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FEA Not To Miss Town

Software & Engineering Solutions

Town Hall Meeting, Blog & Gossip

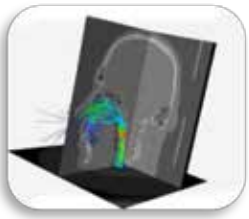
AEROSPACE - Lockheed

ANSYS

AUTOMOTIVE - Ford

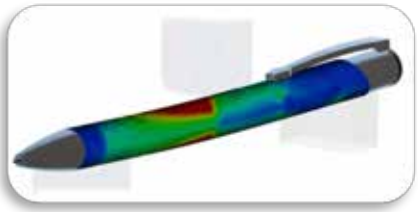
CADFEM

CADFEM Medical



DYNAmore Germany

DYNAmore Nordic



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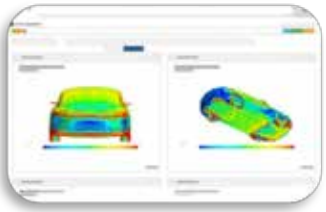

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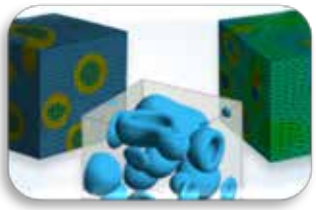
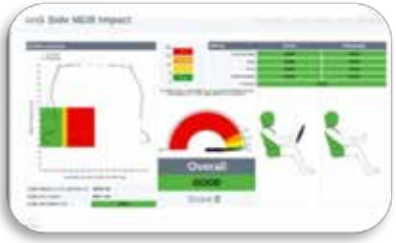


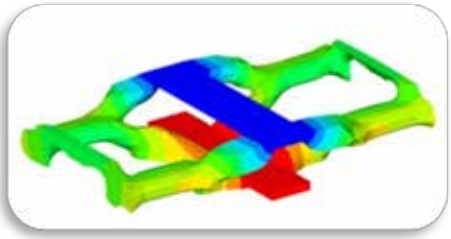
LLNL

MSC - Hexagon

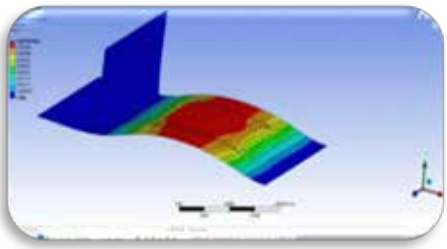
OASYS



OmniQuest



OZEN



Booth - Protect your melon

Free publication & independently owned

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Goal

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After that, going forward from the email's receipt, content (excluding that found on Twitter, Linkedin, YouTube, FaceBook and other social media) will not be included.

Editors: **(alpha order) Anthony, Art, Marnie, Marsha, Yanhua**

Town Pretend to be Editors

The Old Cattle Rancher - No one in town knows his name. You yell "Hey, Old Rancher."
The Old Retired Pilot - No one in town knows his name. You yell "Hey, Old Pilot."
The Old Retired Racer - No one in town knows his name. You yell "Hey, Old Racer."
They are all brothers - strange family

Contact us at feaanswer@aol.com

Map Vector & town graphics in our magazine are courtesy of vecteezy

Table of contents

Author and/or person using social media, or information from the company website

The websites used will have the complete articles, and higher resolution graphics/videos.

MAY

Automotive and/or Racing Information

Airport - Aerospace

Town Announcements will be in this style box.

Thanks to Vecteezy for our **Map Vector/town and many of the graphics in our magazine**

Table of contents

Research Hospital

Town Library - Periodicals & Special Class Announcements

Old Cattle Rancher

FEANTM website what you missed

Town Hall

Convention Center Booths

Monthly town hall meeting. Serving - coffee & Pretzels

Our town comprises companies, engineers, scientists, mathematicians, universities, professors, students, consultants, and individuals interested in software, hardware, and solutions.

Gossip at the local coffee shop, and your pets are welcome. (Small pets, horses stay outside!)

Town secretary special hello wave: Abdullah, Brett, Esref, Ferhat, Jenson, Kensington, Marisa, Marta, Mustafa, Nicole, Rasmus, Rheannon

1. **We have added LLNL (Lawrence Livermore National Lab) to our town map - LLNL is important to our town and the LS-DYNA history. See Page 21**
2. **Our Convention Center added personal booths in alpha order. This month we have Ameen, Curt, Jenson, Kathleen, Marisa, Rasmus, Tarik**

As presiding town Supervisor, I call this meeting to order:
I appreciate the town and guests approving the purchase of a new bicycle helmet for the Town Secretary
1. Does anyone know why she purchased a combat helmet?
2. She advised us that she would provide research to prove she needs a combat helmet.
3. Repeatedly throwing her bicycle helmet against the Town Hall does not constitute a blast scenario.
4. She missed the wall and threw it through my glass window.
5. Call the building dept. to repair my window - Return the helmet to the Town Secretary.

See Research Hospital - Protective Performance of Helmets and Goggles in Mitigating Brain Biomechanical Response to Primary Blast Exposure

Our town information clerk had a purchase order from the K-9 unit for dog bones
1. The old pilot found the order and then crossed off "b" in bones and added "dr" - it then spelled Drones
2. We had combat drones delivered! NO, the K-9 dogs can't exercise by chasing drones!
3. We denied drone combat games at the airport - donate them to their respective military.
4. Please stop flying a drone past my window. There isn't anything called dog drones for exercise.
5. No, the town secretary can't keep one for deliveries - NO, I'm not chasing one for exercise!!!!!

See Airport - 3 ordered drones being donated.

Town Residents voted - make sure you don't miss the following

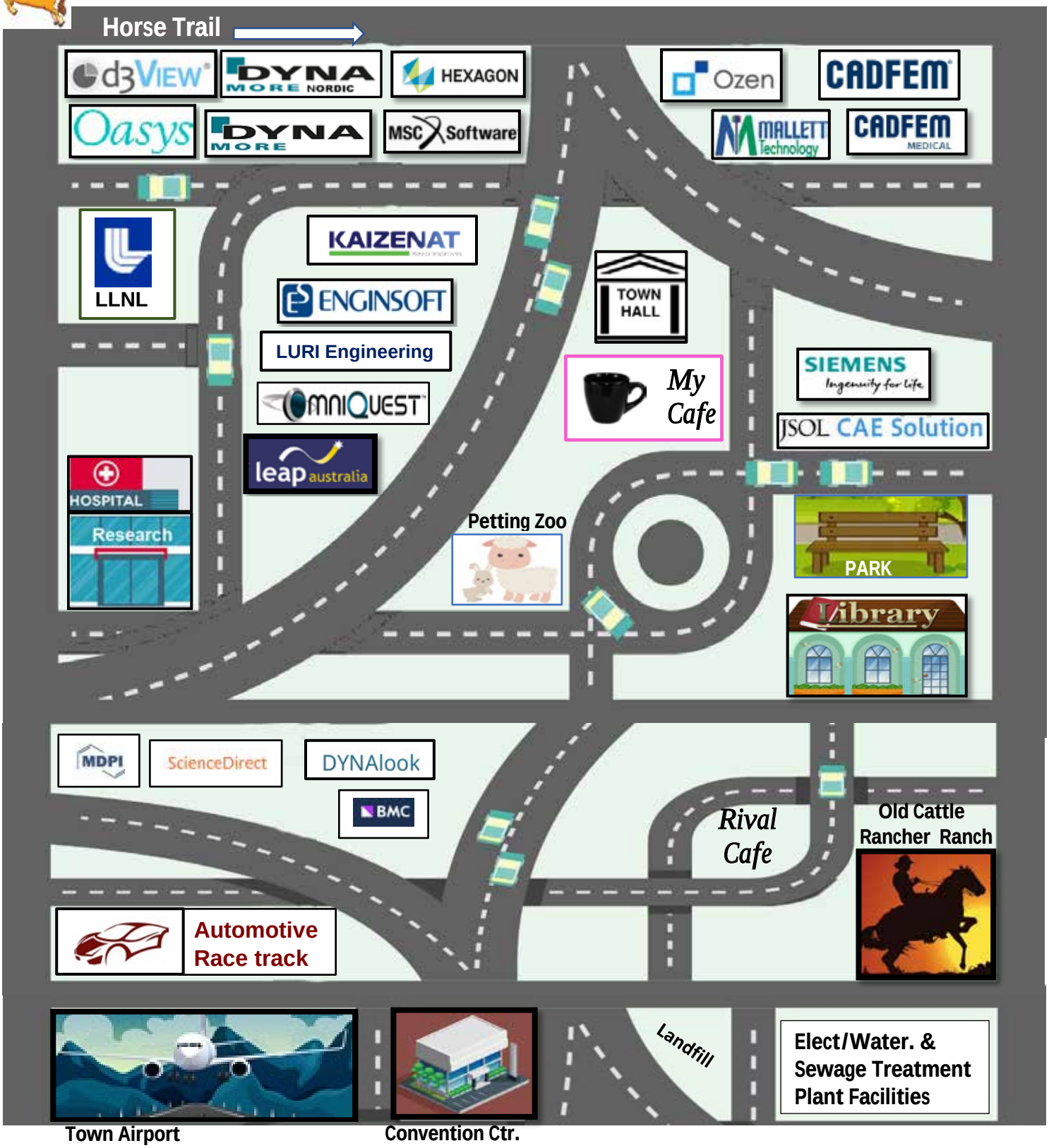
May 17-20
Crash Analysis

June 01
CADFEM Ansys Simulation Conf

June 20-23
Hexagon Live Global

June 22
Ansys & DYNAmore Hybrid Infoday Battery Simulation

Town Map



* **The logos displayed, of content in our magazine, do not represent their endorsement.**
* **To be removed, please notify feaanswer@aol.com with the request.**
* **Your town lot will be auctioned, with the Town applying all proceeds to the coffee budget.**
* **The town map changes pending information, and rotational building rentals.**

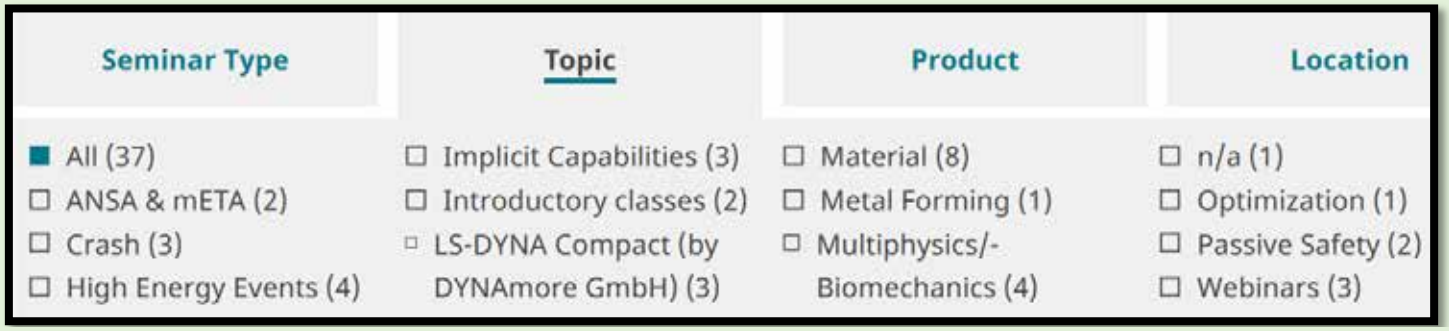
We welcome Rasmus Schutzer to our town meeting for a Meet & Greet with our town residents.

Did you know that DYNAmore Nordic AB is dedicated to supporting engineers solving non-linear mechanical problems numerically? Our main focuses are: Support, sales, training, engineering services and software development. We are your first choice for pilot and development projects concerned with the simulation of non-linear dynamic problems.

Among the products we offer you:

- **LS-DYNA** - The general-purpose, implicit and explicit FEM software LS-DYNA is one of the most advanced simulation tools for nonlinear structural analysis!
- **Models** - To assess a vehicle, tests are carried out under comparable conditions. For this purpose, accurately specified barrier and dummies are used as test devices. DYNAmore develops and distributes the FE models of these test devices.
- **Pre- and Postprocessing** - On the website you will find all information about our pre- and postprocessors LS-PrePost, PRIMER and DYNAform.
- **Optimization** - Multiple tools for optimization and stochastic analysis from stand-alone software able to be linked to any simulation code up to complete software packages and postprocessors in non-linear finite element applications and design optimization capabilities.
- **Process Chain:**
  DIGIMAT is a state-of-the-art nonlinear multi-scale material & structure modeling platform, which helps engineers to design and optimize composite materials in a fast and cost-effective way.
  Envyo is a multi-purpose mapping tool dedicated to LS-DYNA. It allows for the transfer and manipulation of simulation result data between differently discretized meshes and from different solvers to a LS-DYNA specific input format.
- **Simulation Data Management** - SCALE.sdm is an integrative software solution for continuous simulation data and process management. The modules Status.E (SCALE.project), LoCo (SCALE.model) and CAViT (SCALE.result) combined form a powerful system solution for virtual product development.
- **Material Card**s - In cooperation with the Austrian steel producer voestalpine, DYNAmore has created a material database for over 60 different steel types for metal forming simulations.
- **DynaXtend** - More LS-DYNA analysis power - maximum flexibility. Bookable at any time!

Training - All our trainings you may attend either on site or online. In the "Comment" field in your course registration you can specify if you prefer to take part on site or online. Among the topics offered:



Flag video can be viewed on the website blog

How Fluid-Structure Interaction Works and Why it's Important - What is Fluid-Structure Interaction?

Authors: Marisa Melchiorre & Steve Defibaugh

Fluid-structure interaction (FSI) is the interaction of a fluid flow with a solid structure. Think of a wind gust rotating a turbine blade, a boat hull under wavy conditions, or the air rushing over the front panel of an F1 car. Anywhere a fluid and structure meet, FSI occurs.

Ansys Fluent and Ansys Mechanical can be coupled to simulate fluid-structure interaction, like the above Ansys flag flying in the wind.

How can FSI Affect Product Design and Performance?

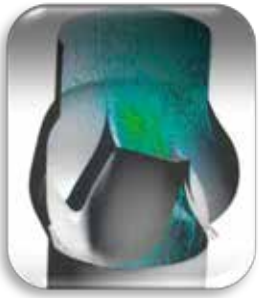
Understanding FSI is critical for the design of many products. Not accounting for the effect of a fluid on a solid or vice versa can result in overestimating or underestimating product performance. Consequently, the end product design may lead to unexpected and undesirable outcomes, ranging from bothersome noises to complete product failure.

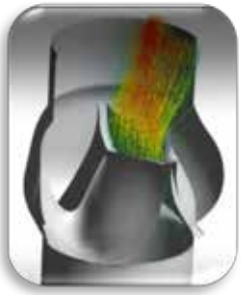
Whether you're designing a bridge, aircraft, or gas turbine, understanding how the interaction of fluids and structures impacts your project requires a solution that accurately predicts and integrates both behaviors.

Applications of FSI

Designing aircraft: As a plane flies, airflow around the wing causes the wing to deform (which, in turn, changes the way the air flows, altering the wing even more).

Solving the FSI in wing design dramatically increases the aerodynamic performance of the aircraft.





Modeling blood flow: To evaluate the effects of blocked blood vessels in aneurysms, FSI accounts for how blood pressure and flow velocity influence a vessel's ability to stretch and change in size.

Predicting sound: When air flows pass over a car, surfaces like the hood and side mirrors can vibrate and radiate sound into the interior. By addressing these FSIs, engineers can adjust the design to reduce noise and increase passenger comfort.

The Role of Multiphysics Simulation in FSI

Before an FSI has the chance to compromise your product, you can predict and prevent it through multiphysics simulation.

For example, if you wanted to see how turbulence and pressure changes might affect the integrity of a hydropower turbine, your analysis would include data provided by both Ansys Fluent and Ansys Mechanical simulations. When used independently, these simulations tell you one story at a time. But **when integrated through Ansys Workbench, you'll see the most accurate prediction of how the two physics impact each other.**

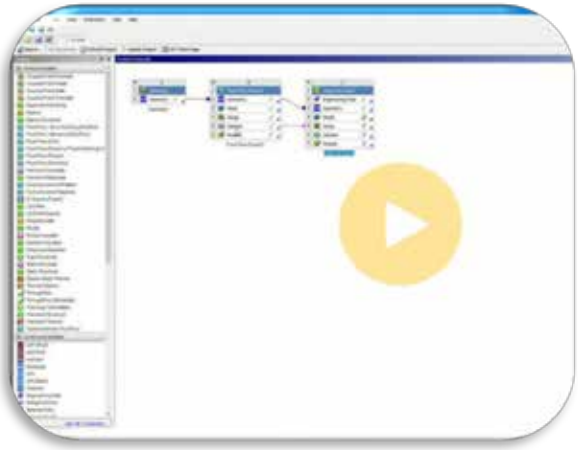
Workbench automatically exchanges data between simulation solvers, giving you one seamless workspace from which to navigate.

The advanced mesh mapping technology in Workbench ensures data is translated precisely from computational fluid dynamic (CFD) to finite element analysis (FEA) and back without the need to input data manually, write code, or exchange data files. This reduction in manual inputs significantly decreases errors because you set up the CFD and FEA simulations, drag and drop, and everything is transferred into one space.

Do you Need a One-way or Two-way FSI Simulation? Modeling approaches can vary depending on the degree of physical coupling between the fluid and solid and the level of fidelity needed. For applications involving rigid body motion and conjugate heat transfer, deformations can be neglected, and the problem can be efficiently solved entirely within the CFD solver.

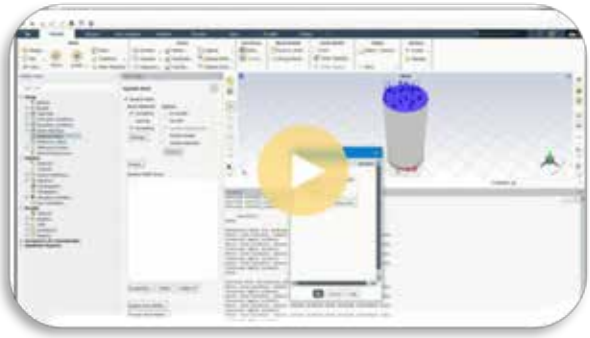
When stresses and deformations must be accounted for, the fluid and structural simulations are coupled to transfer data between the solvers for either a one-way or two-way coupled simulation.

Related Content: The Fundamentals of FEA Meshing for Structural Analysis
How to Perform a One-way FSI Simulation



One-way simulations are easily performed in Workbench by directly linking your CFD and FEA simulations. This is done through a simple drag-and-drop task that automatically connects your simulation's geometry and solution cells.

How to Perform a Two-way FSI Simulation - Two-way simulations are executed by linking your CFD and FEA simulations with System Coupling. This video creates a one-way simulation in Fluent, then transforms into a two-way simulation with Mechanical via Workbench. The two-way data exchange made possible through Workbench creates a simultaneous and straightforward simulation.



Video can be played on website

Use FSI to Predict and Prevent - FSI simulations help engineers prevent damage that can affect performance and lead to product failure by predicting interactions between fluid flows and solid structures.

Marisa Melchiorre, Manager Product Marketing, Ansys

Marisa leads marketing plans across multiple products in the Structures Business Unit, including Ansys Mechanical. She is responsible for marketing collateral, social media content, marketing messaging, customer and partner marketing collaborations and product messaging strategy to promote and sell Ansys solutions within our customer segments.

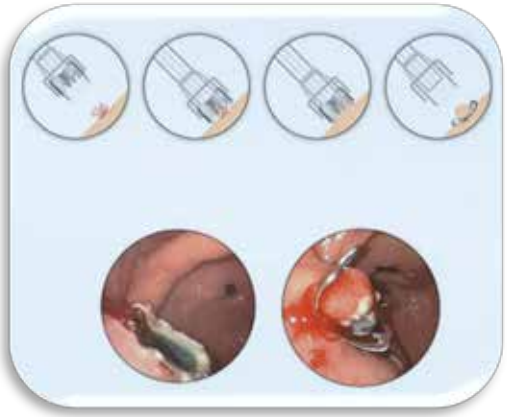
Steve Defibaugh, Product Marketing Manager, Ansys

Ovesco Endoscopy AG - Structural mechanical analysis for superelastic clips An analysis workflow can significantly improve the development process of new nitinol clip systems.

