video masters from our 2K files for video release--in HD, NTSC, and PAL--and that was another first."

SGI played an important role, according to Matza. "SGI was very supportive throughout the entire process, and it worked quite well on an Onyx2 system. However, we wanted more flexibility and speed, so we started discussions with SGI on its new Onyx 3000 and SGI Origin 300 systems and high-speed disks. We did a lot of benchmarking and had many discussions, and that has brought us to this powerful new technology that allows filmmakers to much more precisely color-time and finesse their images, do certain types of dissolves, digital opticals, and repositions, and actually create new frames." - "It's an emerging market," Matza concludes. "I don't think there is any doubt that several years down the road most films will be finished in this fashion."

LS-OPT User's Manual Version 2
October, 2003

A Design Optimization and Probabilistic Analysis Tool
For The Engineering Analyst



Preface to Version 2

Version 2 of LS-OPT evolved from Version 1 and differs in many significant regards. These can be summarized as follows:

1. The addition of a mathematical library of expressions for composite functions.

2. The addition of variable screening through the analysis of variance.

3. The expansion of the multidisciplinary design optimization capability of LS-OPT.

4. The expansion of the set of point selection schemes available to the user.

5. The interface to the LS-DYNA binary database.

6. Additional features to facilitate the distribution of simulation runs on a network.

7. The addition of Neural Nets and Kriging as metamodeling techniques.

8. Probabilistic modeling and Monte Carlo simulation. A sequential search method.

As in the past, these developments have been influenced by industrial partners, particularly in the automotive industry. Several developments were also contributed by Nely Fedorova and Sergy Terekhoff of SFTI. Invaluable research contributions have been made by Professor Larsgunnar Nilsson and his group in the Mechanical Engineering Department at Linkoping

University, Sweden and Professor Ken Craig's group in the Department of Mechanical Engineering at the University of Pretoria, South Africa. The authors also wish to give special thanks to Mike Burger at LSTC for setting up further examples for Version 2.

The LS-OPT manual consists of three parts. In the first part, the Theoretical Manual (Chapter 2), the theoretical background is given for the various features in LS-OPT. The next part is the User's Manual (Chapter 4 through 16), which guides the user in the use of LS-OPT*ui*, the graphical user interface. These chapters also describe the commence language syntax. The final part of the manual is the Examples section (Chapter17), where eight examples illustrate the application of LS-OPT to a variety of practical applications. Appendices contain interface features (Appendix A. Appendix B and Appendix C), database file descriptions (Appendix D), a mathematical expression library (Appendix E), advanced theory (Appendix F), a Glossary (Appendix G) and a Quick Reference Manual (Appendix H). Sections containing advanced topics are indicated with an asterisk (*)

Most users will start learning LS-OPT by consulting the User's Manual section beginning with Chapter 4 (The design optimization process). The Theoretical Manual (Chapter 2) serves mainly as in in-depth reference section for the underlying methods. The Examples section is included to demonstrate the features and capabilities and can be read together with Chapters 3 to 14 to help the user to set up a problem formulation. the items in the Appendices are included for reference to detail, while the Quick Reference Manual provides and overview of all the features and command file syntax.

LSTC's Optimization software code is freeware.

To obtain a copy of LS-OPT contact your local distributor or contact sales@lstc.com

Livermore Software Technology Corporation
7374 Las Positas Road
Livermore, California 94550

www.lstc.com
925 449 2500

OASYS LS-DYNA Environment – Arup
www.arup.com/dyna - Application – Metal Forming

In addressing the demand for higher quality products in ever shorter time, designers of sheet metal components have turned to computer-based simulation. The goal is to produce tools which form the product 'right first time'. Simulation was initially used to 'trouble shoot' a production problem but is now being used to design and try out the tools before any metal is cast.

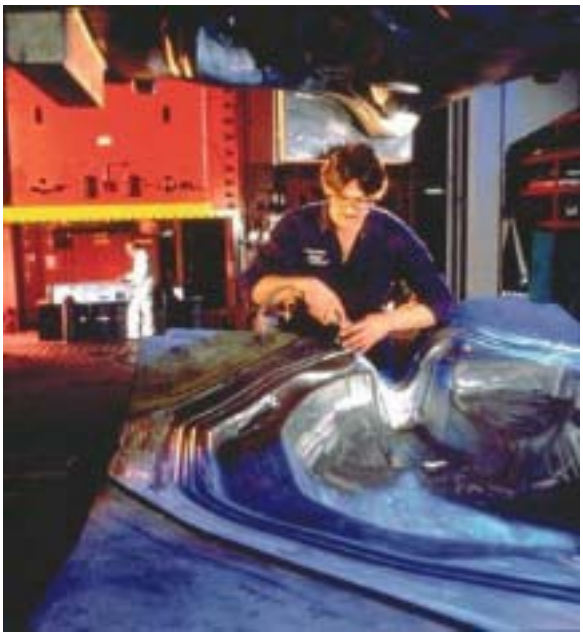


Figure 1. Press Tools can now be analysed before manufacture, eliminating the trial and error approach

