FEA - CAE Not to Miss & More

MAY 2025 ISSN 2694-4707

Town Hall Meeting in the town that mostly exists
Town Plaza: Drive slowly – Galloping Prohibited

Airport - Lockheed

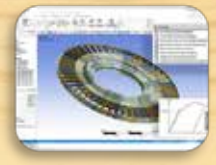
Airport - THK

Auto – Mercedes

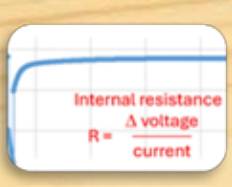
Racer - Scuderia

Marco - RBF

Madhukar - CADFEM



Metin - OZEN



Curt - AUTODESK

Axel - LLNL

DYNA3D
impact/legacy

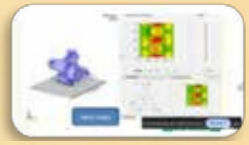
Marta – OASYS

UK Users'
Conference

Claire - Employment

ANSYS
LS-DYNA

Jenson – DFE Tech



Brianna - LLNL

NCBI
BLAST nt

Jeff - SIEMENS

Brent – GOENGINEER

Trina - RESCALE

Legal - the shortened version (it was too long to read)

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Editors: Anthony, Art, Marnie, Marsha, Sabyl

Town Pretend to be Editors:

The Old Rancher	No one in town knows his name. You yell "Hey, Old Rancher."
The Old Pilot	No one in town knows his name. You yell "Hey, Old Pilot."
The Old Racer	No one in town knows his name. You yell "Hey, Old Racer."
Racer's Daughter	The whole town knows her name. You yell "HEY, Slow down!"
	They are all family - strange family

Names, & characters of AI visitors and AI editors are the products of imagination. Any resemblance to actual persons, living or dead, or actual events is purely coincidental.

We will always remember

FEANTM Town Always Salutes:

- Our US military, NATO and Friends of the US & NATO - First Responders, Police, Fire Fighters EMT's, Doctors, Nurses, SWAT, CERT Teams, etc.
- We salute engineers, scientists, developers, teachers AND students because without them we would not have technology.

USA & allies of the USA

Parking & Coffee are free.

R & D - Camping - Town Map

Horse Trail → Yield right of way to horses

R&D Technology Business Park

RV CAMPING
Park in any vacant camping site

CADFEM · OFETECH · d3VIEW · OZEN · ENGINSOFT · AUTODESK · Oasys · DYNA MORE · DYNAlook · Ansys · Applus DatapointLabs · rescale

Town Hall & Library

Lawrence Livermore National Laboratory

rbf · MEDITATE · rbf.LAB · LIVGEMINI

The Old Rancher

Race Track

Airport

Sports Stadium

- **Logos represent companies/academia/research with solutions for today's world.**
- If you wish to have yours removed, kindly inform us at **feaanswer@aol.com**.
- Proceeds from the auction of your building will be allocated to the coffee budget.
- The map is subject to change - building sites will be rotated accordingly.

Table of Contents

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Individuals are the persons we wish to thank. It doesn't imply association with a company.
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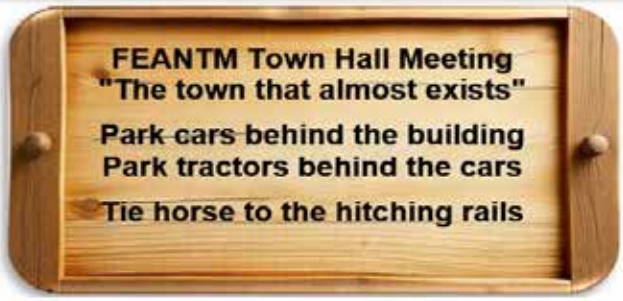
Welcome to our County, Town Hall Meeting & Announcements

Town Motto: Creation is born from trying. If it doesn't work, learn & try again. You will succeed. Ideas, simulations, medical cures, creativity wouldn't exist without the passion to keep trying. You've Got This



GAVEL BANG! Who yelled, "OH NO! Our Town Supervisor found the meeting gavel." You're doing major accomplishments. Me? I'm still figuring library aisles in our town library. Now, time for coffee and more aisle thinking!!