Ovesco Endoscopy AG specializes in medical products for flexible endoscopy and endoluminal surgery. Its innovative main products include endoscopic clip systems (OTSC: Over The Scope Clip) made of Nitinol. To save expensive prototypes, an analysis workflow has been set up.

Branch: Medical technology
Specialist field: Structural mechanics

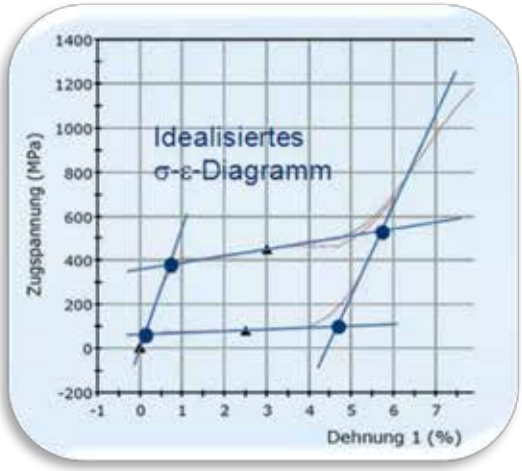
Task	**Solution**	**Customer benefits**
The special functions and therapeutic effects are based on the special material and design properties of the OTSC system. The superelastic nitinol used is bio- and MRI-compatible and therefore also suitable for remaining in the body as a long-term implant. Nitinol prototypes, however, are expensive and time-consuming to produce.	The Nitinol material properties were mapped with the material law available in Ansys Mechanical and used to determine the assembly and extraction forces. By varying the design, the material characteristics or even the coefficients of friction, different assembly and application scenarios can be analyzed.	With the analysis workflow now available, the development process of new clip systems can be significantly improved and made more efficient.



Clip application procedure for hemostasis

Project Details - Task

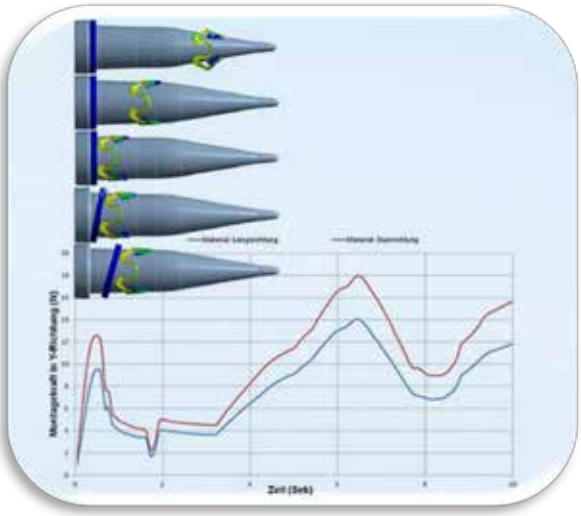
Ovesco Endoscopy AG specializes in medical products for flexible endoscopy and endoluminal surgery. Its innovative main products include endoscopic clip systems (OTSC: Over The Scope Clip) for the treatment of gastrointestinal bleeding and for endoscopic wall closure in the digestive tract. The special functions and therapeutic effects are based on the special material and design properties of the OTSC system. The superelastic nitinol used is bio- and MRI-compatible and thus also suitable for remaining in the body as a long-term implant. Especially the mounting of the clip in the endoscopy system as well as the application of the clip on the tissue require the highest mechanical reliability to avoid inconvenience during the surgical procedure on the patient.



Stress-strain curve of superelastic Nitinol with elastic strains of up to 5 percent.

Solution

Due to its special properties as a shape memory alloy, nitinol is often used in surgical medical technology. In addition to the special characteristic of "remembering the initial state", this metal is distinguished above all by its super-elastic behaviour. As a result, high elastic strains can be endured without permanent deformation. This material property was mapped with the material law available in Ansys Mechanical and used to determine the assembly and extraction forces. By variation of the constructional design, the material characteristics or also the coefficients of friction between contact pairs, different assembly and application scenarios can be analyzed within the scope of a nonlinear static calculation. The model creation and analysis was carried out as a pilot project as an introduction to simulation while accompanying the development of the design.



Customer Benefit - With the analysis workflow now available, the development process of new clip systems can be significantly improved.

- Shorter development time: Quick information on important questions regarding clamping, actuating and clamping force.
- Cost reduction: Saving of expensive prototypes with high-quality and expensive material (Nitinol).
- Reliability: Greater fault tolerance when applying the clip due to a more robust design and thus greater reliability in operative use.

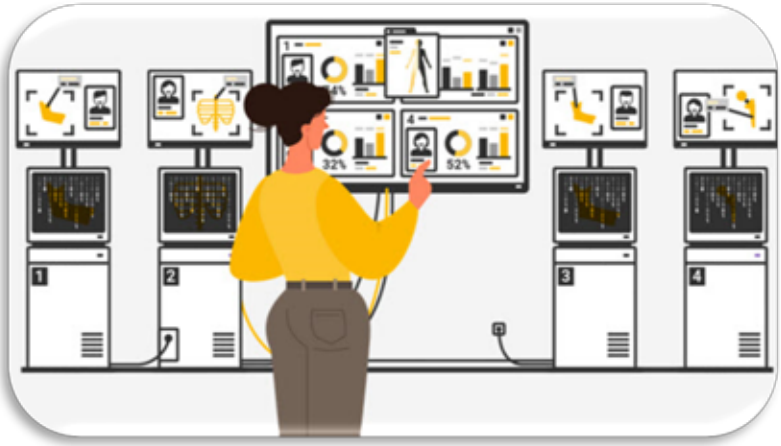
Simulation of the assembly and actuation process (top)
and force-time curves for different material characteristics (bottom).

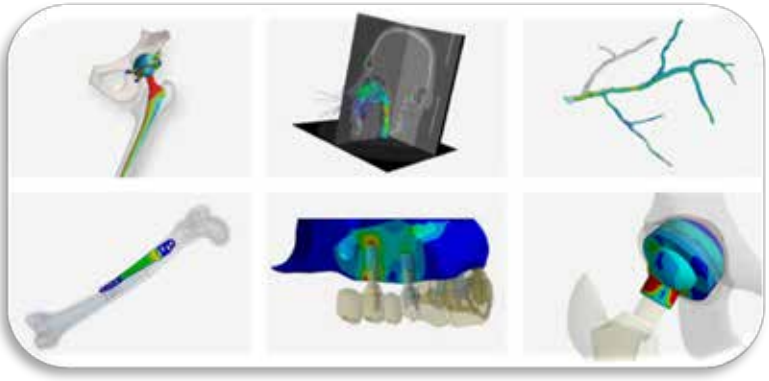
DEPUTY HEAD OF TECHNOLOGY

Fendy Kumala

fkumala@cadfem.de

CADFEM Medical makes complex physical simulations easily accessible and opens up new possibilities for personalized treatment of your patients. Benefit from our strong partners and more than 35 years of experience in the simulation world.





Our offer to you

- In silico trials on the behavior of implant systems in situ under biomechanical boundary conditions
- Preliminary studies with simulations for clinical trial designs and ex-vivo or in vitro studies
- Support for clinically relevant questions
- Design optimization of patient-specific implants under biomechanical conditions
- Development of physiologically-motivated performance criteria for medical devices
- Project work and simulation support on the mechanical behavior of biological structures and systems

Tailored simulation for Patient-Specific Simulation

We simulate for you how your implant behaves in a patient's body.

We simulate for you how your implant behaves in a patient's body.

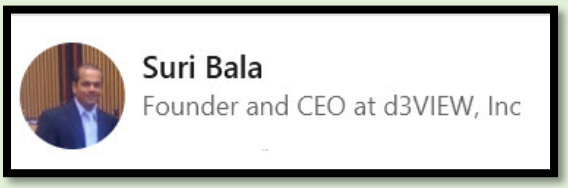
Benefits for you

- Better understanding of the implant behavior in a patient's body
- Efficient evaluation and verification of patient-specific implants
- Cost and time reduction due to in silico rather than in vivo trials

Individual implants for all

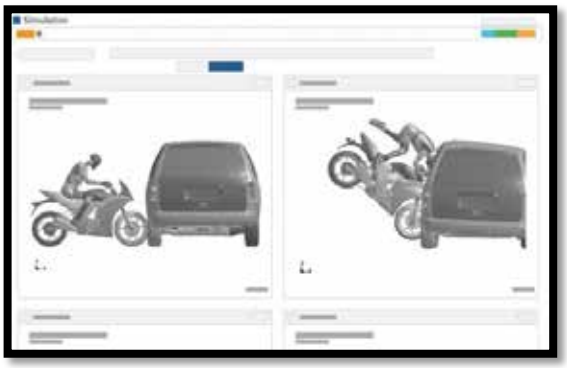
The understanding of how biological structures behave under stress in a healthy and pathological state is growing day by day. With the help of state-of-the-art simulation techniques, the behavior of implants in interaction with the human body can thus be reproduced in silico.

In contrast to common in vivo or in vitro methods, patient-specific simulation enables the possible effects of a medical intervention to be shown individually for each patient. Additive manufacturing techniques also make it possible to use patient-specific implants. With numerical simulation, their safety and quality can be efficiently checked and verified.

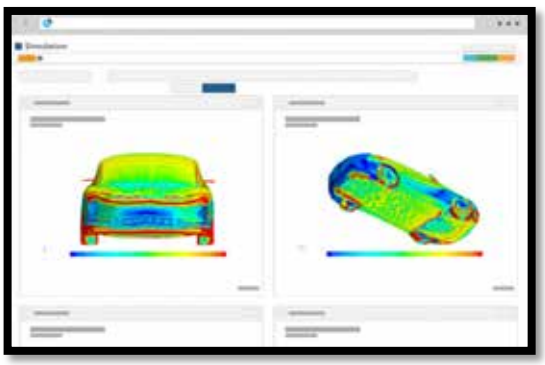


"Did you know that d3VIEW offers you a Comprehensive Application for Smooth Simulation Management. You can redefine the way you manage your simulations. Our simulation application infuses simulation data, information and visualizations into a comprehensive, interactive viewing window. While the simulations are solving, you can monitor them, interact with them using live preview and explore visualized critical information. You can perform DOEs, or run optimization using a single interface."

Simulation Data Visualization



Simulation Results Visualization



Multi-Physics Visualization

Simulation Details

- View the details of your simulations in real-time.
- Visualize different elements of the running job such as energy balance, minimum time-step history and time remaining for completion.
- Simulation details also provides the ability to discover and eliminate any abnormalities before the simulation finishes.

HPC Jobs

- Conveniently review specified HPC job configurations as well as submission history.
- Find information such as the submission node or the number of CPUs effortlessly, so you can compare and guide the submissions of new simulations.

Simulation Files

- Readily manage and share your simulation files.
- You can add more files related to your simulation or use the built-in data viewer to deeply study them.
- Simulation Responses
- Examine your simulation data outputs, overlay curve responses and, in accordance with our Peacock Application, view default animations.
- With extensive data extraction capabilities from templates, you can extract information from a variety of data formats using an intuitive web interface.

Fine-Tune and Accelerate Your Problem-Solving

- As scientists and engineers, we all the know the importance simulations have in solving complex real-world problems safely and accurately, making information conveyable for better decision-making.
- This is why efficient simulation management is so beneficial and why employing the Simulations application will help you accomplish your business goals with speed and ease.

[The 16th German LS-DYNA Forum will take place from October 11-13, 2022 in Bamberg and online.]

Ansys and DYNAmore cordially invite all LS-DYNA users to the 16th LS-DYNA Forum in Bamberg, Germany.

Like last year it will be a hybrid event. The online conference will take place on October 12 & 13.

ORGANIZERS:

With approximately 100 technical presentations, keynotes from renowned speakers and an accompanying hardware and software exhibition, the forum is the main event dedicated to LS-DYNA in Central Europe.

Special feature of the forum: Presenters can present in English or in German.
New: You can optionally submit your abstract for the Ansys "Level-up 3.0" online conference.
Simply click on the corresponding box when submitting.

Bamberg's Old Town has been on the UNESCO World Heritage List since 1993. The city grew continuously around a medieval core and today has one of the largest unspoiled old town centers in Europe.

Schedule 2022

- Monday, 10 Oct. from 6 p.m.
  Get together in the exhibition and conference registration
- Tuesday, 11 Oct. from 8 a.m.
  Start of the conference
- Tuesday, 11 Oct. from 8 p.m.
  Gala Dinner
- Wednesday, 12 Oct. from 8:30 a.m.
  Second conference day
- Wednesday, 12 Oct.
  Day 1 Online Conference
- Thursday, 13 Oct.
  Day 2 Online Conference

Thank you, Rasmus, Anders and Mikael for assisting the FEA community.

With LS-DYNA it is often sufficient to build only one finite element model, a so-called virtual prototype, of the fully assembled product and use it for all load cases. A one model strategy can save both a lot of time as well as increase the accuracy of the results.

Virtual prototype

Case study: From CAD to a fully functional virtual prototype

Creating a virtual prototype

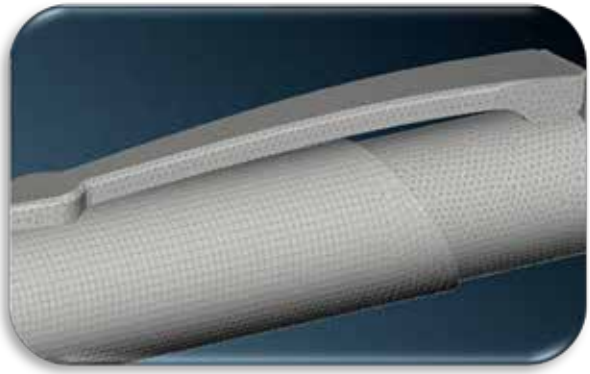
Due to technical limitations, finite element simulations are often performed only on the most critical component or subsystem for each load case. This can lead to a collection of specialized finite element models for the same product.

Here we will demonstrate how one single LS-DYNA virtual prototype can be used for several load cases, by creating a virtual prototype of a pen with all its mechanisms.

Why virtual prototypes? The LS-DYNA software is a leader in the race for simulation to match testing, and for many applications, LS-DYNA can today produce truly lifelike simulations. Even though advances in numerical solution techniques have made physically realistic simulations possible, why should one bother? There are several good reasons why customers use virtual prototypes, and the most common we encounter in our daily work with customers are:

- to detect serious design flaws early, i.e. before costly testing of prototypes/production
- to quickly guide the designers in the right direction to fulfill the design requirements
- to reduce the number of prototypes
- to reduce time to market
- to optimize performance

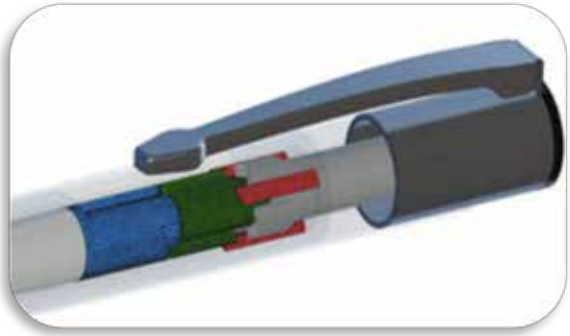
From CAD to virtual prototype Building a virtual prototype starts with a CAD drawing. The CAD is then converted to a finite element model in the preprocessor. In the preprocessor, it is possible to remove small design features, so-called defeaturing, that will not influence the product's structural response. Defeaturing simplifies the model and decreases the simulation run time on the computer.

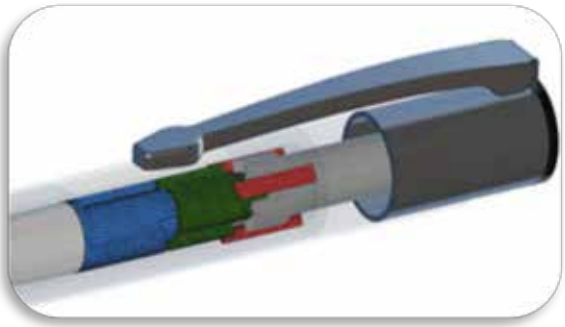


Here we used the preprocessor ANSA to create the finite element model mesh of a pen and then prepare the model for simulation in LS-DYNA. ANSA is a complete solution covering all steps from CAD to the ready-to-run solver input file for LS-DYNA. ANSA can automatically defeature the model and has many options when it comes to meshing the model. Most of the preprocessing steps in ANSA can also be automated, a real time-saver, especially for repeated simulations of similar products.

One model – Many load cases - All the pen components are included in the finite element model – it is a true virtual prototype that can be used for all the load cases described below and many more.

Please view pen movements on the website





Load case 1: Normal use of the pen -

The first load case simulates the pen mechanism. This analysis utilizes LS-DYNAs easy to use automatic all-to-all contact algorithm that is capable of handling the sliding behavior over sharp edges between the parts. The model is also initialized with the correct pre-tensioning of the springs in the mechanism.

Load case 2: Bending stiffness - a measure of quality

With a three-point bending test, we can simulate the pen's bending stiffness – a stiff pen feels solid, which is a sign of quality. This simulation is a static load case, and we have added supports and a punch to simulate the correct test setup.

Load case 3: Drop test - overload/abuse

Finally, the pen model is used to simulate a highly dynamic load case. The drop test is a typical load case to check that the product's structural integrity is up to par. An initial velocity is applied to the pen, and we simulate the impact on a rigid surface.

To learn more: Simulations have time and again proven to be a cost-effective product development tool that avoids costly product redesign. We have the software and knowledge required so that you may learn to perform these simulations yourself. We will guide you all the way, including training and support. To learn more, please contact one of our technical experts listed on this page.

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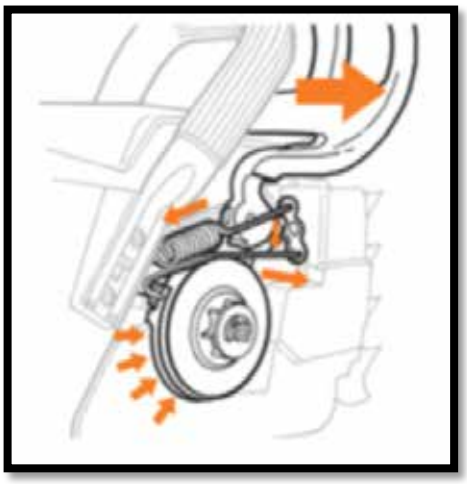
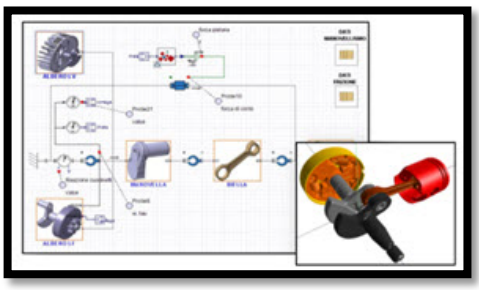
Maximising chainsaw safety over the tool's life by analysing the kickback problem and lifetime tool fatigue and performance

ABSTRACT - The avoidance or reduction of chainsaw kickback is a key safety feature for manufacturers. The challenges for engineers are to obtain more accurate analyses of the problem over the tool's lifecycle, improve post processing analyses and then to validate the analyses experimentally.

In this technical article, EnginSoft and chainsaw manufacturer Emak explain how they used the advanced system modeling capabilities of the MapleSoft products (Maple and MapleSim) to determine maximum chainsaw system performance, detect performance issues early, manage multiple engineering domains and improve pre- and post-processing analyses, before conducting structural analysis and experimental validation with ANSYS Mechanical Workbench 18.