LS-DYNA has been used for sheet metal stamping simulation since the late 1980s and can be used to assess a proposed forming process and tool design. Assessment includes not only formability, ie splitting or wrinkling, but also quality, ie impact line location, movement of features, springback and surface conditions such as 'teddy bear's ears'. Complex forming sequences with multiple operations including trimming can be analysed. Simulation allows the designer not only to confirm formability but also to optimise the process, examining different materials, blank shapes, tool loads, lubrication, drawbeads,etc.

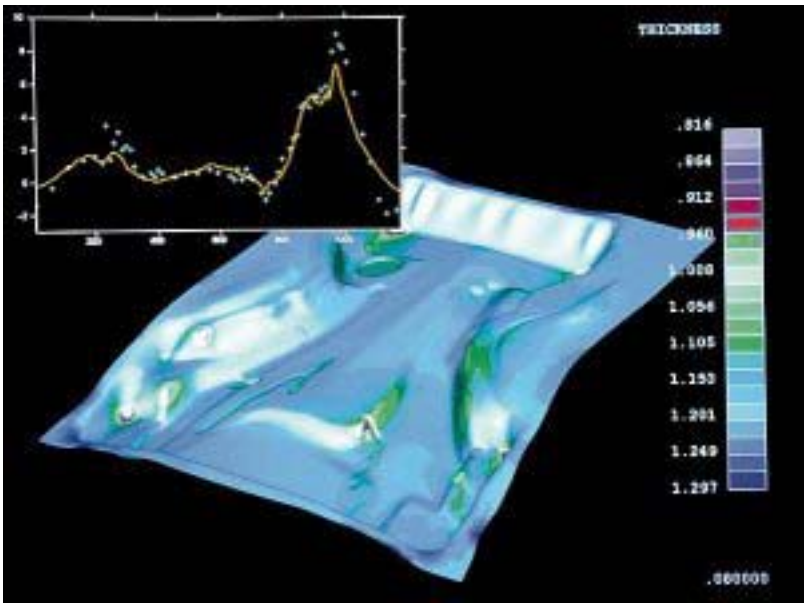


Figure 2. Thickness distribution from LS-DYNA, with prediction compared against measurement

Forming processes within the scope of LS-DYNA simulation include rigid tool stretch and draw forming (with multiple tool action), sheet and tube hydroforming (including bending operations), flex forming, roll forming and superplastic forming. LS-DYNA simulation can equally be applied to bulk forming problems such as rolling, forging and casting. Forming results can be coupled with structural analysis to see the true response of the component, accounting for thickness, stress and strain variations from forming.

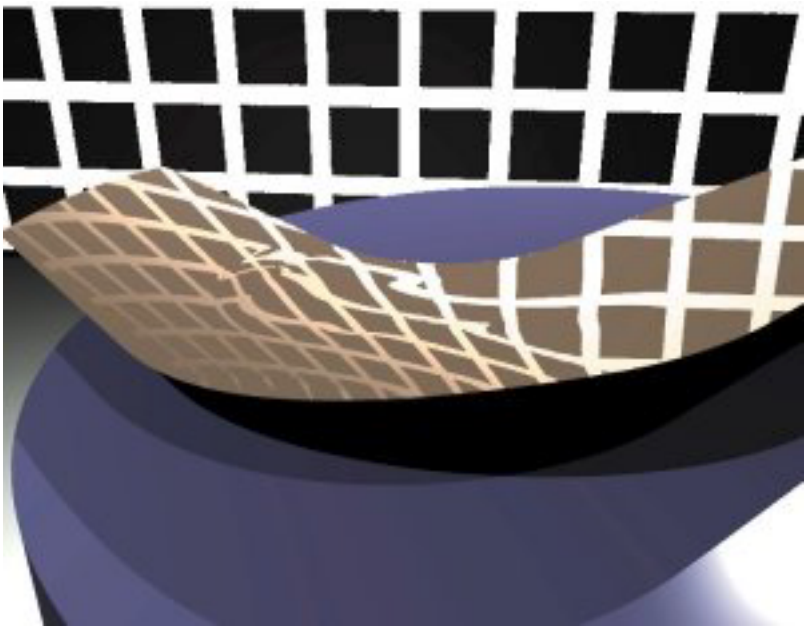


Figure 3. Visualization of “teddy bear’s ears” around a sunroof opening predicted by Arup Software