Don't miss the articles below:

1. **Axel – LLNL, Big Ideas Lab' looks how DYNA3D has served as a workhorse for American industry for nearly 50 yrs.- Stephen Wampler**
2. **Claire – Ozen Engineering – Remote Job Opportunity LS-DYNA**

Welcome to the May edition of FEANTM. Since Spring has arrived and the flowers are in bloom, I'd like to briefly mention the Fibonacci Sequence. It's a sequence associated with math, science, engineering, & other disciplines. My purpose in mentioning it is to remind you of its beauty and abundance in the world. I invite you to take time to relax & enjoy the beauty of the Fibonacci sequence in nature or wherever you find the patterns. The next time you're on your walk, take a minute to look at the Fibonacci sequence among flowers, tree branches, and pine cones. It 's a relaxing & interesting way to pass the time.

Thank you for being part of the FEANTM+ community.

Best regards, Marnie B. Azadian, Ph.D., Managing Editor

Claire: Remote opportunity for our LS-DYNA community! Sr. Level Engineer wanted experienced with Ansys LS-DYNA. So, visit the website for complete information.

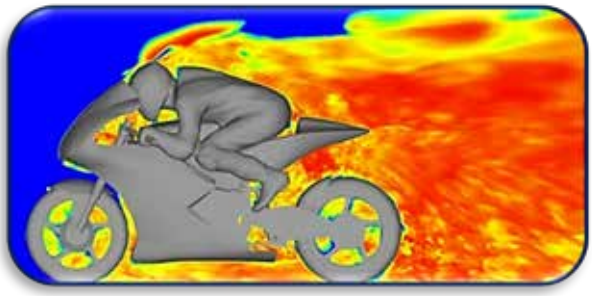
Madhukar: Understanding Elasto-Plastic Material Models in Ansys Mechanical…Material models are mathematical descriptions of how materials behave under loads.

Metin: Article by Brian Peschke, Battery Equivalent Circuit Model Simulation in Twin Builder, "One of the primary challenges in battery thermal management is ensuring temperatures are below maximum operating limits."

Marco: 1) Shape Optimization of Frame Structures Through a Hybrid 2D & 3D Numerical Approach.

2) Numerical Simulation of Snowdrift Dev. in Non-Equilibrium Flow Fields Around Buildings

Paper quote, "All presented simulations were performed in ANSYS Fluent software version 2020 R1 on the High Performance Computing infrastructure provided by the National Centre for Nuclear Research..."



Web – MDPI - **Comprehensive CFD Aerodynamic Simulation of a Sport Motorcycle**

K. Winski, A. Piechana

The Institute of Automatic Control and Robotics,
Warsaw University of Technology, Warsaw, Poland

Abstract - Nowadays, aerodynamics is a key focal point in the vehicle design process. Beyond its direct impact on the performance of a vehicle, it also has significant effects on economics and safety. In the last decade numerical methods, mainly Computational Fluid Dynamics (CFD), have established themselves as a reliable tool that assists in the design process and complements classical tunnel tests. However, questions remain about the possible obtained accuracy, best practices and applied turbulence models. In this paper, we present a comprehensive study of motorcycle aerodynamics using CFD methods which, compared to the most common car aerodynamics analysis, has many specific features. The motorcycle, along with its rider, constitutes a shape with very complex aerodynamic properties. A detailed insight into the flow features is presented with detailed commentary. The front fairing, the front wheel and its suspension were identified as the main contributors to the aerodynamic drag of the motorcycle and its rider. The influence of rider position was also studied and identified as one of the most important elements when considering motorcycle aerodynamics. An extensive turbulence models study was performed to evaluate the accuracy of the most common Reynolds-averaged Navier–Stokes models and novel hybrid models, such as the Scale Adaptive Simulation and the Delayed Detached Eddy Simulation. Similar values of drag coefficients were obtained for different turbulence models with noticeable differences found for $k-\epsilon$ models. It was also observed that near-wall treatment affects the flow behaviour near the wheels and windshield but has no impact on the global aerodynamic parameters. In the summary, a discussion about the obtained results was set forth and a number of questions related to specifics of motorcycle CFD simulations were addressed.