Chain Break in detail



Engine Model in MapleSim and Model in ANSYS WB

Solving the chainsaw kickback problem with Maplesoft and ANSYS

The article describes the various phases of the workflow process adopted by the engineers in the modeling process, from the creation of the initial model, the mathematical and physics analyses that they conducted, to the analyses of the results obtained, the DOE verification process and finally the experimental validation of their findings.

The use of the MapleSoft and ANSYS software in combination allowed the engineers to drastically reduce trial time and fine-tuning, while also saving time on data interpretation and mathematical analysis in order to improve chainsaw performance, minimising damage and fatigue over the product life to increase chainsaw safety for operators

The Emak Group operates worldwide, handling distribution in Italy and in another ten foreign markets - USA, France, Germany, UK, Spain, Poland, Ukraine, China, South Africa, Chile and Brazil - through subsidiary companies, offering a vast assortment of products with recognized brands and addressing a highly diversified customer target group. Emak products address gardening and forestry duties and agriculture such as brushcutters, lawnmowers, garden tractors, chainsaws, rotary tillers and motor hoes. Emak also produce diaphragm pumps for the agricultural sector (irrigation and spraying), piston pumps for the industrial sector, professional high-pressure washers, hydrodynamic units, and urban cleaning machines.

The Chainsaw kickback problem - Chainsaws is one of the flagship products from Emak. It incorporates numerous safety features common to many engine-driven power tools. Manufacturers have introduced numerous design features to improve safety. Some features have become de factor standards, and others are legal requirements in particular jurisdictions. Best practice dictates that an operator should inspect the saw before starting work and only operate the saw if all the safety features are properly functional. Additional safety features provide a significant commercial advantage to chainsaw producers. Most chainsaw safety features are focused on the kickback problem, and seek to either avoid it (chain and bar design), or to reduce the risk of injury should it occur (chain brakes). Especially, the chain brake ensures maximum safety in using the chainsaw. It protects the operator from dangerous kickbacks which can occur during working phases. It is actuated, with consequent instant locking of the chain, when the operator presses the lever or automatically by inertia when the protection is pushed forward in the event of sudden kickback.

Modeling and optimization using Maplesoft + ANSYS
The main challenges can be summarized into three main questions that Emak want to answer:

- How to get more accurate analyses?
- How to improve post-processing analyses?
- How to validate analyses experimentally?

To answer questions 1 and 2, the Emak team needed a software solution that could provide an advanced system level modeling to maximize system performance, detect performance issues at an early stage, handle multiple engineering domains and improve pre and post processing analyses. Emak discovered in MapleSoft products, Maple and MapleSim, the perfect pairing to perform these tasks.

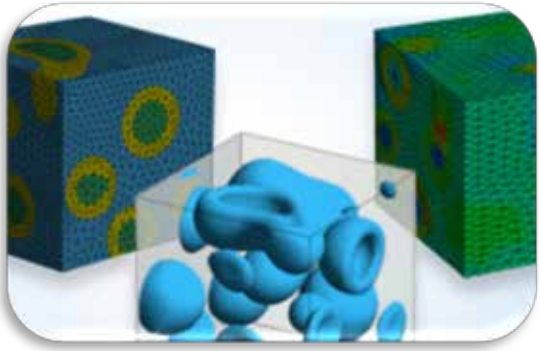
T**o answer to question 3**, ANSYS Mechanical Workbench 18 has been used for structural analysis, including linear, nonlinear and dynamic studies

Maple is a math software that combines the world's most powerful math engine with an interface that makes it extremely easy to analyze, explore, visualize, and solve mathematical problems. Maple can:

- solve math problems easily and accurately
- provide insight into a problem, solution, data, or concept using a huge variety of customizable 2-D and 3-D plots and animations
- keep problems, solutions, visualizations, and explanations all together in a single, easy-to-follow document, to avoid wasting time reconstructing thought processes
- create interactive applications for colleagues easily and share them over the web

MapleSim, instead, is a Modelica®-based system-level modeling and simulation tool that applies modern techniques to dramatically reduce model development time, provide greater insight into system behavior, and produce fast, high-fidelity simulations….**For complete information visit Enginsoft Expertise Website**

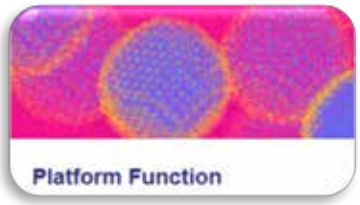
Conclusion - **By coupling Maplesoft products with ANSYS WorkBench 18, EMAK achieved high computational accuracy. In particular, by using Maple, the Emak engineers were able to drastically reduce the time typically spent on multiple trials and fine-tuning.** Moreover, Maple's graphical interface makes reading the data far easier. On the other side, MapleSim, allows to create models quickly, and the mathematical analysis tools enable to really understand what is going on the chainsaw's single cylinder engine and brake, and how to optimize them…
.



J-OCTA is useful at the forefront of material research and development

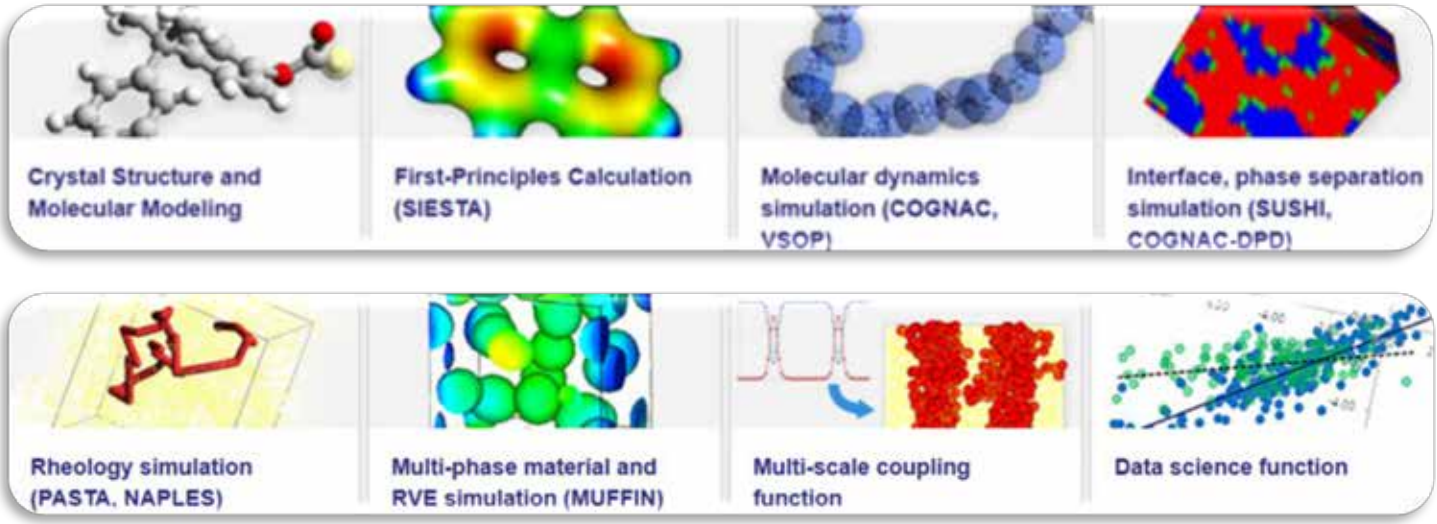
J-OCTA is a material property analysis software that predicts material properties from atomic scale to micrometer scale on a computer when developing a wide range of materials such as rubber, plastics, thin films, paints and electrolytes.

It can be used as a knowledge discovery tool to understand complicated phenomena and physical properties which could not be grasped only by experiment results. We will support state-of-the-art material design and material development by linking and operating simulators corresponding to each scale on a common platform.



Please visit the website for videos, J-OCTA structure, student edition, and complete information

Main Functions - J-OCTA can be used to simulate



STUDENT EDITION -The J-OCTA Student Edition is a free software that consists of the basic functions from the J-OCTA advanced simulation system, and it is useful for small calculation and/or validation. Anyone can use the student edition for free and without any license application and/or registration. The J-OCTA Student Edition is useful as both the atomistic molecular modeling tool for J-OCTA simulations and as a support tool for your analyses. You also can try to evaluate the capability of J-OCTA as a provisional test prior to the formal introduction.

YouTube - J-OCTA & DIGIMAT] Finite Element Analysis of mesoscale structures obtained by molecular simulation Maiko Watanbe A case study is presented

LS-DYNA on page 6 of the publication **Computer Crashes: Software developed at Lawrence Livermore National Laboratory helps modernize the field of car crash simulations.**

Complete PDF - Lawrence Livermore National Laboratory creates over $8 billion of economic impact through technology transfer ...The new study quantified the economic impact of 200 cooperative research and development agreements, known as CRADAs, and 208 license agreements signed between 2000 and 2020.

Such agreements are important as they enable the lab to collaborate with private companies on new science and the advancement of technologies. Electric vehicles—whether hybrid, plug-in hybrid, or all-electric—are rapidly becoming a more common sight on American roads. According to the U.S. Department of Energy (DOE), a record 761,000 electric vehicles were sold in 2020, representing the fifth consecutive year of growth. The market share of these cleaner, greener cars is expected to reach almost a third by 2030, with Europe and Japan joining the U.S. as leading regions.

Given the growing demand, one concern from car makers and government agencies involves battery safety. Most electric vehicles use lithium-ion batteries, the same kind found in consumer electronics like cell phones and laptops. Traffic accidents and fire incidents can damage the lithium-ion battery, leading, in worst case scenarios, to fires and explosions.

To better understand the threat to occupants, responders, and those involved in post-crash operations, Livermore Software Technology Corporation (LSTC) worked closely with Ford Motor Company to create computational models of lithium-ion batteries. LSTC successfully adapted its core software technology, LS-DYNA, into an accurate, user-friendly, and cost-effective program for battery safety simulations. LS-DYNA is a multi-module software package capable of simulating complex, real-world problems for the automotive, aerospace, civil engineering, defense, manufacturing, nuclear, and biomedical industries.

“Modeling a car crash was one of the first and biggest applications of LS-DYNA, and since the automotive industry is developing more hybrid and electric cars, it was important to be able to see how a battery behaves during a crash,” said Pierre L’Eplattenier, Senior Scientist at ANSYS, Inc., which acquired the Livermore, California-based company in 2019. “Now it is available to all car makers and is being used more and more, not just in the U.S. but also in Europe and Japan.”

What makes LS-DYNA unique is that it can incorporate multiple aspects of physics—such as mechanics, electromagnetism, and thermal processes—into each simulation. To build up the electromagnetism module, L’Eplattenier and his colleagues got a much needed helping hand from DOE’s Lawrence Livermore National Laboratory (LLNL). In 2006, LSTC was awarded a Copyright License Agreement (CLA) to utilize FEMSTER Software, v. 2.0 technology from LLNL. FEMSTER was something called a finite element library, and it allowed LSTC to incorporate electromagnetic fields, electromagnetic forces, and current into LS-DYNA. A finite element library is a toolkit that provides fundamental building blocks for developing finite element algorithms. **“Without FEMSTER, I’m not sure we would have started an electromagnetism module in LS-DYNA at all. Bringing in FEMSTER was really a key part,” said L’Eplattenier. “Now we have developed a lot of things on top of it, but for the roots as a starting point, this technology was very important.” LSTC itself began as a spin-off company from LLNL, founded by John O. Hallquist in 1987.**

At LLNL, Hallquist developed DYNA3D, a massive finite-element program that could model large deformations in metal and other stiff materials as a result of collisions and explosions. Finite-element programs break large domains into simpler parts—for example, dividing the sides of a building into many small triangles—in order to solve complex equations that arise in engineering and mathematical modeling.

After kicking off collaborations with the automotive industry, Hallquist decided to start his own company to commercialize a public-domain version of DYNA3D, which eventually became known as LS-DYNA.

“The fact that it did bending, folding, and collapsing of metal structures got the attention of the automobile industry. In the mid-1980s, John left LLNL to develop the code in the direction that the automobile industry needed,” said Roger Werne, Senior Advisor for the Innovation and Partnerships Office at LLNL. “That code basically pioneered the entire field of automobile crash simulation. LS-DYNA was the original code that could do that, and it was really quite good."

Today, LS-DYNA is the primary crash analysis tool utilized by over 80 percent of the world’s major automotive manufacturers. It has saved car makers like General Motors billions of dollars by eliminating the need for expensive collision testing with actual vehicles.

Early on, however, the program only took mechanical modeling into account. In the 1990s, thermal processes were added to the program to make it a true multi-physics simulation, followed by electromagnetism and fluid dynamics modules from 2004 onwards.

Licensing FEMSTER from LLNL served as the starting point for the electromagnetism code within LS-DYNA. FEMSTER saved L’Eplattenier and his colleagues significant amounts of time in terms of generating the foundation needed to use smaller elements three dimensional shapes such as tetrahedrons, hexahedrons, and wedges—that make up the larger structure.

The CLA to utilize FEMSTER allowed LSTC to couple mechanical, thermal, and electromagnetic responses in battery safety simulations for electric vehicles, along with several other real-world problems. One of the more innovative of these applications was electromagnetic forming, a method for shaping aluminum that uses high-intensity pulsed magnetic fields to induce a current, generating a strong repulsive magnetic field in the aluminum. This extremely fast process can push the aluminum onto a shaped die, without being pressed mechanically. **“Magnetic metal forming allows the aerospace and automotive industries to replace a lot of parts that were previously made by steel with aluminum, which is much lighter,” said L’Eplattenier. “At the time, LS-DYNA was the only code that could do these kind of magnetic metal forming simulations.”**

Another project, currently in progress, attempts to model the electrophysiology of the human heart. The propagation of electric waves in the heart triggers the contraction of the four chambers, two upper chambers (atria) and two lower chambers (ventricles). Simulations of this process, along with fluid dynamics of blood flow, can be used to study heart conditions like arrhythmia or the effects of medicine. Such a model could also help surgeons determine whether a procedure would be beneficial for a given patient.

All in all, LS-DYNA has enabled researchers, private companies, and government organizations to accurately simulate tests before building complete prototypes. ANSYS sells the program to several agencies of the U.S. government, including the DOE, National Nuclear Safety Administration, Department of the Navy, NASA, and the Federal Aviation Administration. “That’s one of the nice things about having a successful technology transfer with a start-up company that started up and continues to grow. When they have those connections and roots with a national lab, it’s common for us to see them come back with other needs, as LSTC did with FEMSTER,” said Charity Follett, Business Development Executive at LLNL. “Most of the world doesn’t realize how much of our day-to-day technology comes out of national labs.”

Excerpt from the article written by: Kambiz Kayvantash, Sr. Director of ML/AI Solutions for Design and Engineering, Manufacturing Intelligence Division, Hexagon

Various applications of ROM for automotive design and optimization. (Image courtesy of MSC Software.)

The Evolution of FEA Applications Using ML/ROM Technologies

The field of computational mechanics is undergoing a quiet revolution with the arrival of various machine learning (ML) and reduced order modeling (ROM) technologies. The idea to combine data-based and partial differential equation (PDE)-based physics is possible thanks to the availability of various sensing and imaging technologies as well as computing resources.

These are enabled by data mining and machine learning techniques that have been available since early 1950's.

These achievements are accompanied by the capabilities of reduced order modeling, which originated in the 1980's and enables data compression and the encapsulation of large discretized PDE models—life finite element analysis (FEA). Finally, the arrival of various domain decomposition and sub-structuring techniques within the FEA community, and the associated multi-processing technology, also contributed greatly to both fields—contributing to the emergence of the recent unified approaches to ML exploiting both available data and solver solutions.

This apparent revolution will likely peak in the near future, due to the availability of combined cloud services allowing for the creation of huge databases containing model-based physics and numerically performant and computationally efficient solutions combining ML and ROM.

From the computational point of view, three topics are of major importance:

- How to generate sufficient data to allow for the establishment of models which represent the underlying physics.
- How to identify sub-structures, or more generally how to efficiently decompose models into their components, or modes, to allow disassembly of the models for efficient learning, as well as eventual re-assembly of the responses with sufficient efficiency and precision.
- To devise efficient and economic sampling techniques which provide not only the best learning data set, but also the smallest.

In this article, we explore the above topics through a study of recent advances reported in the industrial FEA community, including linear and nonlinear (implicit and explicit) mechanics, and demonstrating how various ML techniques (supervised, non-supervised and reinforcement learning) and ROM techniques (POD, FFT, CLUSTERING) can contribute to more efficient computational technology.

How Does ML/ROM Work? In principle, ML and ROM techniques are interpolation methods that exploit data sets derived from existing virtual or experimental setups. They are essential to the concept of Digital Twins, since they provide the missing link for both rapid re-design and operational evaluations in real-time. While the common starting point is a DOE-type design with sufficient space filling properties, ML/ROM techniques different from response surface methods (RSM).

In RSM, the approximation functions (surrogate model) often represent the effects of variations of variables on a single scalar static function. Additionally, this approximation is dependent on the nature of the fitting function (or surface), or on a prescribed equation which affects the number of runs required. Every different assumption on the nature of the approximation establishes its own requirements on the size of the sampling data.

In contrast, ROM techniques exploit the known physical behavior represented by the “modal” contents, or the discretized PFE’s expressed in terms of combinations of “decomposed” series of responses or clusters of responses. These may be combined with various interpolation techniques such as kriging or radial basis functions, or even simple regression, as well as ML prediction algorithms such as deep learning and multilayer perceptron (MLP). These are not necessarily aware of the nature of the problem, but instead are based on trial-and-error and reward distribution strategies.

Whatever the nature and formulation of the method being used, ML and ROM provide a series of alternative solutions to costly finite element models (FEM) and their variants. These techniques provide completely new frontiers for cost effective and accelerated design, as well as optimization of products or processes.

Applications - Let’s consider some cases where FEM solutions remain expensive and particularly prohibitive for parametric studies, optimization and any other iterative process. Nearly every single simulation type or PDE of a physical problem may be considered. Among the most common cases we will discuss below are structural non-linear analysis (implicit or explicit) and CFD analysis of the optimal layout of wind turbines, simply because these two simulations are particularly costly to conduct.

FEMs of crash-safety situations involving dummies or human bodies have been available commercially for over two decades, and are now beginning to be employed in practical design applications. Nearly every large displacement or large deformation simulation may be considered, and they provide valuable insight both in terms of responses of human bodies subject to external mechanical loading as well as visualization of the kinematics and contacts during the loading.

Wishing to improve the response predictability of these models—and encouraged by the availability of advances in data acquisition solutions—developers are creating finer and finer meshes. This inversely contributes to the robustness as well as the computing performance, storage and CPU requirements of these models.

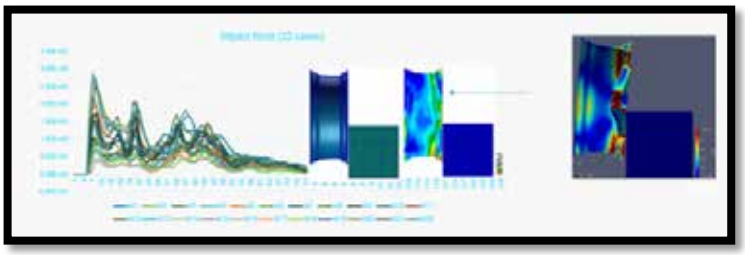
Because of this trend, while highly non-linear analysis models are available for analysis and design of singled-out reconstructions of simple scenarios, they remain impractical for clustered or population statistical studies which require stochastic models and loading scenarios which need to be launched thousands to millions of times. This is a major constraint shared by studies concerning optimization, robustness, sensitivity or indeed any “on-board” modeling, since they all require many repetitions of the simulation configurations or real-time performance. In this respect, reduced order modelling is a clear challenger—and even a winner for all iterative analysis.