Oasys (Ove Arup SYStems) is the software house of Arup and is the distributor of LS-DYNA in the United Kingdom and Ireland. +44 (0) 121 213 3399 - dyna.sales@arup.com

Oasys and Arup have been distributing and working with LS-DYNA for over fifteen years. Oasys markets its own peripheral software, OASYS ***PRIMER***, ***D3PLOT*** and ***T/HIS*** that is fully compatible with LS-DYNA aiding speed of model preparation and interpretation of results.

Markets engineering software products developed to the exacting standards of Ove Arup & Partners. Consulting engineers, planners and project managers working in all areas of the built environment. Headquartered in the UK

Numerical Modelling of Impacts on Ski Safety Nets

Publication presented at the 4th European LS-DYNA Users Conference, 2003
Melissa Adoum, CRIL Technology Melissa.adoum@criltechnology.com

Safety nets are used to protect skiers during downhill competitions. However, although these nets are now able to retain skiers in almost all cases, the deceleration during such impacts can cause severe harm to skiers including hyperflexion injury or vertebra compaction.

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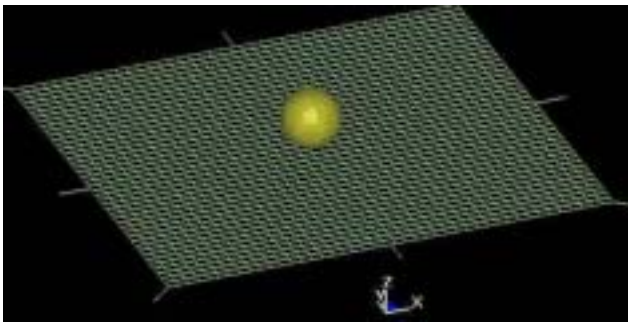
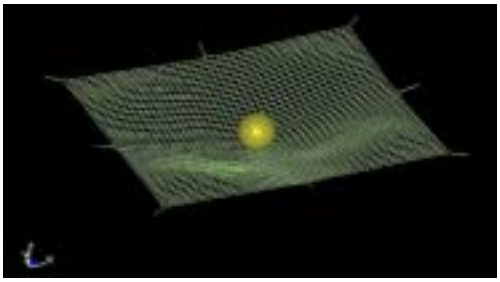
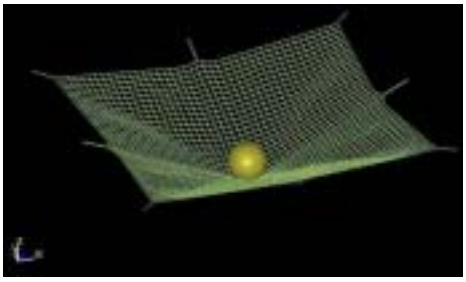


Square Net with Tightener, 4.43 m/s Time = 0



Square Net with Tightener, 4.43 m/s Time 80.997



Square Net with Tightener, 4.43 m/s Time = 261

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Personal Websites of Interest

Marsha Victory FEA Information Inc.	horse rescue	www.livermorehorses.com
Len Schwer SE&CS	travel diaries -photos	www.schwer.net/LenSchwer/
Ray Jurevicius Jurevicius Engineering, Inc	Miscellaneous details about binoculars made from two 8" f/6.3 Newtonian telescopes.	www.j-engineering.com/ATM
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Events & Courses from the Events page on www.feainformation.com

2003		
Oct 29-31	Testing Expo North America	USA
Nov 11	LS-DYNA Update Forum from DYNAmore (free of charge)	Germany
Nov 12 –14	CAD-FEM User Conference	Germany
Nov 18-19	MSC. Software Virtual Product Development Conf.	UK
2004		
May 2-3	8th International LS-DYNA Users Conference	USA
May 10-12	Optimization Technology Meeting	USA
May 24-26	ANSYS Users Conference & Exhibition	USA

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