Introduction - One of the first practical applications of Computational Fluid Dynamics (CFD) was the analysis of the external aerodynamics of vehicles. Currently, these tools are widely used both in the areas of designing sports cars as well as civilian cars [1]. CFD is also an excellent tool for testing innovative concepts, such as unusual methods of generating downforce [2,3] as well as using movable aerodynamic elements to improve cornering [4] or braking [5,6,7]…

Materials and Methods - In the presented research, the methods of computational fluid dynamics (CFD) were used to investigate aerodynamics of a motorbike. While CFD is currently a proven and reliable method used in the study and design of aerodynamics, the accuracy and correctness of the results are influenced by a number of elements: geometry detail, proper numerical mesh, selection of the turbulence model, boundary condition definition etc.. Therefore, it is good practice to perform an experimental validation or comparison with experimental data from the literature. In our study, the reference simulation was a high-class simulation using the DDES method….

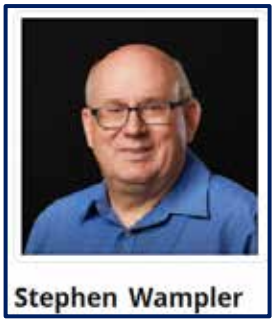
A podcast Not To Miss: LLNL "**In the podcast, Roger Werne lauds the work of Hallquist, who went on to start his own software company, saying, "John was by far the most productive and creative software engineer that I've ever seen."**

Web – LLNL - [The latest episode of the Big Ideas Lab podcast — on the impact and legacy of DYNA3D]

Big Ideas Lab' looks how DYNA3D has served as a workhorse for American industry for nearly 50

Stephen Wampler

An iconic Lawrence Livermore National Laboratory (LLNL) computer code that has saved the automobile industry billions of dollars is the focus for the episode of the Big Ideas Lab Podcast. Listen on Apple or Spotify.



Nearly 50 years ago in 1976, a then-LLNL mechanical engineer named John Hallquist wrote a small, 5,000-line program known as DYNA3D to help supercomputers analyze the structures of bombs dropped from the B-1 aircraft. The code modeled stress traveling through structures.

No one ever could have expected the big things that have come from DYNA3D.

Automakers use it in crash simulations. Beer manufacturers have run the code to design cans. Surgeons have used it to understand how fluid flows through the heart. Jet engine manufacturers have utilized it to certify modifications to engines and to model bird strikes.

At times, it has been utilized by 300 users, including eighteen aerospace companies, nine atomic energy firms, thirteen automakers, thirty-seven research labs and twenty-five engineering corporations. The user list has been a "Who's Who of global industry: General Motors, Alcoa, General Electric, Mercedes-Benz are but a few of its devotees over time.

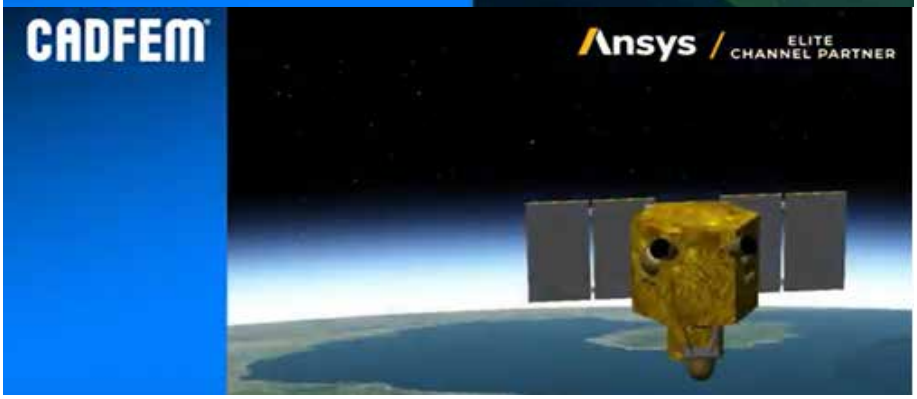
A 1993 study found that DYNA3D and its successor programs save American industry about $350 million each year. As one aerospace engineer interviewed for the study put it: "DYNA is what Hershey is to chocolate bars and Kleenex is to tissue. People don't ask for a (dynamic) finite element code; they ask for the 'DYNA-like' code."

"The unique feature of DYNA3D is that it is able in three dimensions to model the folding collapsing of metal structures on themselves," said Roger Werne, who served as a senior adviser in the Lab's Innovation and Partnerships Office until his retirement in September.

"It saved the automobile industry billions of dollars per year. They no longer had to do many, many real full-time crashes. They could model the crash on a computer, do the changes they needed in order to strengthen the auto structure and then do a final test crash to validate the models that they had developed."