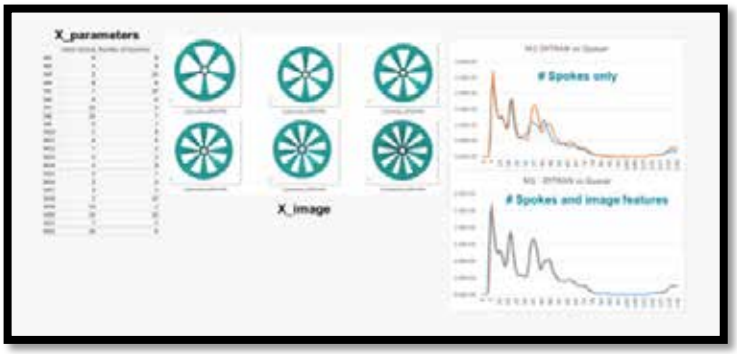
The principle is simple: First, use an FEM sampling technique to create and run a few parametric versions of the initial model. Second, use decomposition techniques to reduce the complexity of the output. Third, use interpolation techniques (ML, RBF, Kriging, etc.) to predict the response for new parameter settings (instead of using FEM for calculation). Finally, re-compose the “modal” responses and solve for the complete prediction of the original FEM.

The following examples demonstrate the full advantages of the combined ML/ROM approach for parametric and shape or layout optimization of crash or non-linear analyses.

In the first example, different wheel shapes with different numbers of spokes are tested against a curb impact scenario. Combining images of the wheels and the crash impact curves, we can predict the optimal case shape and parameters with very high precision.

Visit website for high resolution graphics





Shape and parameters optimization using images and crash signals based on combine ML and ROM models. (Image courtesy of MSC Software.)

The second application concerns a multi-physics application requiring communication of models solved at different spatial and temporal scales via FEM or FVM. A fluid structure interaction problem may help us to describe the advantages.

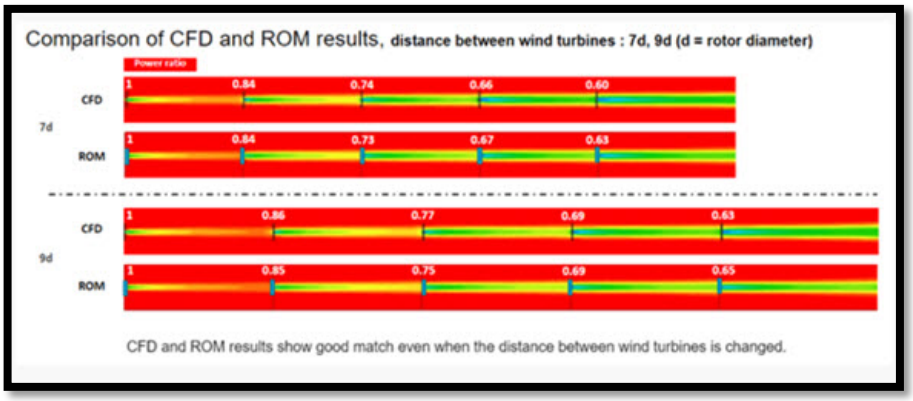
Reduced models of large, time dependent and CPU-consuming applications may involve multi-physics applications, such as the Arbitrary Lagrangian Eulerian (ALE) method for fluid-structure interactions. The models’ ROMs have the advantage of being re-employed in a “solver independent” environment as sub-parts or components of a system without the need to be recomputed at every cycle. They can simply be reconstructed from previous results. The computation time is improved, and off-the-shelf models may be optimally exploited in a wide variation of scenarios, including on-board computing.

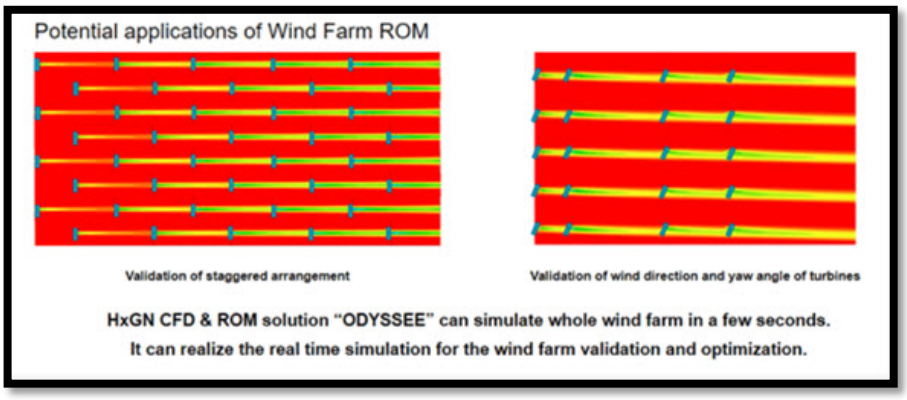
A major advantage of this approach is that a reduced model generated by any finite element code could easily be used for any other commercial code, since the ROMs are interchangeable among solvers and PDEs.

From a mathematical point of view, a reduced model approximates the initial governing equations based on decomposition and sub-structuring techniques. In its application, these are like response surface techniques representing surrogates of the original model. However, contrary to surrogate or response surface models, the results of a reduced model are not only based on an initial “static” grid but are “reconstructed” from time dependent functions obtained from full resolution of partial differential equations (PDE). Simply speaking, instead of solving the original PDE, we solve a reduced or simplified version of it, based on the knowledge obtained from existing previous solutions.

This allows for the creation of a single ROM in the following example, where it is used frequently and sequentially or in parallel. Any arrangements of parametric studies are easily assumed and optimized with respect to the wind turbine design parameters or environmental layouts.

For example, a single wind turbine is sampled below for different parameters, allowing for the creation of its ROM which may subsequently be used for optimal design.





Parametric studies of multiple wind turbine positions, layout and rotor diameter using a ROM model of a wind turbine. (Image courtesy of MSC Software.)

Conclusion

The above examples demonstrate clearly that design and optimization engineers today may employ a new set of tools halfway between FEM models and traditional tables allowing for real-time or embedded analysis and decisions to be made.

Optimization and stochastic analysis of any complex model becomes a reality, and may be systematically used for improving designs, and minimizing costs and environmental impacts.

Finally, the ML/ROM models are the core of the “digital twin” concept and solutions, since they allow for integration of machine learning and predictive analysis based on both observed and simulated data.

Marta Kempa, MBA - Marketing Coordinator & Seppi
Oasys LS-DYNA
Oasys Software, Tutorials & Classes Not To Miss

"Exciting new features to help you power through your workflow and achieve high-quality results. Oasys Suite 19.0 is the latest release of the comprehensive LS-DYNA PRE and POST processing suite."

Excerpt - For the full article and high resolution graphics visit the website

The Oasys LS-DYNA team is pleased to announce the release of OasysSuite 19.0.

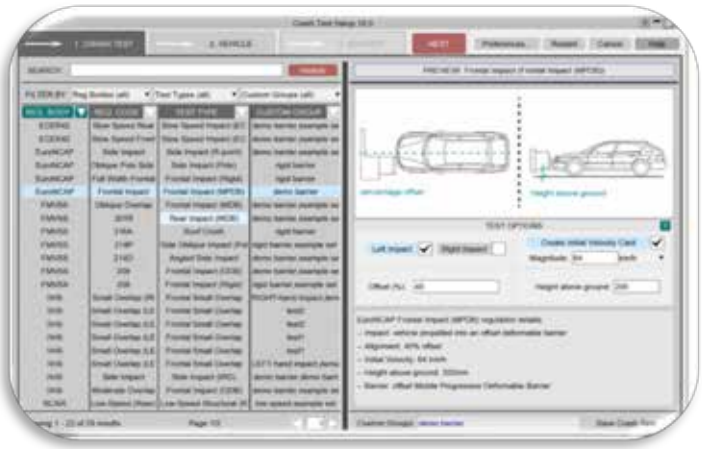
For many years, the Oasys software has been helping engineers' power through their LS-DYNA workflow. Oasys has all the tools required for you to build your models quickly and efficiently. From creating connection data and fitting seatbelts, to automatically post-processing your many analyses, Oasys helps you visualise your results quicker.

Our support for LS-DYNA is paramount. **The Oasys software supports all the latest features in LS-DYNA. Our comprehensive LS-DYNA checking tool ensures that any analysis issues are captured early on, saving time when deadlines are tight, and providing results you can trust.**

This new version of the Oasys LS-DYNA Environment has exciting new features and updates within PRIMER, D3PLOT, T/HIS, REPORTER and SHELL to further enhance your ability to succeed in producing high quality models and results quickly.

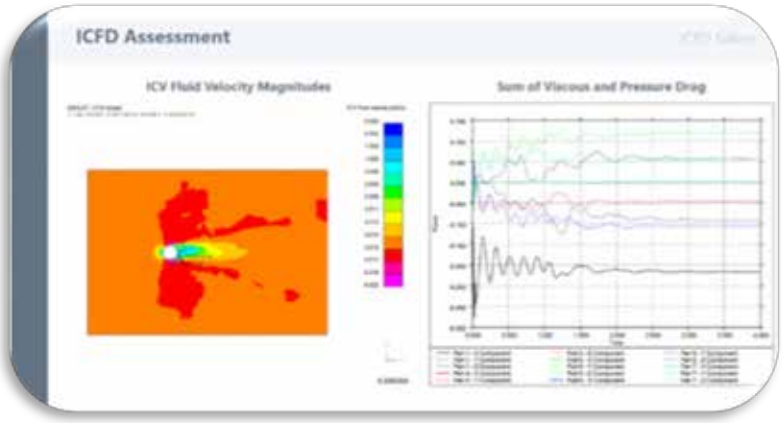
Key highlights:

- Many new additions and updates to automotive tools across PRE and POST processing, including pedestrian, occupant, and full crash models
- New interactive ways of modifying the user interface to meet your needs and speed up how you work
- Comprehensive support for new LS-DYNA data across the workflow



New features in detail - Improved usability, speed and performance across the Oasys LS-DYNA Environment

New additions and functionality for Crash Test Setup – making it easy to set up crash analyses in a consistent way:



New ICFD assessment template – quickly see the outcomes of your ICFD analyses

Other speed and performance highlights:

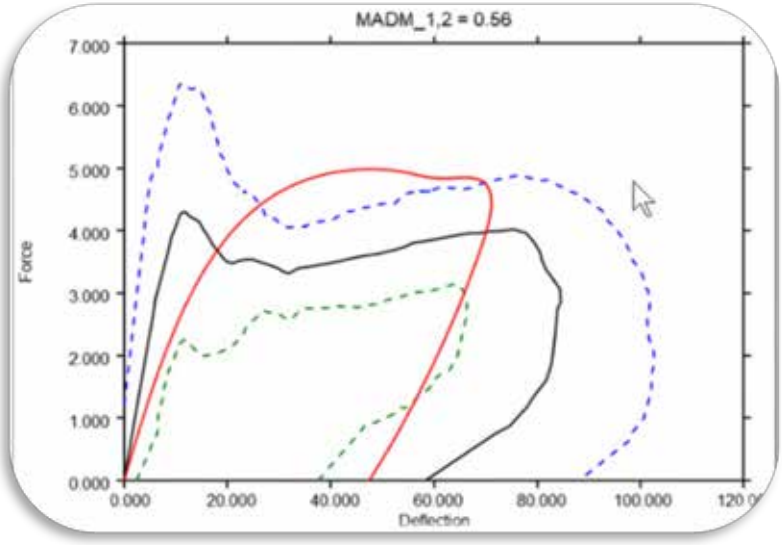
- New “Favourites” menu to speed up your PRIMER workflow
- Improved multiple cut-section functionality in PRIMER and D3PLOT
- Improvements and additions to the Pedestrian Markup Tool
- Further additions and improvements to the Pedestrian HIC area calculator tool – linking to your results data in D3PLOT and T/HIS
- New interactive method for arranging multiple windows in D3PLOT and T/HIS
- Support for HDF5 format in T/HIS
- Further user colours support

Further integration of the Oasys Suite and Automation Tools

New IIHS Side MDB Impact 2021 template

Other integration and automation highlights:

- New and improved REPORTER templates – including for MPDB
- Upgraded JavaScript “engine” to improve performance and expand functionality, including adding support for EC6 modules
- Tool to allow easy transfer of deformed geometry and other information between D3PLOT and PRIMER
- New options to make it easier to automate post-processing using the Oasys SHELL



Latest expert tools for LS-DYNA models

New curve processing functions in T/HIS (e.g., Bessel filter and MADM):

Other expert tool highlights:

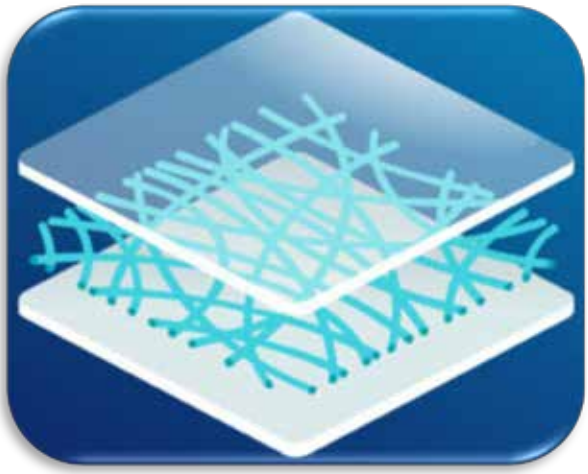
- Enhanced LS-DYNA keyword support including R13/R14
- Improved creation methods for “patch” adhesive connections
- Additional controls for mesh created for HAZ spotweld connections
- Improved support for IGA LS-DYNA models
- New functionality for the encryption tool – aids encryption of LS-DYNA models
- Further support for human body models
- Improved support for *COMMENT – “anchoring” comments to specific keyword blocks
- New contact penetration checking tree – makes it easy to navigate through and investigate penetrations in your model

Backwards compatibility

The Oasys Suite 19.0 LM-X license file and license daemons are backwards compatible for all currently supported versions of Oasys Suite.

Download Oasys Suite 19.0 now

Genesis® for Ansys® Mechanical (GSAM/GTAM) adds the power and versatility of Genesis® structural optimization capability to the ANSYS environment.



Topology Design of a Compliant Mechanism

Engineers can enlist the rich breadth of Genesis® optimizations, performing optimization data definition, solving, and post-processing all within the Ansys analysis systems. In this article, we would like to show how to perform topology optimization to design a compliant mechanism.

Loading Conditions - There are two loadcases defined as shown in the image below. In the first loadcase, the structure is fixed on the top surface, enforced displacement are applied along X direction on the two side surfaces and along Y direction on the bottom surface. The objective is to find a structural configuration that provides preload as output at the bottom surface when pressing from the two side surfaces. The second torsional loadcase is added to make sure the structure has certain stiffness in z direction.

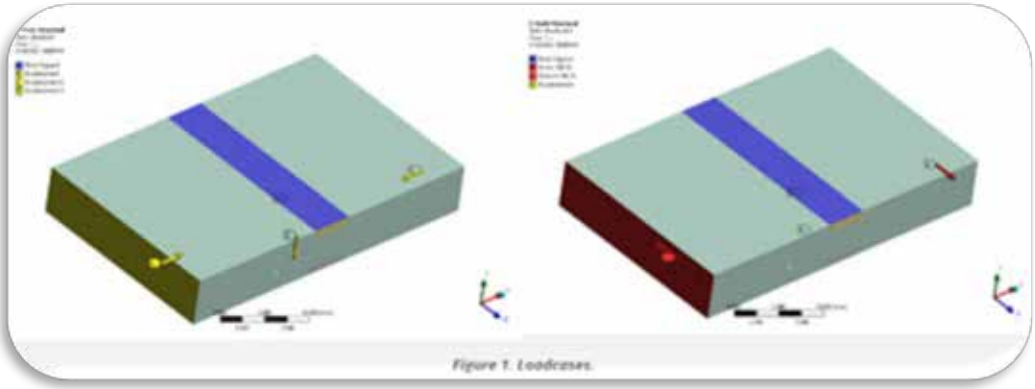


Figure 1. Loadcases.

Optimization Problem Definition - In ANSYS Mechanical, we add the Objectives,

Constraints, and Topology Regions to the GENESIS system, and define the corresponding data as described below.

Objective 1: Maximize the sum of reaction force along Y direction at the bottom output surface for loadcase 1	**Objective 2**: Minimize the strain energy for loadcase 2	**Constraints**: mass fraction < 0.2

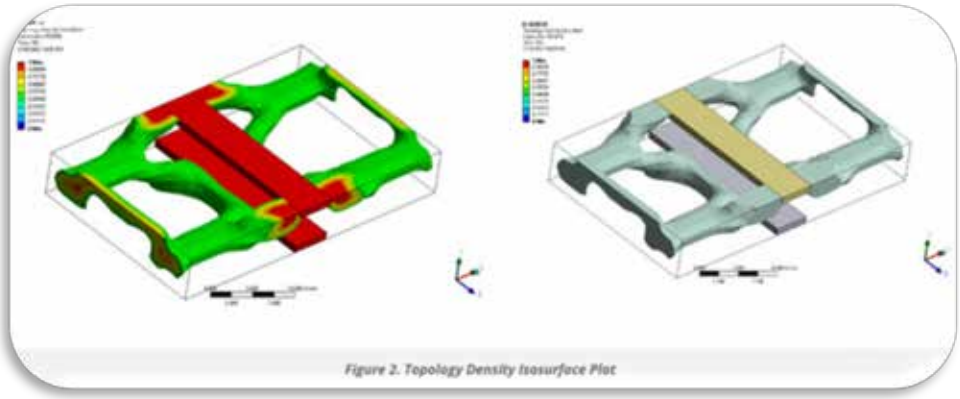


Figure 2. Topology Density Isosurface Plot

Optimization Result

The optimization finished with 50 cycles. The topology density isosurface result is shown as below

The deformation animation plot after optimization is also shown as below - View movement on website

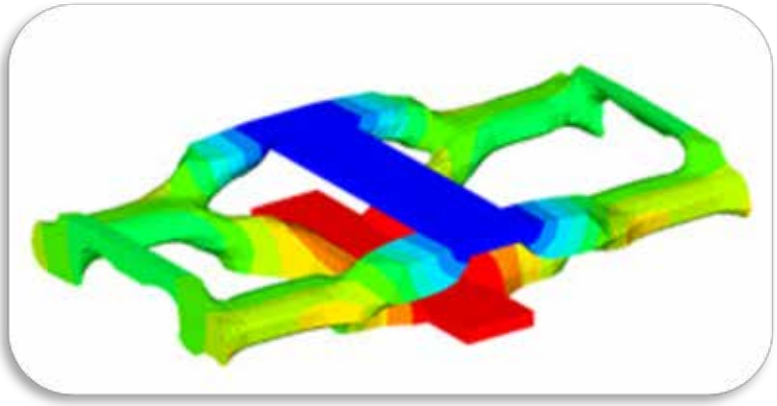


Figure 3. Deformation Plot

Summary - Topology optimization created a structure that is flexible in x direction, such that when pressing along x direction, the bottom surface goes downward and applies compression to the device in contact with it. The objective improvement is shown in the table below.

Index Objective Components

Response-ID / Loadcase-ID / Type	Design Cycle 0	Design Cycle 50	Change
157 / 1 / DRESP2/3	-3.658382E+05	2.359626E+04	106.4%
158 / 2 / SENERGY	5.009633E+00	7.441391E+00	48.5%

Maximum Constraint Violation

	Design Cycle 0	Design Cycle 50	
	0.0%	0.0%	

Figure 5. Summary in GENESIS

Topology optimization is a great tool in GSAM, which is easy to set up but also very useful for design improvement and innovation. Our engineering team can work with you to conduct a Test Case showing how OmniQuestTM will improve your designs, processes and your overall business.

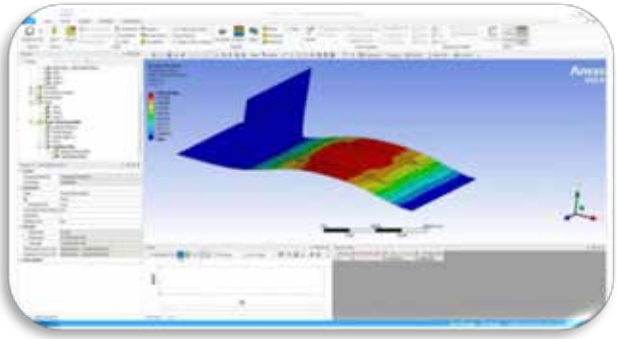
For more details, please contact us at gsam.(support@omniquest.com)
Connect with us now for complimentary webinars and evaluation software.

Metin Ozen
Principal & CEO at Ozen Engineering, Inc. and Mallett Technology, Inc.

MingYao Ding

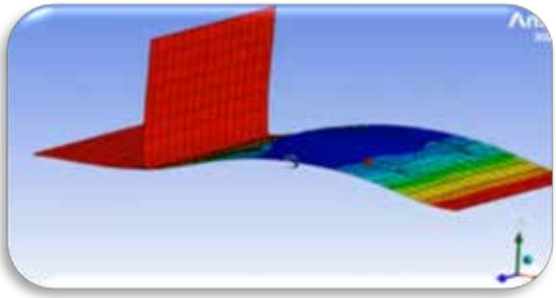
MingYao Ding, Principal/VP Engineering @ Ansys Elite Channel Partner - Ozen Engineeing Inc.

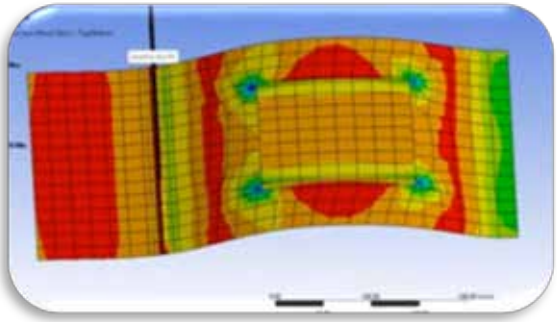
"Ansys added some very easy to use seam weld fatigue simulation capabilities. This makes it much easier to join parts together accurately using seam welds. Below is a video I made as an example."

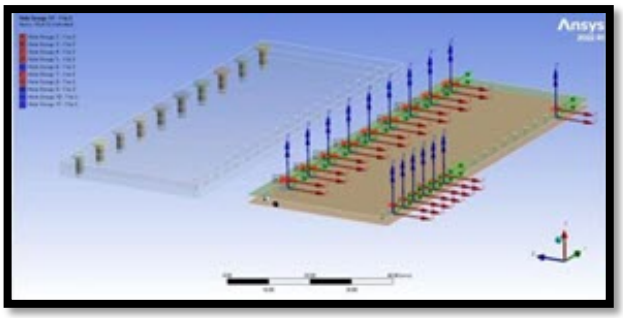


YouTube
Seam weld simulation in Ansys Mechanical

This video demonstrates how we setup a seam weld simulation. Including how to easily setup a seam weld according to the Volvo/Chalmers method and weld fatigue calculations.







YouTube - Ansys bolt setup tools

"First welds, now bolts. I'm connecting with Ansys. Setting up bolts can be tedious. Especially if they come in dozens or hundreds.

In this video we demonstrate how to quickly setup bolts in 3d solid and shell models using Ansys mechanical. This feature increases accuracy and saves time."

Geared for Success: Ford Now Operates 3D Printers Autonomously, Increasing Efficiency and Reducing Cost

- Using a mobile robot, Ford operates 3D printers autonomously; the company has filed several patents for the technology in its drive to innovate
- Autonomous process enables 3D printer to run continuously with no human interaction needed, increasing throughput and reducing cost of custom-printed products
- Innovative Ford communication system enables different pieces of equipment from various suppliers to send commands to one another, working autonomously in collaboration

REDFORD, Mich., Mar. 16, 2022 – **At Ford's Advanced Manufacturing Center, Javier is tasked with operating the 3D printers completely on his own.** He is always on time, very precise in his movements, and he works most of the day – taking only a short break to charge up. This innovative robot on wheels from supplier KUKA, called Javier by Ford's additive manufacturing operators, is integral to the company's development of an industry-first process to operate 3D Carbon printers with an autonomous mobile robot rather than a fixed, stationary unit.

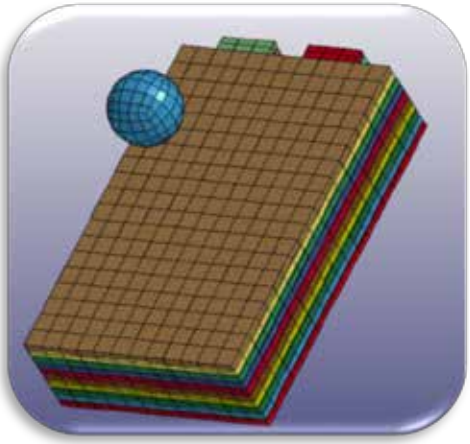
"This new process has the ability to change the way we use robotics in our manufacturing facilities," said Jason Ryska, director, global manufacturing technology development. "Not only does it enable Ford to scale its 3D printer operations, it extends into other aspects of our manufacturing processes – this technology will allow us to simplify equipment and be even more flexible on the assembly line."

Ford has achieved great accuracy with Javier, using his feedback to significantly reduce margins of error. In addition to 3D printers, the method can be applied to a vast array of robots already working at the company to increase efficiency and reduce cost. In its drive to innovate, Ford has filed several patents related to the overall process, communication interfaces and precise positioning of the robot, which does not require use of a camera vision system to "see."

Typically, different pieces of equipment from various suppliers are unable to interact because they do not run the same communication interface. Ford developed an application interface program that allows different pieces of equipment to "speak the same language," and send constant feedback to each other. For example, the Carbon 3D printer tells the KUKA autonomous mobile robot when the printed product will be finished, then the robot lets the printer know the robot has arrived and is ready for pick-up. This innovative communication is what makes the whole process possible.

Javier enables Ford to operate its 3D printers all night long, even after employees have left for the day. Not only does this increase throughput, it reduces the cost of custom-printed products. Ford has used the printer to make low-volume, custom parts, such as a brake line bracket for the Performance Package-equipped Mustang Shelby® GT500.

While the process itself is autonomous, Ford operators are responsible for uploading 3D designs to the printer and maintaining the machinery, and for engineering new ways to use the technology.



PDF - [A Path Towards Including Batteries in Electric or Hybrid Car Crash Simulations with LS-DYNA®]

Pierre L'Eplattenier, Iñaki Çaldichoury ANSYS

Safety is an important functional requirement in the development of large-format, energy-dense, lithium-ion (Li-ion) batteries used in electrified vehicles. Many automakers have dealt with this issue by enclosing the batteries into protective cases to prevent any penetration and deformation during the car crash. But with the range of electric vehicle increasing and thus the size of the batteries, a more detailed understanding of a battery behavior under abuse becomes necessary

EXCERPT: Computer aided engineering (CAE) tools that predict the response of a Li-ion battery pack to various abusive conditions can support analysis during the design phase and reduce the need for physical testing. In particular, simulations of the multi-physics response of external or internal short circuits can lead to optimized system designs for automotive crash scenarios. The physics under such simulations is quite complex, though, coupling structural, thermal, electrical and electrochemical. Moreover, it spans length scales with orders of magnitude differences between critical events such as internal shorts happening at the millimeter level, triggering catastrophic events like the thermal runaway of the full battery. The time scales also are quite different between the car crash happening in milliseconds and the discharge of the battery and temperature surge taking minutes to hours. **A so called "distributed Randles circuit" model was introduced in LS-DYNA in order to mimic the complex electrochemistry happening in the electrodes and separator of lithium ion batteries [1][2][3].** This model is based on electrical circuits linking the positive and negative current collectors reproducing the voltage jump, internal resistance and dumping effects occurring in the active materials. These circuits are coupled with the Electromagnetics (EM) resistive solver to solve for the potentials and current flow in the current collectors and the rest of the conductors (connectors, busses, and so forth). The EM is coupled with the thermal solver to which the joule heating is sent as an extra heat source, and from which the EM gets back the temperature to adapt the electrical conductivity of the conductors as well as the parameters of the Randles circuits [1]. One of the advantages of the Randles circuit model is the relative easiness to introduce internal short circuits by just replacing the Randles circuits in the affected area by a short resistance [1][3]. **The Randles circuit model also is coupled with the mechanical solver of LS-DYNA where the deformations due to a battery crush allow the definition of criteria to initiate internal shorts [1]**. The Randles circuit model can be used either on a solid element mesh that include all the layers of a cell [1][2][3], or using composite Tshells [4][5]. In the second case, the mechanics is solved on the composite Tshell, but an underlying solid mesh with all the layers still has to be built to solve the EM and the thermal. This implies very large meshes and hence simulation times when dealing with many cells, let alone modules, packs or a full battery. This new Battery Macro (BatMac) model allows simulating a cell with very few layers of elements (down to one). Two fields exist at each node of the mesh, representing the potential at the positive and negative current collectors…

Stalker Unmanned Aerial System

Stalker is an operationally proven small, silent, Group 2 Unmanned Aerial System (UAS) that provides unprecedented long-endurance imaging capability in a variety of contested environments and is in use by Special Forces around the world.

Watch on YouTube - Designed to combine the flexibility of a portable system with the endurance and payload performance of a larger, more costly vehicle, Stalker VXE and XE's class-leading endurance, broad operating envelope, and open system architecture allow it to execute diverse and demanding missions while maintaining a small operational footprint and crew requirement.

Power & Fuel	Launch	Payloads
Optionally powered by a ruggedized Solid Oxide Fuel Cell, Stalker uses propane to achieve 8+ hours of operation. To support the needs of the mission, the system can also be easily reconfigured in the field to a battery powered option that provides 4 hours of endurance.	The Stalker VXE Block 30 system was upgraded with a next generation vertical take-off and landing capability to provide users with greater mission flexibility for operations in austere locations around the world. The Stalker XE Block 25 system can be hand launched from bungee or rail options.	The custom droppable payload compartment allows the user to precisely drop a small payload from the air. A digital backbone allows for rapid deployment of the latest technology, meaning better pictures and more capabilities. Stabilized pan, tilt, zoom electro-optical, infrared, and low-light cameras with the ability to lock and track targets enables unprecedented imaging capabilities in a small UAS for operations in all weather conditions, day or night.

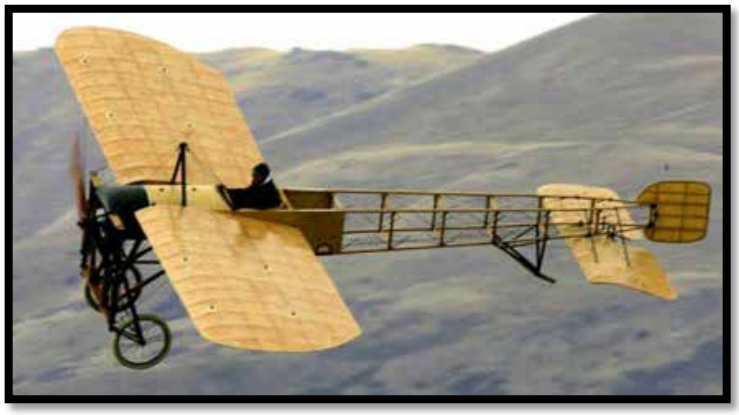
The quiz was left in the suggestion box by The Old Retired Pilot. We are sending it out to the residents and guests. No one in town knows his name. You yell, "HEY, Old Pilot."

The Old Retired Pilot and the Town Secretary are arguing in the hall. She's screaming that he called her vintage. Since they are both adults, she then called him ancient. Need I tell you he was referring to vintage planes and not her age? Do you volunteer to explain to her that older planes are called vintage? The town will compensate you for your time with coffee.

Quiz - can you name the four planes below.

Extra Credit for D. It's like having the name Douglas on the front of a T-shirt!

(The answers are at the bottom of the Goodbye page)



A_____

B_____

C_____

D_____

An unmanned aerial vehicle (UAV), commonly known as a drone, as an unmanned aircraft system (UAS), and also referred by several other names, is an aircraft without a human pilot aboard. The flight of UAVs may be controlled with various kinds of autonomy: either by a given degree of remote control from an operator, located on the ground or in another vehicle, or fully autonomously, by onboard computers.

The General Atomics **MQ-9 Reaper** (sometimes called Predator B) is an unmanned aerial vehicle (UAV) capable of remotely controlled or autonomous flight operations developed by General Atomics Aeronautical Systems (GA-ASI) primarily for the United States Air Force (USAF). The MQ-9 and other UAVs are referred to as Remotely Piloted Vehicles/Aircraft (RPV/RPA) by the USAF to indicate

The **Bayraktar TB2** is a medium-altitude long-endurance (MALE) unmanned combat aerial vehicle (UCAV) capable of remotely controlled or autonomous flight operations. It is manufactured by the Turkish company Baykar Makina Sanayi ve Ticaret A.Ş., primarily for the Turkish Armed Forces.[

The **IAI Eitan** ("Steadfast"; export designation Heron TP) is an unmanned reconnaissance aircraft developed in Israel in the early 21st century by the Malat division of Israel Aerospace Industries.[1] The aircraft is a newer version of the IAI Heron.

Fueling the Falcon

A KC-135 Stratotanker from Fairchild Air Force Base, Wash. refuels an F-16 Fighting Falcon over New Mexico, April 14, 2022. Crews from Fairchild AFB provided air refueling support during a training mission, allowing the F-16 crews to maintain mission readiness. (U.S. Air Force Photo by Staff Sgt. Lawrence Sena)

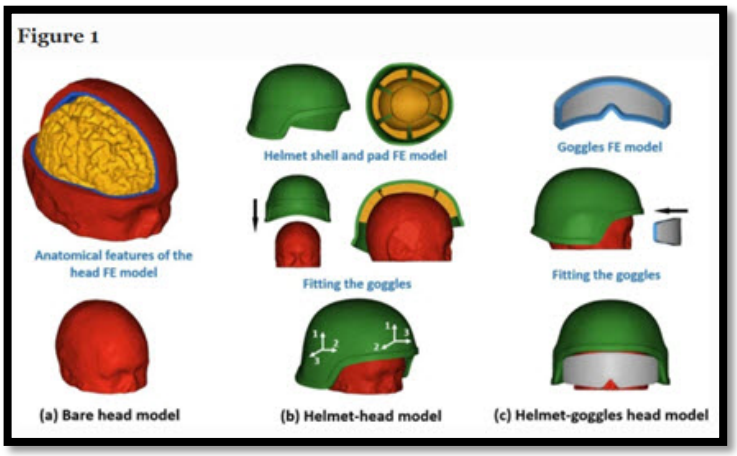
In unison - Two U.S. Air Force F-35A Lightning IIs assigned to the 48th Fighter Wing at RAF Lakenheath, United Kingdom, fly alongside a KC-135 Stratotanker assigned to the 100th Air Refueling Wing at RAF Mildenhall, U.K. during a refueling mission over the North Sea, April 14, 2022. The F-35A is a fifth-generation fighter that provides the joint warfighter global precision attack capability against current and emerging threats, while complementing the Air Force's air superiority fleet. (U.S. Air Force photo by Senior Airman Kevin Long)

Missing Man formation

Historic World War II aircraft fly in a Missing Man formation during The Doolittle Raiders 80th anniversary ceremony, April 18, 2022, at Okaloosa Island, Fla. This was the final formation in the flyover, concluding the aerial review honoring participants of Doolittle Tokyo Raid. (U.S. Air Force photo by Senior Airman Amanda A. Flower-Raschella)

Thanks to S. Dhomase for liking a post by M. Ghajari, Senior Lecturer (Associate Professor)
Springer Open Access - Published: 16 March 2022 - BMES Biomedical Engineering Society

The development of the FE models and simulations were conducted using the LS-DYNA nonlinear hydro-code We developed three models to investigate the protective performance of a combat helmet and goggles: bare head model, helmet-head model and a helmet-goggles-head model (Fig. 1)…



EXCERPTS

[Protective Performance of Helmets and Goggles in Mitigating Brain Biomechanical Response to Primary Blast Exposure]

XIANCHENG YU & MAZDAK GHAJARI
Dyson School of Design Engineering,
Imperial College London, UK;

Centre for Blast Injury Studies,
Imperial College London, UK

Abstract - The current combat helmets are primarily designed to mitigate blunt impacts and ballistic loadings. Their protection against primary blast wave is not well studied. In this paper, we comprehensively assessed the protective capabilities of the advanced combat helmet and goggles against blast waves with different intensity and directions. Using a high-fidelity human head model, we compared the intracranial pressure (ICP), cerebrospinal fluid (CSF) cavitation, and brain strain and strain rate predicted from bare head, helmet-head and helmet-goggles-head simulations. The helmet was found to be effective in mitigating the positive ICP (24–57%) and strain rate (5–34%) in all blast scenarios. Goggles were found to be effective in mitigating the positive ICP in frontal (6–16%) and lateral (5–7%) blast exposures. However, the helmet and goggles had minimal effects on mitigating CSF cavitation and even increased brain strain. Further investigation showed that wearing a helmet leads to higher risk of cavitation. In addition, their presence increased the head kinetic energy, leading to larger strains in the brain. Our findings can improve our understanding of the protective effects of helmets and goggles and guide the design of helmet pads to mitigate brain responses to blast.

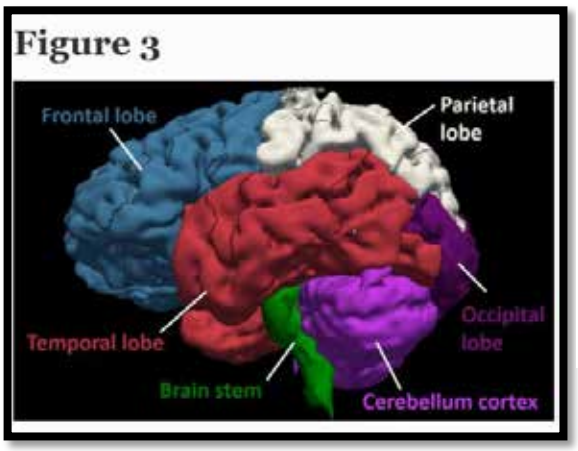
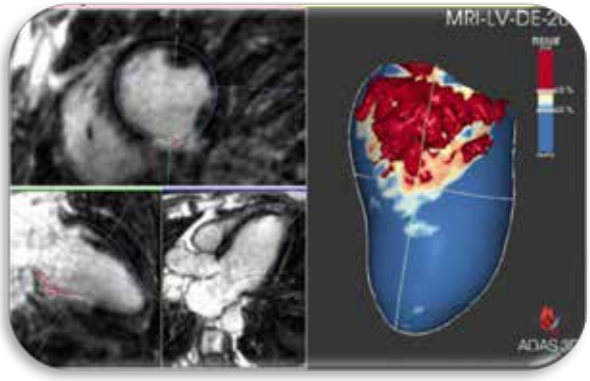


FIGURE 3. Brain anatomy, including four lobes, cerebellum cortex and brain stem.

NIfTI format, which allowed us to use FSL, an MRIbased neuroimaging tool, to analyse the data. We created masks of four lobes (frontal, parietal, temporal and occipital), cerebellum cortex and brain stem (Fig. 3), which were used to determine the mean and standard deviation of the negative/positive pressures, strain and strain rate in these regions of interest

13th European LS-DYNA Conference 2021, Ulm, Germany

This segmentation and tissue classification are used to build, using LS-DYNA, a detailed electrophysiology model containing the relevant features for simulating arrythmia. **Using LS-DYNA, this model is then used to simulate a normal heartbeat and a clinical pacing protocol for inducing arrhythmia**



From Time Delayed MRI to Patient-specific computational modeling of scar-related ventricular Tachycardia

Karim El Houari, Clementine Shao, Sophie Collin, Michel Rochette,
ANSYS - France

Pierre L'Eplattenier, Inaki Caldichoury,
ANSYS-LST - USA

Martin Steghofer, Rosa M. Figueras, Luis Serra
ADAS3D Medical SL - Spain

EXCERPTS

Sudden cardiac death commonly occurs due to heart rhythm disorders called arrhythmia. Although recognized as the most efficient treatment options, Cardioverter Defibrillator implantation and tissue ablation are still not used to their full potential. Recently, advances in computational modeling and the increasing use of imaging tools have proven that patients' digital twins can play a role in addressing these limitations. This paper presents such an approach using the industrial software ADAS-3D and LS-DYNA. The workflow starts from Late Gadolinium Enhanced-Magnetic Resonance Imaging (LGE-MRI) data from a patient with structural heart disease. The left ventricle and fibrotic substrate were analyzed using ADAS-3D software, which enables to distinguish between tissue that is healthy, scarred, and intermediate, and to extract topological information. This segmentation and tissue classification are used to build, using LS-DYNA, a detailed electrophysiology model containing the relevant features for simulating arrythmia. Using LS-DYNA, this model is then used to simulate a normal heartbeat and a clinical pacing protocol for inducing arrhythmia.