The link is on the website article - Tune in to the episode of the Big Ideas Podcast and learn more about DYNA3D, the Livermore computer code that has served as a workhorse for American industry for nearly five decades. Listen on Apple or Spotify.

Student	I want to plan orbits in outer space and build rockets
Bart R.	How about we first start with a video
Student	Okay, but then I also want to make my own videos.
Bart R.	Well, young lady, you will succeed.



Web – YouTube – CADFEM India

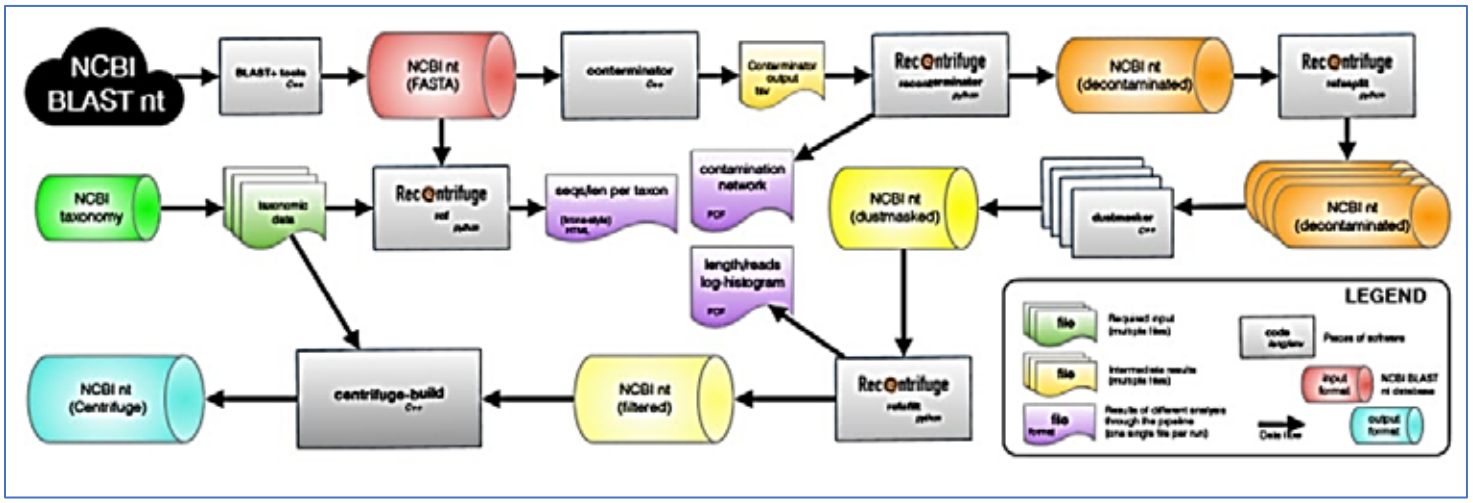
From Launch to Orbit - Optimizing Space Missions with ANSYS STK

Precision, reliability, and seamless integration—key to successful space missions. **With Ansys STK, engineers can model, simulate, and analyze every aspect of a mission, from liftoff to orbital insertion.**

- Plan and optimize satellite trajectories with high-fidelity mission modeling
- Ensure seamless communication with real-time link analysis
- Avoid collisions and manage large satellite constellations with advanced tracking
- Visualize complex scenarios with interactive 3D simulation

LLNL Quote – "Imagine creating a comprehensive, searchable index for a library containing hundreds of millions of books — a task that would take a single person a lifetime to complete. Now imagine discovering that many of these books contain mislabeled pages or paragraphs written by different authors than those credited. This dual challenge — creating an efficient system to quickly locate information while ensuring its accuracy - mirrors what (LLNL) Lawrence Livermore National Laboratory researchers faced when working with the National Center for Biotechnology Information's (NCBI) Nucleotide (nt) database, a vast repository of DNA sequences from across all known species.

Web – LLNL [New nucleotide database could improve microbe identification for science and medicine](#) Jeremy Thomas



Nucleotide databases like NCBI nt have a broad range of applications, from diagnosing infection and tracking disease to monitoring environmental health, studying microbiomes and developing bioengineered solutions. While NCBI nt contains an incredible amount of information — trillions of nucleotides — it has grown so large that it's become difficult for scientists to implement effectively, according to LLNL Microbiology/Immunology Group Leader Nicholas Be.