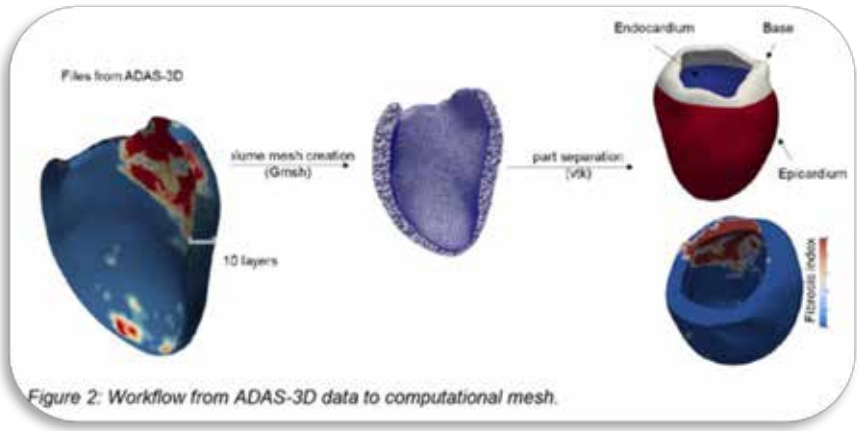
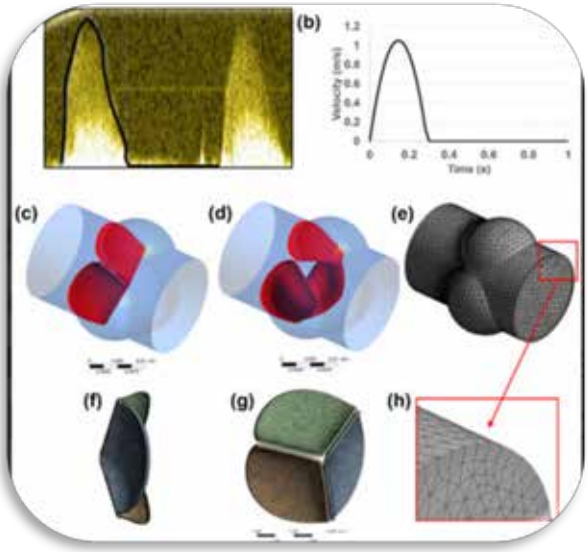


Figure 2: Workflow from ADAS-3D data to computational mesh.

The objective of this automated workflow is to create the keyword files needed to run simulations using LS-DYNA

Thanks to MDPI Open Access

Fluid-structure interaction (FSI) analyses were adapted using ANSYS Workbench to incorporate both flow dynamics and leaflet deformation accurately.



Computational Analysis of Wall Shear Stress Patterns on Calcified and Bicuspid Aortic Valves: Focus on Radial and Coaptation Patterns

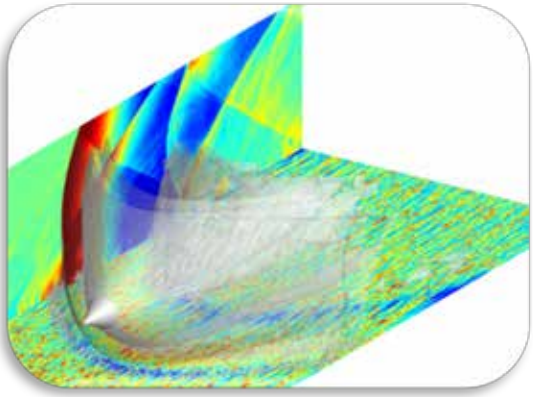
Huseyin Enes Salman
Dept of Mechanical Engineering, TOBB University of Economics and Technology, Turkey
Levent Saltik
Dept of Pediatric Cardiology, American Hospital, Turkey
Huseyin C. Yalcin
Biomedical Research Center, Qatar University, Qatar

Abstract - Calcification and bicuspid valve formation are important aortic valve disorders that disturb the hemodynamics and the valve function. The detailed analysis of aortic valve hemodynamics would lead to a better understanding of the disease's etiology. We computationally modeled the aortic valve using simplified three-dimensional geometry and inlet velocity conditions obtained via echocardiography. We examined various calcification severities and bicuspid valve formation. **Fluid-structure interaction (FSI) analyses were adapted using ANSYS Workbench to incorporate both flow dynamics and leaflet deformation accurately.** Simulation results were validated by comparing leaflet movements in B-mode echo recordings. Results indicate that the biomechanical environment is significantly changed for calcified and bicuspid valves. High flow jet velocities are observed in the calcified valves which results in high transvalvular pressure difference (TPG). Wall shear stresses (WSS) increased with the calcification on both fibrosa (aorta side) and ventricularis (left ventricle side) surfaces of the leaflet. The WSS distribution is regular on the ventricularis, as the WSS values proportionally increase from the base to the tip of the leaflet. However, WSS patterns are spatially complex on the fibrosa side. Low WSS levels and spatially complex WSS patterns on the fibrosa side are considered as promoting factors for further calcification and valvular diseases.

1. Introduction - Aortic valve disease is one of the most common cardiovascular disorders, affecting 25% of the population over 65 years of age [1,2]. Valve disorders may be innate as in the case of a bicuspid valve formation or may develop later in a lifetime as the leaflet calcification. The aortic valve separates the left ventricle from the aortic vessel and consists of three half-moon-shaped leaflets and three slot-like sinus cavities on the aortic root. The valve leaflets are the most dynamic structures in the valve, and the sinuses are the gaps corresponding to the back of the leaflets. Aortic valve leaflets are thin structures that allow the transport of nutrients, oxygen, and waste through diffusion [3]…

Thanks to Marco Evangelos Biancolini for "liking" a post by Ivan Spisso on social media

Ivan Spisso, "The organizing committee is happy to announce the forthcoming Summer School on Computational Fluid Dynamics & SuperComputing, to be held at the Gran Sasso Institute, L'Aquila (Italy) from July 17th to July 22nd, 2022."



First Summer School on Computational Fluid Dynamics & SuperComputing, July 17-22 2022 - GSSI - L'Aquila (Italy - The School is a fully in-person event.

The aim of the school is introducing participants to modern concepts in computational fluid dynamics, with special reference to implementation of high-fidelity methodologies (LES and DNS) on massively parallel, heterogeneous supercomputing platforms, including both CPUs and GPUs.

Courses will be given by internationally recognized scientists, and will include coverage of a broad range of topics as turbulent, multi-phase and compressible flows, also in the presence of geometrical complexity, as well as advanced notions about emerging computer paradigms. Each lecture will be accompanied with dedicated tutorial hands-on sessions, relying on use of remote HPC clusters.

The course is mainly targeted to PhD/post-doctoral researchers, but early-stage researchers will also certainly benefit.

Agenda & Organizers

Day		Date	Topic
1	Sunday	17th July 2022: Afternoon	Welcome and key-note presentation
2	Monday	18th July 2022: Morning	Introduction to HPC infrastructures
3	Tuesday	19th July 2022	Multi-phase flows
4	Wednesday	20th July 2022	Simulations of transition and turbulence
5	Thursday	21th July 2022	Compressible flow
6	Friday	22th July 2022	Immersed boundary methods

Thanks to MDPI for open access and Nishant for brining it to our attention

A two-dimensional machining model and a full-scale three-dimensional machining model are developed in this work using Ansys LS-DYNA® software.

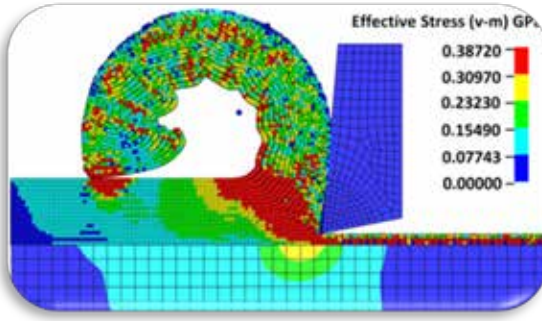


fig 7 Simulation chip profile by 2D machining model

A Realistic Full-Scale 3D Modeling of Turning Using Coupled Smoothed Particle Hydrodynamics and Finite Element Method for Predicting Cutting Forces

Nishant Ojal, Kyle T. Devlugt, Adam W. Jaycox
Precision Systems & Manufacturing,
Lawrence Livermore National Laboratory, Livermore, CA, USA
Ryan Copenhaver, Tony L. Schmitz
Dept. of Mechanical, Aerospace, & Biomedical Engineering,
The Univ. of Tennessee, Knoxville, TN., USA
Harish P. Cherukuri
Dept. of Mechanical Engineering & Engineering Sci.,
The Univ. of North Carolina, Charlotte, NC, USA

Abstract

Computational modelling is an effective technique for understanding the complex physics of machining. Large deformations, material separation, and high computational requirements are the key challenges faced while simulating machining. **This work introduces a full-scale three-dimensional model of turning operations using a combined approach based on the Smoothed Particle Hydrodynamics (SPH) and Finite Element (FE) methods.** By exploiting the advantages of each method, this approach leads to high-fidelity coupled SPH-FE machining models. Cutting forces and chip morphology are the primary results of interest. The machining models are validated with the results of turning experiments. Two-dimensional machining model underpredicts the cutting force and feed force by approximately 49% and 70%, respectively. Moreover, passive force cannot be predicted using the two-dimensional model. On the other hand, with the three-dimensional models developed in this manuscript, the difference between the total simulated force and experimentally measured force is ~17%. The chip morphologies correlate with experiments in terms of the direction of the chip movement and the “long” continuous chips observed while turning Al 6061. This work expands the realm of machining simulations from two-dimensional orthogonal machining or sectional three-dimensional model to a full-scale realistic simulation. The encouraging simulation results show the potential to study more complex phenomena, such as machining stability and tool path modulation.

Excerpt 1. Introduction - With technological advancement, there is an increasing demand for high-quality products at low manufacturing costs and better process efficiency that requires a comprehensive study of the processes involved in manufacturing. Machining is one of the most common manufacturing operations to process raw material into a finished product. Understanding the complex physical phenomena occurring during machining is important for enhancing the product quality and reducing the operating cost…

Please read the full paper on the MDPI Website

		
I LOVE the little white calf DARE to be Different!!	I thought the squirrel, I call Dinky, had his head stuck in the feed bag - I walked up to save him. He pulled his head out of the bag and he gave me a look, "Hi Gramma, I was eating breakfast."	He didn't even take his little foot out of the bag! Then he just went back into the bag to eat. I'm supposed to be alpha! My animals just ignore that fact.

Yesterday I heard Don yell to me from the kitchen, "Why do you have a Turkey on the roof of your car?"

I wanted to answer, "Honda gives you a free pet turkey with every Pilot, and he was just delivered!"

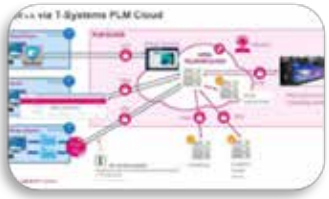
I ask all of you, HOW AM I SUPPOSED TO KNOW WHY THERE'S A TURKEY ON THE ROOF? (Sorry for yelling)

I told Don that I had no idea why a turkey was on the car - then I got a lecture about paint scratches, turkey droppings, buffing car roofs. Neither of us chased the turkey so he would not scratch the roof.

Why do you need to tie the shoelaces on your work boots? I go out to my truck to feed the "wild" critters. Put my hand in the bin, see something move, think SNAKE, jump back, trip on a shoelace, land on my butt! Don runs out with his snake-shot pistol. A) He can't shoot into a bin in my darn truck! B) it turns out it wasn't a snake in the bin C) HOW is it my fault it was only a mouse? A cute little mouse - Don put on gloves, picked it up, moved it to the garden at the other end of the property, then proceeded to lecture me about tying shoelaces on work boots before going out to do chores.

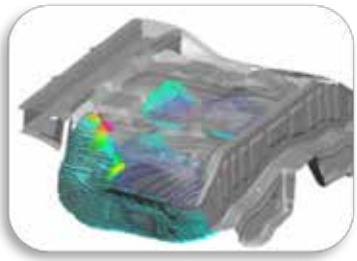
Tutorials

OASYS - animations of analyses in Oasys D3PLOT and Oasys REPORTER



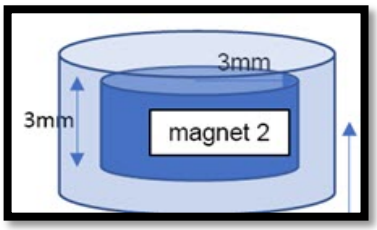
M.Schenke (DYNAmore GmbH)- DynaXtend - Flexible and short-term LS-DYNA software and hardware lease

- ARUP - Oasys PRIMER Crash Test Setup

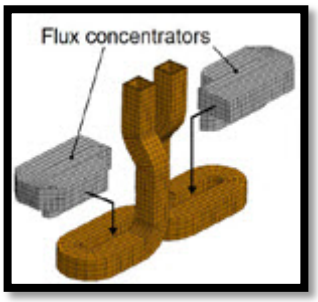


Oasys LS-DYNA Environment - Introduces the ALE solver in LS-DYNA for modelling FSI and other problems

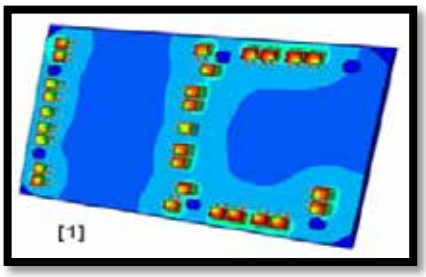
Papers



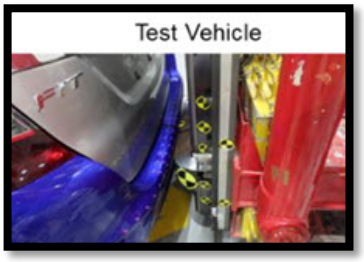
PDF - T. Nguyen - Magnet Dynamics using LS-DYNA



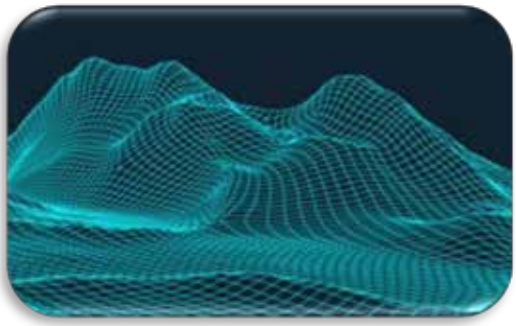
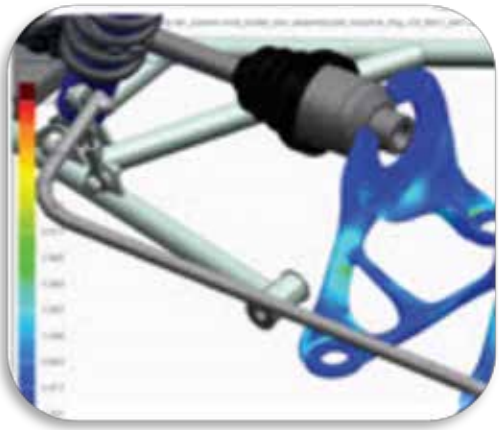
PDF - M. Duhovic - Applications of the new magnetostatic solver/ AMS preconditioner in LS-DYNA®

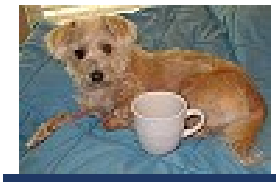


PDF - M. Morak - Modeling and Simulation of the long-term Behavior of Thermoplastics in LS-DYNA



PDF - CASE STUDY – Material models for depiction of unloading in low speed crash applications

	04/25/ OmniQuest - Multi-start Optimization in ILIAD – Part 1: The Nested Workflow Approach
	04/18/- Curt - ANSYS - (video on website) CEA Aims to Democratize Space by 3D Printing Rocket Engines
	04/11 - OmniQuest - Accounting for Uncertainty in Optimization
	04/04 - Siemens - N. Finberg Lightning fast and durable printed parts

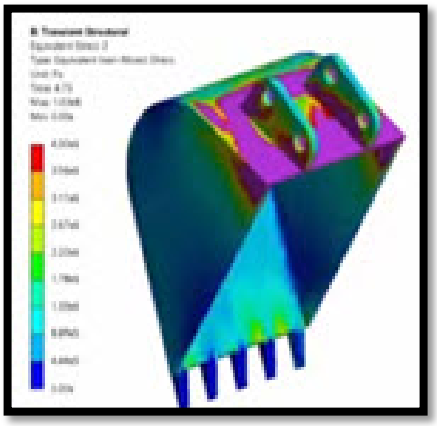


YES, it is Lego Flavor Coffee Day! Or we can use them to make coffee cups and smash them into each other! OR, as someone yelled, "We can skip your blah, blah and go to YouTube!"

DYNAMORE - The Lego Challenge

Ameen Coffee Week~ Always interesting videos. We have a bus, this week named Yildiz, to take us all to YouTube. We call the bus watch and learn Cofee Day Yildiz Tech Univ. Bus. Yes, I agree that the name was a tad long!

Ameen Topa - Part of a collaboration with Yildiz Technical University, Turkey.
Radome Structure: Meshing Impact Zone and Coarse Zone



Our new coffee scoop? Okay, I heard someone say, "That reminds you of a coffee scoop?" Well, then hop into the bucket and let's travel to YouTube! And remember most things remind me of coffee!

Rocky DEM - Excavator bucket simulation: Rocky DEM

My Virtual Travel Outing

Thank you for joining me on my visit to this month's museum. I visit a new museum every month.

We are heading to **Motorcar Museum of Japan**. English so you will have a great tour on their website.

Because Japan is home to quite a few car manufacturers, there are many museums in Japan that display automobiles.

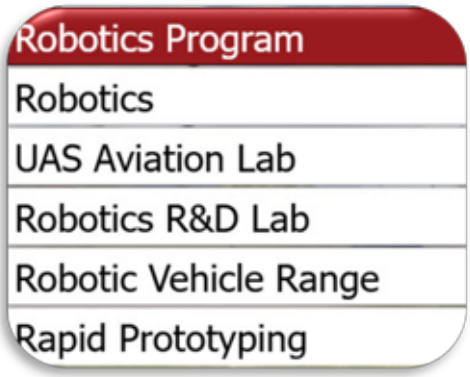
The Motorcar Museum of Japan stands out among these as the country's oldest and largest automobile museum, boasting more than 500 cars on permanent display.