Be and his team identified two major problems with existing resources. First, the version of the nt database compatible with Centrifuge — a popular tool that helps classify DNA sequences quickly and accurately — hadn't been updated since 2018. Second, they discovered the nt database contained significant errors, inconsistencies and "contaminations" — in this context, contamination refers to genetic sequences incorrectly labeled or containing material from organisms other than those they're supposed to represent. These contaminated sequences can mislead scientists into mistakenly identifying pathogens or drawing incorrect conclusions about the microbes present in their samples.

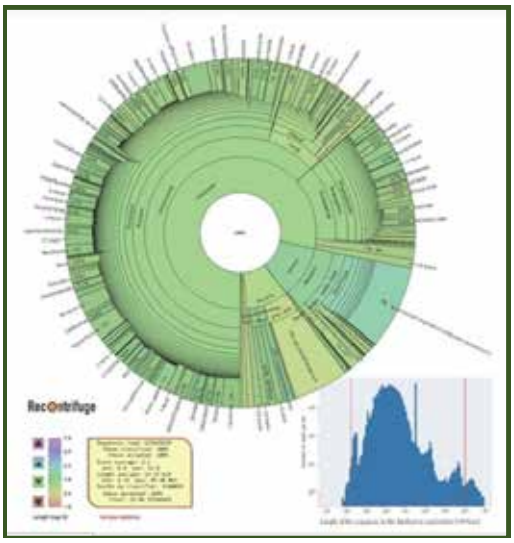
In a new study published in the journal mSystems of the ASM (American Society for Microbiology), LLNL researchers have addressed this problem by creating new, optimized indices of the nt database that simplify how scientists classify microorganisms found in various samples, from soil to human bodies, significantly improving the ability to identify and understand the myriad microorganisms that inhabit our world. The researchers leveraged advanced computing technologies to build cleaner, curated databases optimized for Centrifuge, making it easier to determine which microorganisms are present in a sample.

“By resolving contamination, filtering errors and updating content, our new nucleotide-based reference database dramatically improves metagenomic classification accuracy and reliability,” said Be, principal investigator on the project. “Our database dramatically reduces such errors, resulting in robust, reliable identification of unknown DNA sequences. Its implementation will facilitate a more complete understanding of the microbial world, regardless of the specimen source.”

One of the key features of this new database is its use of rigorous quality control measures. The researchers implemented a range of techniques designed to filter out contaminants and improve the accuracy of classifications — in short, they cleaned up the data, ensuring that only relevant and trustworthy sequences made it into the database.

As the team demonstrated in their paper, using the new database significantly reduced the number of misleading classifications, particularly for the genus Plasmodium, a type of parasite responsible for malaria. In studies involving mice, previous analyses had incorrectly flagged certain species of Plasmodium as significant, leading to possible misinterpretations of the data.

The scientists conducted re-analyses of existing metagenomic data to illustrate the effectiveness of their new database. They found that when they used their newly constructed Centrifuge-compatible database, there was a dramatic decrease in false-positive results, which can lead to incorrect assumptions about the presence of harmful pathogens.



A contamination network plot generated during the process of indexing the nt database. The contamination was detected between the five default “kingdoms” with the width and color scale of the arrows related to the number of sequences involved. The rate of contamination detected in the database (non-redundant sequences) before contamination removal was significant: almost half a percentage point. (Image: Jose Manuel Marti)

The work is valuable because researchers from various fields rely on accurate microbial identification to draw valid conclusions.

In medicine, determining the presence of specific bacteria or viruses can guide treatment decisions. In environmental science, understanding microbial communities is vital for assessing ecosystem health or bioremediation efforts. Similarly, in forensics, accurate identification can be crucial in criminal investigations.

“We hope this new database will raise awareness of the extensive computational resources needed to regularly update searchable databases, ensuring comprehensive organism coverage and accuracy as new sequences are screened for errors,” said bioinformatics scientist and co-author Jonathan Allen.

Beyond merely providing a reference database, the researchers emphasized the importance of treating such resources as dynamic entities — expanding and improving over time, much like software that needs regular updates to remain effective. This approach mirrors best practices from software development, where developers continuously refine and validate their products to ensure they are serving their users reliably.