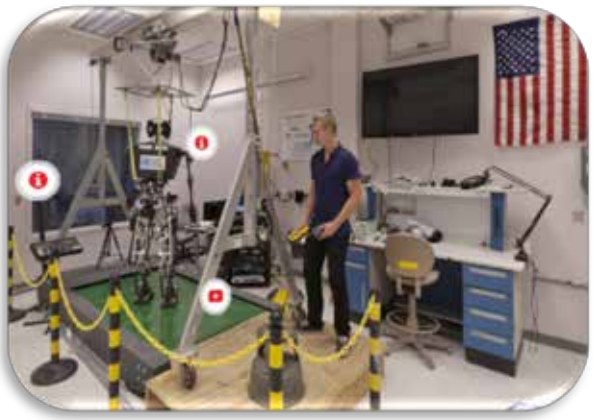
This museum was established in 1978 by Shoso Maeda, a local entrepreneur, mainly as a way to display his personal collection of cars. He also served as its first curator, and dedicated himself to collecting and displaying a wide range of domestic cars, based on the principle of "preserving the wisdom of pioneers for future generations—always remember, learn from, and better understand their achievements, both domestically and internationally

Sandia Robotics

Thank you for joining me on my visit to Sandia National Laboratory located in the US

Take a virtual look inside the facilities where the research, design and testing take place - Sandia's High Consequence Automation & Robotics group is a world leader in developing robotic solutions to respond to high consequence challenges that impact national security. In addition to decades of experience developing and delivering complex automated systems of every size and multitudes of applications, the group brings a unique integrated approach to developing system software and information architecture, automated planning and programming, and sensor- and model-based control for intelligent systems.





CONVENTION CENTER - Exhibit Hall Poster Board

MAY

Welcome to our Convention Center exhibit hall & Coffee Cafe. Coffee, of course vanilla, hazelnut, and other flavors are courtesy of our favorite coffee shop (not the rival coffee shop).

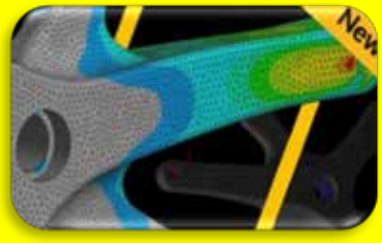
Poster Board area is on the internet, news, or Social Media Posts Not To Miss

Thanks to Kathleen Fritz of DYNAmore

Autoliv - 'Motorcycle Rider Model For Injury Prediction. This is a 3-year project' with Chalmers tekniska högskola, MIPS and BETA CAE Systems. A collaborative initiative to enhance the SAFER human body model in predicting injuries sustained by motorcycle riders in crashes.

DYNAmore France - we are happy to be partners and platinum sponsors of CSMA the15th National Conference on Structural computations

We welcome you to visit with us at our DYNAmore France booth.

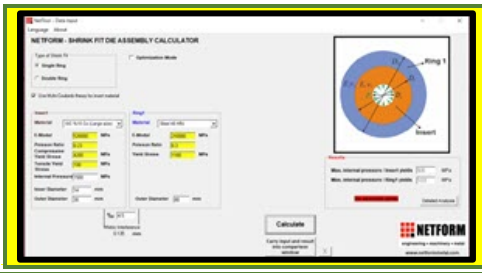


Thanks to Sean Harvey Principal Engineer at Ansys

Another free Ansys Innovation Course is now Available! This course is titled Reviewing Results - Validation and Insight Using Ansys Mechanical A critical aspect of engineering simulation is the proper evaluation of the results. In this course, we cover Validating and Verifying the Model Setup, understanding which Stress Measure to Use, and Analyzing More than One Design. Enjoy!

Applus+ IDIADA designated as laboratory for the certification of electric scooters

Applus+ IDIADA has recently been designated as a laboratory to certify Personal Light Electric Vehicles (PLEV). **To date, Applus+ IDIADA is the only official accredited laboratory in Spain.**



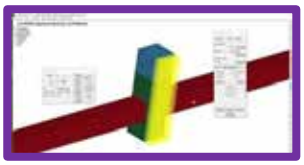
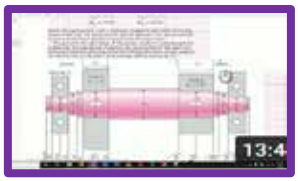
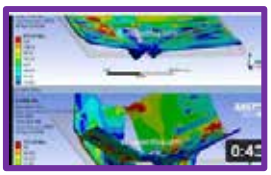
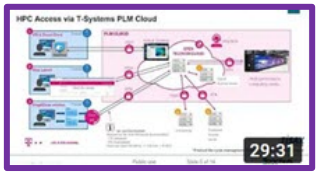
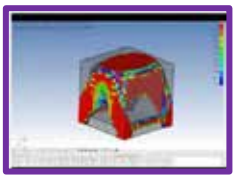
NETFORM Engineering - With the help of **NetTool, developed by NETFORM Engineering,** stresses on a prestressed forging die with one or two stress rings can be calculated and interference values can be optimized. Stress distribution on the prestressed tool system can be compared using different diameter and interference values as input; maximum internal process pressure limit can be calculated.

CONVENTION CENTER
YouTube Booths

May

Current videos
from our booth visits:
On April 22nd

Free Coffee for
visiting our exhibitors

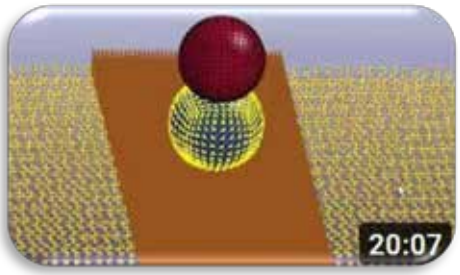
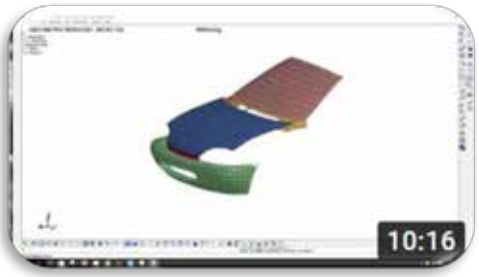
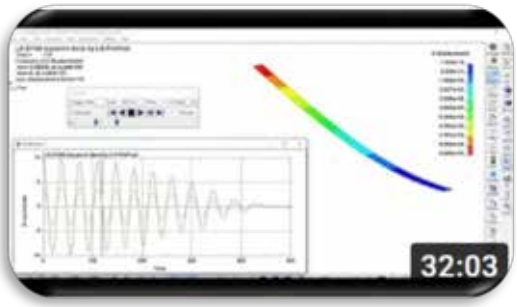
Ameen Topa			BETA CAE
ANSYS			Oasys LS-DYNA
Ozen Engineering			R.P Santiago
Expert FEA			DYNAmore
ETA			LURI Engineering
MEETING ROOM			APPLUS+ IDIADA

If you have a YouTube Channel, send us the URL feaanswer@aol.com
Simulation videos for consideration should be minimum 10 sec long

Research Scientist at Universiti Teknologi PETRONAS

"On my YouTube Channel you will find tutorials and engineering content. Below are a few of the tutorials."

Tutorials

	**LS-DYNA Tutorial: Model Editing**
	**LS-DYNA Tutorial: Carhood Editing**
	**LS-DYNA BASIC TUTORIAL: Thermal Tutorial**
	**LS-DYNA TUTORIAL 6: Springback Simulation**

Curt Chan, Hover Cars Podcast Host

"Thank you for joining us and listening to the podcast episodes. The podcasts are brought to you by myself, Curt Chan, and Josh Poley, with Mary Kate Joyce as your third podcast host."

(Although Curt, Josh and Mary-Kate are employees of Ansys, their views do not represent those of Ansys.)

Hover Cars and Hard Problems podcast discusses the engineering problems of today and the future.

The days of tackling getting better gas mileage in the automotive industry is a one-directional approach in our rearview mirror. Now we're challenged with improving safety and autonomy and communicating with other automobiles or collecting data to help evolve the transportation industry.

Available Podcasts: Join us for this new series - Podcasts will be added every two weeks

To Digital and Beyond	Secrets of a Tech Leader
A Curious Case of Jane Trenaman	Simulation and Autonomy
Muscle Cars and Modeling	

Since the dawn of time, dreamers have imagined our future, and engineers have brought these visions into reality. But it's much easier to imagine all wonderful things than it is to make them happen or to predict the future at all. Today, many of our daily gadgets and technology were unimaginable just a few years ago. And yet, things predicted 70 years ago that seemed obvious next steps still elude us today. Having a computer in your pocket seemed unobtainable yet driving to work in your hover car was almost a foregone conclusion.

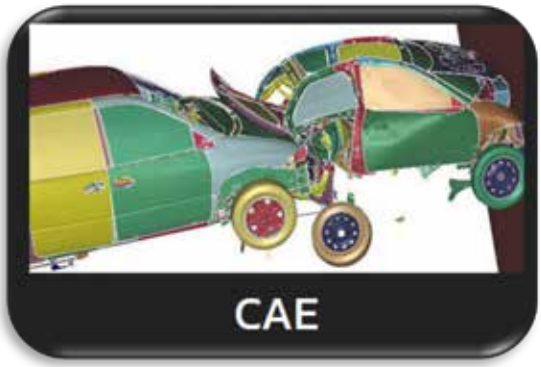
But why? We don't all drive hover cars because the technology challenges are more complex than we realized. It is a challenging problem, even by today's standards.

And the number of hard problems is growing. New revolutionary technologies are being invented, causing everything to become more connected and more complex. New creations create even more complicated, hard problems to solve.

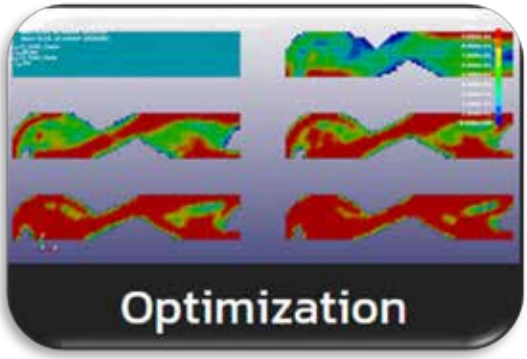
Jenson Chen - Dyna Forming Engineering & Technology DFETECH

DFETECH is an engineering firm established since 2005 to provide advanced engineering solutions to industries ranging from automotive and aerospace to electronics, consumer products, civil engineering and defense. Our expertise includes CAE, modern stamping engineering, dimensional engineering and variation prediction.

Among the produces we offer, have training and use in our consulting.



- ANSYS
- LS-DYNA
- LS-PrePost
- LST Dummies
- LST Barriers
- Inventium
- PreSys
- VPG
- THUMS

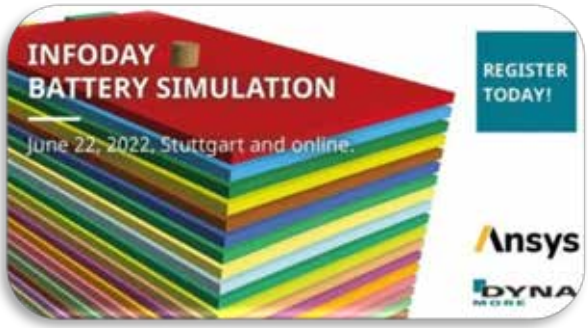


- ELSDYNA
- LS-Opt
- LS-TaSC
- Genesis
- GSAM/GSTAM
- VisualDOC

- ODYSSEE
- Lunar
- Quasar`

Kathleen Fritz - DYNAmore GmbH

"We, Ansys and DYNAmore, welcome you to Battery Simulation Infoday. Join industry professionals, engineers, and interested parties covering today's challenges, successes, and future developments while discussing battery simulation."



Ansys and DYNAmore invite you to **the first hybrid information day on battery simulation.** The focus will be on the current possibilities in the field of battery simulation as well as future developments.

The event (free of charge) will take place on **June 22, 2022 in Hotel Pullman Stuttgart Fontana and online from 9:00 am to 5:00 pm.**

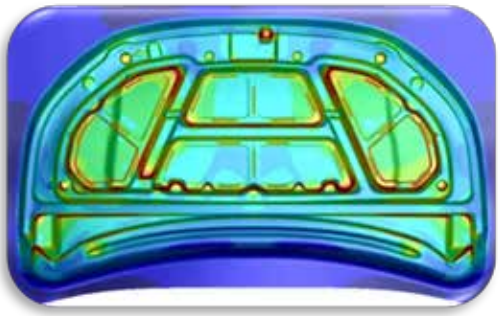
The complete Agenda can be found on the website. **Below are a few highlights not to miss**:

Welcome	**Maik Schenke**	DYNAmore GmbH
Overview on how Simulation helps in Battery development and Integration	**Maik Schenke** **Rolf Reichelt**	DYNAmore GmbH, Ansys Inc
Lithium-Ion Batteries in Thermal Runaways	**Nils Karajan**	DYNAmore GmbH
Thermal Abuse Simulation in a Battery	**Rolf Reichelt**	Ansys Inc
Mechanical Modelling of Lithium-Ion Pouch Cells	**Alexander Schmid**	TU Graz
Multi-physical characterization and simulation of battery cells for predicting abuse scenarios	**Martin Schwab**	4a Engineering
Car Battery Modelling and Integration for Crash	**Stanislaw Rybak**	EDAG Mechanical
Better Battery Management via System Simulation	**Rolf Reichelt**	Ansys Inc.
Wrapping up and Farewell	**Maik Schenke**	DYNAmore GmbH

Venue - The hotel Pullman Stuttgart Fontana is conveniently located directly at the train station of Stuttgart-Vaihingen. With the S-Bahn the city center and the airport can be reached in a few minutes. The hotel is also very easy to reach from the A8 freeway. Parking is available at the hotel for a fee. Participants of the info day can also park in the underground parking of the DYNAmore Headquarters. DYNAmore is only a few minutes walking distance from the hotel.

Marisa Melchiorre -- Ansys

Ansys Forming - a streamlined, end-to-end workflow and the fastest solve time for methods and die shop engineers. There's also an added level of security with the software backed by the trusted solver, Ansys LS-DYNA.



EXCERPT - **Ansys Forming Provides a One-Stop Shop for Metal Stamping**

Engineers across the metal stamping industry may now be able to take an extended lunch. Ansys has just released its first metal stamping simulation software, an all-inclusive product that meets multiple industry needs within a single platform, slashing time and costs.

Sheet metal processing or fabrication is used in a wide scope of industries from automotive, aerospace, and electronics to construction, medical, and more.

Forming, also referred to as metal deformation, is a set of fabrication processes that manipulate the metal without cutting it. There are a number of forming processes, including bending, stamping, and spinning, and each can be used for tasks like flanging or hemming. Essentially, any manufacturer or construction company converting slabs of sheet metal into functioning parts is engaged with some form of sheet metal processing. Yet physical prototyping during the meticulous sheet metal fabrication process is time-consuming and costly, with challenges frequently arising.

Ansys Forming greatly reduces all of these woes, allowing you to simulate, digitally design, and validate every step of the sheet metal forming process with speed and accuracy. It provides a streamlined, end-to-end workflow and the fastest solve time for methods and die shop engineers. There's also an added level of security with the software backed by the trusted solver, Ansys LS-DYNA.

Stamping Out Challenges with Ansys Forming - Formability, surface defects, and springback are just three of the top challenges facing engineers in the sheet metal processing industry. Like its name suggests, formability involves the ability of sheet metal to be formed without imperfections like buckling, wrinkling, necking, or cracking.

Surface defects may include any of the above-mentioned nuisances or just unevenness, which is an equal hindrance to design and often occurs due to the misuse of the stamping die, or tool, used to shape the metal.

Springback is possibly the most frustrating pain point because it happens after the forming process is completed due to the elastic recovery of bent parts. This means that even after you complete the task and your metal is in the form you wish, it can snap back toward its original shape if you don't account for the springback factor. The springback factor is the number of degrees that the metal will likely "spring back" and is traditionally calculated by performing test bends….**What's more, you don't have to be a finite elements analysis (FEA) expert to run simulations in Ansys Forming.**

With an intuitive and easy-to-use graphical user interface (GUI) you can effortlessly setup your simulations, monitor your jobs, and analyze your results with many parameters predefined for straightforward selection.

Rasmus Schutzer - DYNAmore Nordic AB

"It is with great pleasure we invite You to the Nordic LS-DYNA Users' Conference. The conference language is English. Keynote presentations will be held in English."

Nordic LS-DYNA Users' Conference 2022 will be held 18-19 October 2022 in Gothenburg, Sweden.

On October 18-19, LS-DYNA users from the Nordic countries, the Baltic states and the rest of Europe will meet at The Swedish Exhibition & Congress Centre (Svenska Mässan) in Gothenburg. Participation is free of charge but you must register your participation in the conference via link below Register to conference.

The central part of this event is the user presentations about the software and its usage. This event is an ideal forum to discuss your experiences on LS-DYNA and LS-OPT with other expert users in simulations of complex mechanical problems.

The conference will provide a great opportunity to share and discuss experiences, to obtain information on upcoming features in LS-DYNA, LS-OPT and LS-PrePost and to learn more about new application areas. For further information please klick on Call for Papers on link below.

If you have any questions, please contact us using e-mail: conference@dynamore.se

- In order to make the most out of these conference days we kindly ask for your cooperation and encourage you to make an oral presentation, where you talk about your experience in CAE and using simulations to facilitate your work, improve quality, reduce cost, research and any other exciting areas you may use simulations for.
- The presentation should be no more than 20 minutes and we would like to receive a short abstract of your topic for organisational purposes.
- Abstract should be submitted no later than May 20.
- Please send us your abstract using the link on our website noted above.

In addition to interesting presentations we also invite you to attend the conference dinner in the evening of the 18th. You must pre register your attendance via link Register to conference below.

Important dates

- Abstract submission: 20 May 2022
- Author notification: 7 June 2022
- **Register to conference: 16 September 2022**
- Conference date: 18-19 October 2022

For more information visit our conference page - We look forward to meeting you in Gothenburg.

Dr. Tarık ÖĞÜT, Chairman of MILMAST

MILMAST is an 'Engineering and Technology Design Company', manufacturing carbon composite / aluminum Telescopic Mast Systems, and Military Trailers.

Excerpt - Read the complete Interview with Dr. Tarık ÖĞÜT, Chairman of MILMAST
By Armada International

What would you like to share about the establishment of MILMAST and FİGES?

I founded **FİGES** as soon as I returned from abroad in 1990. The focus of our company is to design and manufacture products that are not made in Turkey by using numerical mathematical methods and computer technologies in various disciplines of physics. In addition, we provide R&D services by using related software and hardware to companies that want to progress in these goals. These activities are called Computer-Aided Engineering…**These activities are strategically important for Turkey to become more vital by developing products with high added value and an R&D culture.**

MILMAST company emerged from the needs of our defense industry, especially ASELSAN. First, we listened to our customer's needs, learned what kind of product they wanted, and immediately started to work. We did not request any R&D funds from our customers or other sources, and we used our resources to progress rapidly. We manufactured the prototypes and subjected them to various environmental tests according to MIL-810 standards. Our development process continued for approximately two years…

MILMAST Website

Telescopic Mast series Excerpt - General Features - all Telescopic Mast series comply with international MIL-STD-810G, MIL-STD461F, MIL-STD-1472G and MILSTD-973 military standards and perform their duties smoothly in the toughest environmental conditions. We thrive on engineering challenging masts and strive to exceed our customers' expectations. From the initial quoting process, through the platform integration, to the final close out process, our team works as your partner to ensure the highest level of service.

Key Features	**Product Series – Usage Areas**
* Electro – Mechanical Carbon – Fiber composite MAST Systems * Conforming to MIL-STD- 810G * Extended Height Between 3-20 meters * High Payload Capacity * Robust Design * Lightweight and Compact Design * Compatible With Sloping Lands * Silent Operation * Special Design for Low Bending & Displacement * Rapid Deployment and Easy Integration	* Heavy Duty Operations (SDO): * Search and surveillance * Electronic communication and warfare * Target acquisition devices * Weapon turrets * Sensor and radar systems * Fire extinguishing applications

Additional features and information - Visit our website and feel free to contact us

Thanks Pascal Bornet for bringing a great video to our attention

YouTube Video - Black & Veatch Environmental, Safety, Health & Security (ESH&S) team decided to show the impact of falling objects, emphasizing the value of engineering controls such as tool tethering and hazard prevention planning, as well as barricades, safety nets and PPE (personal protective equipment). Protect your melon!

Transcript - Dropped A DROPPED OBJECTs can be a real headache IS MORE THAN JUST INCONVENIENT... however, on site those DROPPED OBJECTS CAN BECOME DEADLY IN AN INSTANT. TODAY WE are going to EXAMINE WHAT CAN HAPPEN TO A PERSON'S HEADs WHEN OBJECTS ARE DROPPED. at different heights and weights - with and without the proper safety gear. THE RESULTS MAY...BLOW YOUR MIND.

WE WILL DROP THREE OBJECTS OF VARIOUS WEIGHTS, FROM A HEIGHT OF 30 FEET, WITH AND WITHOUT PROPER PROTECTIVE GEAR, ON OUR UNSUSPECTING WATERMELONS.

At Black & Veatch we take safety seriously. To make sure the experiment is in a controlled environment the team has constructed a safety cage around our unsuspecting watermelons and a tube to ensure a controlled path for the dropped objects, and as always the right personal protection equipment.

OUR FIRST OBJECT TO DROP IS A STRUCTURAL BOLT. FALLING FROM 30 FEET, THE ONE POUND BOLT WILL HAVE AN IMPACT OF ALMOST 3,000 POUNDS OF FORCE

"Alright, ready to start? Clear? We're good. Three, two, one…"

"We dropped a one-pound bolt and you can see it basically sheared off the watermelon's face"

NOW WITH A HARD HAT.

"Three, two, one, dropping. Whoa! Sounded like a gunshot!"

"Hey, look at that. We've got some damage here where his neck would be."

THE NEXT OBJECT TO DROP IS A 4-LB SLEDGE HAMMER. FROM A HEIGHT OF 30 FEET, IT WILL NOW HAVE AN IMPACT OF AROUND 11,500 POUNDS OF FORCE

"Three, two, one, dropping… Wow!"

"I mean, look at all the guts that came out, or all the brain matter. You can't pick it all up!"

SAME SLEDGE, SAME HEIGHT, NOW WITH THE PROTECTION OF A HARD HAT.

“Three, two, one… Whoa! Would you look at that! That sound really sends chills to my bones”

“Minor scuffs and everything on the outside of the melon, but the back side, split up the middle. And the support, the neck pushed all the way up. And you can see here the deflection, the sledge bigger surface area so the hard hat, lots of gooey skin in there.”

THE FINAL OBJECT TO DROP IS A PIPE WRENCH. AT 6-LBS, FROM A HEIGHT OF 30 FEET, IT WILL HAVE AN IMPACT OF ALMOST 17,500 POUNDS OF FORCE

“Three, two, one, drop. Look how clean that cut is.”

“Front side looks good, not so much on the back. The wrench, even though it’s heavier hasn’t been doing as much damage. It must be the shape of the tool. It’s still going to do something to someone. The sledge hammer has a bigger circumference.”

AGAIN, WITH A HARD HAT

Wow. That hit dead center.”

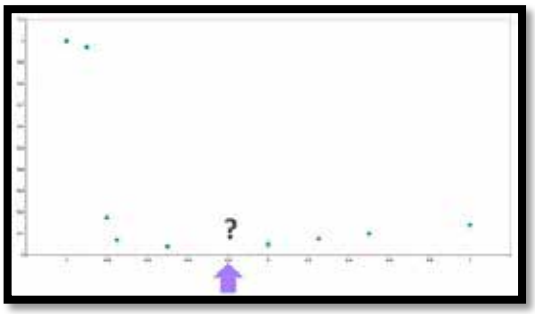
"Oh, lots of brain mush. This is actually almost an inch deflection in the top and then if you flip it over in the suspension, you can see it’s completely covered in matter. No amount of PPE (personal protective equipment) that you’d use in this situation would help. That’s why we have engineering controls. PPE, last line of defense.”

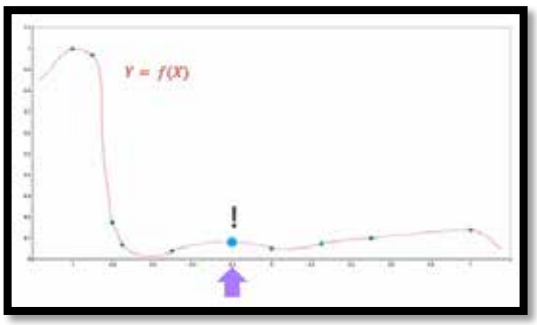
“How many thousands of these do we put up on a project? Think about our other projects, we’re going 100 feet up. It makes the requirements for cause everything is a little inconvenient at times but this really strikes home just why that stuff is so important, and work place cleanliness is a critical factor in safety”
“Absolutely”

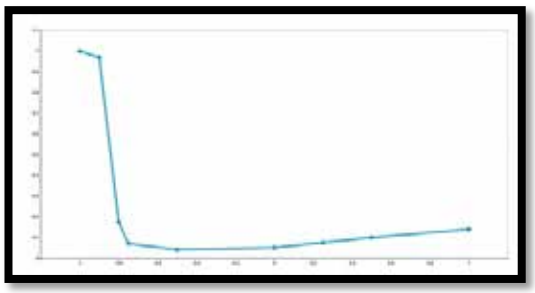
“Don’t be like this melon. Protect your melon.”

Bing, d3View - "It is not unusual that due to various limitations, researchers can only collect limited number of samples. Meanwhile, for many analyses, we desire a higher resolution. In two-dimension case, we have X and Y coordinates of our points."

Excerpt







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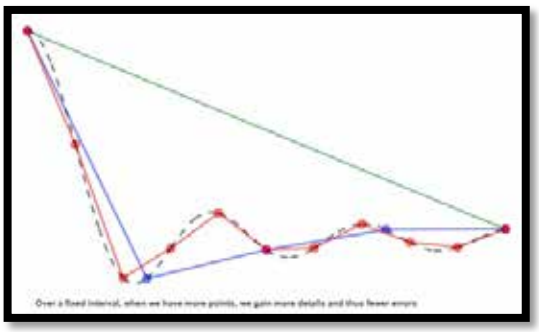


[Interpolation methods for time series data](#) **-** We are interested in what happens in between any of the two points. We can draw a curve passing through these points to describe the relationship between X and Y values. With such a curve at hand, we can estimate the unobserved values in between any observed points. From this perspective, we consider interpolation as a procedure of looking for a function to describe the relationship between X and Y and using this function to estimate the values at any location.

Linear interpolation - Linear interpolation is the most straightforward and commonly used interpolation method. It comes naturally when we have two points, we connect them with a straight line to fill out the missing information in between. By doing so, we made our assumption that the points on the line represent the unobserved values. When there are more than two points, we simply connect any pair of adjacent points with straight lines. This is piecewise interpolation in the sense that on each subinterval formed by two adjacent points, we use a different line segment to represent the missing values. It is possible that all the points lie on the same line, but we still go through the procedure of connecting every individual pair of points

Linear interpolation works the best when we have many points. When there are more points, drastic change in values of two adjacent points is less likely. Imagine the route from work to home. We can use one point to represent the workplace and one for home. When we connect them and claim that's our way home, we are missing a lot of details. If we take a point for every mile, we get more details. But we may still miss a U-turn. Instead, if we take a point every 10 yards, our route is much less likely to miss anything major like a U-turn (even when we do miss, the error is much less) and any two adjacent points will have more similar values. Some discrepancies in between any two adjacent points are small and thus can be ignored. This is also why the linear interpolation is the default method for visualizing discrete data points.

When we have fewer points, the pursuit for higher accuracy prevails. And the errors between the interpolated values and their true values have a larger impact on the analysis. Thus, more interpolation methods are created in order to meet such demands. **Complete Information on website**

CONVENTION CENTER
Booth - Luri Engineering

May

Fabian Leonov S. López - CAE Engineering Manager/COO
LURI Engineering México Automotive/ Structural Analysis FEA
Ask if you are interested in learning more- leonov.lopez@luriengineering.com.mx

Did you know that we use the Genesis® Tool with which we perform structural optimization?

Genesis® Structural Design Optimization Software

Ask for your demo and quote!

leonov.lopez@luriengineering.com.mx

FE Solver & Scripting

- Linear statics and Dynamics Nonlinear GAP/GLUE/CONTACT
- Composite Material Support
- Acoustics
- Heat Transfer Loads
- Fatigue
- Lua Scripting

Structural Optimization

- Weight & Performance
- Direct ANSYS Interface (GSAM)
- Topology Optimization
- Concept Design
- GTAM for ANSYS
- Topography/Topometry/Size/
- Shape/Freedom/
- Mixed Optimization

Modal Test Correlation

- Compare Test Modes and Analytical Modes
- Test Correlation and Sizing Optimization

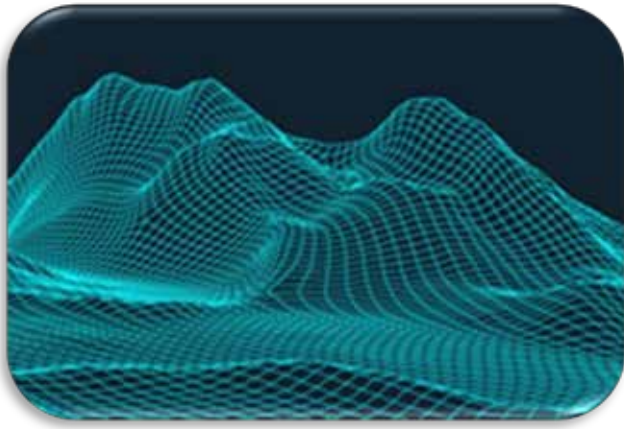
Additive Manufacturing

- Complex Topologies
- Overhand Angle Constraint
- Homogenized Lattice
- Lattice Bar Toolkit

Equivalent Static Loading & MDO

- ESL DYNA interface
- ESL with Ansys and Abaqus (Simulia)

Analysis Includes: Statics, Normal Modes, System Buckling, Heat Transfer, Direct and Modal Frequency Analysis, Random Response
Optimization Includes: Topology, Sizing, Shape, Topometry, Topography, Freeform



Multi-start Optimization in ILIAD – Part 1: The Nested Workflow Approach

By seeking maximum improvement with each iteration, gradient-based optimization algorithms almost always offer design improvement faster than their non-gradient-based (genetic algorithms, simulated annealing, particle swarm, etc.) counterparts for continuous design spaces.

Accounting for Uncertainty in Optimization

Optimization is typically applied to deterministic problems, i.e., a problem in which all variables have an exact value and that can be calculated using fixed mathematical formulas. However, in real life, it is almost impossible to measure the exact values due to several reasons including instrumentation error, manufacturing limitations etc.

Engineers, Assemble!

Design Studio for Genesis® makes it easy to organize your model by letting you create collections of groups/properties called assemblies. Assemblies are non-exclusive – that is, groups may be included in more than one assembly. There are a number of built-in assemblies, such as all PSHELL or all PSOLID or all sizing-designed groups. Design Studio makes it easy to show only the groups in a particular assembly. In the Viewport toolbar, the “Show Assembly” button will pop up a list of assemblies, and the if one is chosen, then only the member groups of that assembly will be shown, while all the rest will be hidden.

Marco Evangelos Biancolini
RBF Morph CTO & Founder - Associate Professor of Machine Design

RBF-Morph

We are happy to announce that our proposal titled "digital twin for human lungs" was accepted for funding in the FF4EuroHPC 2nd call. The funding call targets proposals built around innovation targets arising from the use of advanced HPC.

Digital Twin for Airflow and Drug Delivery in Human Airways

The aim of the project is to create a digital twin of human lungs, that can be used to assess air flow in asthmatic lungs and also paves pathway for patient specific inhaler drug designs. The consortium is led by:

- Dr Shrey Joshi from One Simulations,
- Prof Marco Evangelos Biancolini from RBF Morph/University of Rome (Tor Vergata),
- Prof. Sasa Kenjeres from TU Delft, Dr Simona Celi
- Prof. Cademartiri from FMTG and Gerben Roast from GrepIT.

Digital Twin for Airflow and Drug Delivery in Human Airways

Presentation and Description

Presentation of the problem and objective of the experiment - CFD can be used to assess airflow and improve the efficiency of inhaled drug delivery in human lungs. However, presently this requires patient-specific simulations which can be both costly and time-consuming. The objective of the experiment is to reduce the time scales from weeks to almost real-time and the cost drastically by generating a Digital-twin of the human airway. Once obtained, the Digital-twin resulting from this experiment will be able to reproduce in real-time the airflow in any human airway and inspect the drug delivery process.

Short description of the experiment - The proposed experiment consists of two steps: first, an extensive parametric study of human airways will be executed using advanced HPC to create a database of solutions via CFD. This extensive study will not use the conventional methodology of executing CT scans and cleaning them for CFD, but use a morphing tool based on Radial Basis Functions, to parameterize and adapt a single baseline geometry into new ones. Then, a vast amount of numerical simulations will be used to train the ROM and build the digital twin, allowing to predict flow and drug deposition on any lung geometry and visualize it without having to execute a CFD simulation. Such a tool will be able to provide patient-specific results in real-time and at affordable costs.

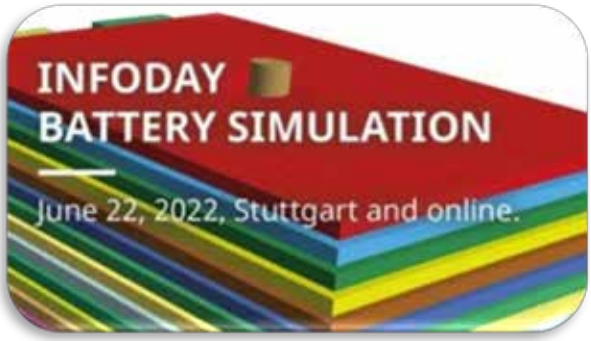
May 17-20 **Crash Analysis**

May 18 ANSYS

June 01 CADFEM Ansys Simulation Conf.

June 20-23 Hexagon

June 22 ANSYS & DYNAmore

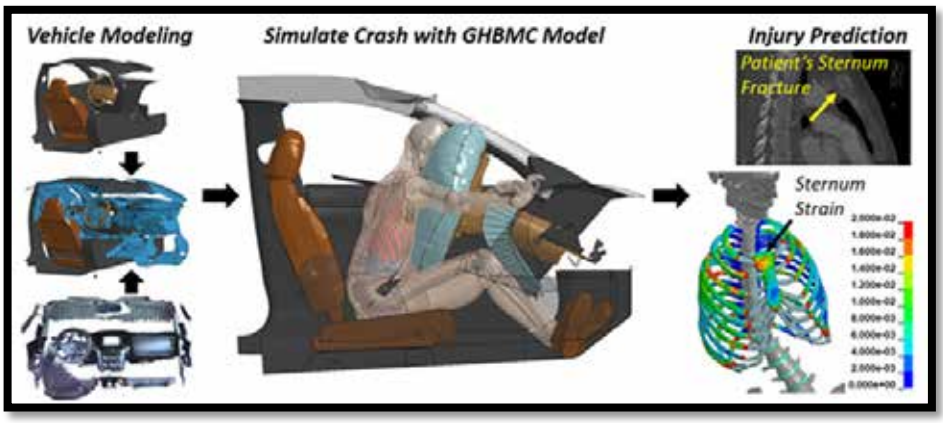


Oct. 11-13 LS-DYNA

Oct. 18-19 LS-DYNA

Nov.16 – 17 Human Modeling

Paper is published at Taylor & Francis Online



Development and implementation of a time- and computationally-efficient methodology for reconstructing real-world crashes using finite element modeling to improve crash injury research investigations

...All case occupants were assumed to be sitting in an upright position at the time of the crash, which was confirmed in the CIREN evidence reports. **Settling was conducted in a 500 ms simulation using LS-DYNA... Application of a 3-point belt restraint was performed in LS-PrePos**t…

Dept. of Biomedical Engineering, Wake Forest School of Medicine, Winston-Salem, NC., USA

"Congrats to Casey & team, for this paper on virtual reconstruction of Crash Injury Research & Engineering Network (CIREN) cases."



Casey Costa Ashley A. Weaver Joel D. Stitzel

- Fang-Chi Hsu, Dept. of Biostatistics & Data Science, Wake Forest School of Medicine, Winston-Salem, North Carolina, USA
- R. Shayn Martin, Dept. of Trauma Surgery, Wake Forest Baptist Health, Winston-Salem, North Carolina, USA
- Anna N. Miller, Dept. of Orthopaedic Surgery, Washington University in St. Louis, St. Louis, Missouri, USA
- James P. Gaewsky, Elemance, LLC, Clemmons, North Carolina, USA

Figure 1. Rigid transformation of the simplified vehicle model to approximate the case vehicle shell geometry.

Abstract - Eleven Crash Injury Research and Engineering Network (CIREN) frontal crashes were reconstructed using a novel, time-efficient methodology involving a simplified vehicle model. Kinematic accuracy was assessed using novel kinematic scores between 0-1 and chest injury was assessed using literature-defined injury metric time histories. The average kinematic score across all simulations was 0.87, indicating good kinematic accuracy. Time histories for chest compression, rib strain, shoulder belt force, and steering column force discerned the most causative components of chest injury in all cases. Abbreviated Injury Scale (AIS) 2+ and AIS 3+ chest injury risk functions using belt force identified chest injury with 81.8% success.

Excerpt Introduction - Finite element (FE) human body models (HBMs) have been developed as cost-efficient supplements to physical tests for investigating injury risk and motor vehicle crashworthiness at a level of detail difficult to achieve in laboratory tests (Iwamoto et al. 2002; Shigeta et al. 2009; Xu et al. 2018). Though these models have been extensively validated using data from controlled laboratory test environments, reconstructions of real-world crashes using HBMs offer valuable opportunities to compare kinematics and injury predictions against real-world crash, occupant, and injury data (Golman et al. 2014). They can also be used to supplement real-world crash investigations. The Crash Injury Research and Engineering Network (CIREN) investigates injury causations and mechanisms in real-world crashes using post-crash vehicle inspections, medical records, and police records (NHTSA 2021). CIREN eligibility is limited to occupants with severe injuries and vehicle models newer than 7 years old. Eligible occupants are enrolled by a medical center (MC) team, who compiles pertinent police, crash, medical, and radiology records to code the occupant's injuries using the Abbreviated Injury Scale (AIS). An engineering center (EC) team then develops BioTabs, a method for documenting injury causation, for each AIS-coded injury. A BioTab consists of three things: (1) an injury causation scenario (ICS) that details the source of energy, (2) the involved physical components (IPC) contacted by the occupant, and (3) the regional injury mechanism (Schneider et al. 2011). Physicians and engineers from both centers then meet for a final case review to reach a consensus for each BioTab.

Previous studies have reconstructed CIREN crashes using FE modeling (Belwadi et al. 2012; Golman et al. 2014; Danelson and Stitzel 2015), but were often limited by the scarcity of full-scale FE vehicle models. Iraeus and Lindquist (2016) addressed this common limitation by developing a simplified vehicle model representative of a range of vehicle interiors…

Among the Research of the Department of Biomedical-Engineering:

- **Global Human Body Models Consortium -** A multi-center, global effort to develop state of the art virtual human models for improving safety in transportation in automotive, aerospace and military applications and addressing the emerging challenges of the autonomous vehicle paradigm shift.
- **Virtual Human Models -** Human body model customization to account for aging, osteopenia, sarcopenia, and anthropometry to improve spaceflight and automotive injury risk prediction.
- **Injury Biomechanics for Soldiers -** With one goal to lay the long-term foundation for the prevention, diagnosis and treatment of veterans returning from Iraq and Afghanistan with blast-exposure injuries.
- **Regenerative Medicine for Soldiers** - The wounded warrior tissue engineering/regenerative medicine program.
- **Head Impact in Sports** - The groundbreaking Imaging, Telemetry and Kinematics Modeling (iTAKL) study that provides ongoing information to track exposure of youth football players for head impacts and concussion.

Graphics Courtesy of Vecteezy

Goodbye and Come Back Soon

QUIZ Credit - Correct Answers A-C - you are served chocolate ice cream!
Correct Answer D you are served candy - lots and lots of candy

A - A restored Bleriot XI
B - Super Constellations
C - The Ukrainian Antonov An-24
D - The DC-8

Our Town Salutes our US military and the military of friends of the US.