“Given the exponential growth in genomic data and the continuous changes in the taxonomic database, there's a clear need for regular updates to serve the scientific community,” echoed researcher and first author Jose Manuel Marti, adding that the team has already received numerous requests to continue releasing this invaluable resource for the field. This high demand is understandable given the significant computational challenges involved, researchers said.

The most demanding step — the indexing process — takes the equivalent of more than five years of CPU (computer processing unit) time on a single core, though parallel processing on the Lab’s large, high-memory density high-performance computing clusters reduces this to a few weeks.

This extraordinary computational requirement underscores why many researchers simply don't have the resources to create such databases themselves, making LLNL’s contribution particularly valuable to the scientific community.

For scientists and researchers looking to utilize the resource, the new decontaminated databases can be freely downloaded from Amazon Web Service storage following the instructions at the Langmead Lab Centrifuge indexes webpage, thus providing the scientific community with the tools to conduct accurate and reliable metagenomic analyses. But the work is just beginning.

Marti said the team is transitioning to the NCBI core_nt database, a subset, yet still challenging-to-index version of nt, supported by a sustainable framework for regular updates and public releases of new indexes. Their documented pipeline ensures consistent quality control with each update.

Beyond Centrifuge, the team is working to generalize their database construction methodology for other classification engines and apply their decontamination, filtering and validation steps to specialized databases, such as those for viral or fungal identification, Marti said. Their goal is to create a dynamic, community-driven resource that evolves with advancements in genomic sequencing and taxonomy, providing researchers with the most accurate reference data for metagenomics analysis.

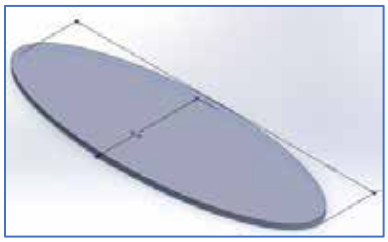
With the immense growth of data, the team is also interested in developing innovative strategies, such as using distributed computing, to help manage the growing computational demands of processing and analyzing these databases. This could involve breaking down the classification problem into more manageable parts, using multiple classifiers that focus on different levels of the taxonomic tree, rather than relying on a single, comprehensive classifier.

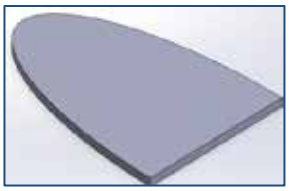
Additional co-authors on the paper include LLNL scientists and researchers:

- **Car Reen Kok,**
- **James Thissen,**
- **Nisha Mulakken,**
- **Aram Avila-Herrera**
- **Crystal Jaing.**

Town choice on GOENGINEER Blog: Is Mathew a good spouse? YES, He designed his wife a table. His blog quote, "To display her pottery at an upcoming exhibition, my wife asked me to design and build custom oval tables that would be easy to assemble and transport between shows. Since I have designed tables before, I had some ideas, so I opened SOLIDWORKS and got to work."

Excerpts – The step by step, with all the pictures of the build, can be viewed on the website.

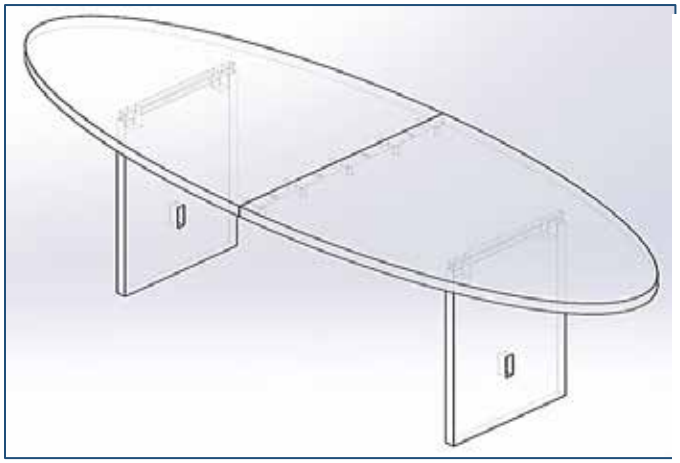




Web – GoEngineer - SOLIDWORKS Designed Custom Exhibition Table - Matthew Kusz

SOLIDWORKS CAD Design - I started with the oval top. The large top makes it challenging to store in a small area, so cutting it in half helps reduce the footprint when packing it in an SUV or van.

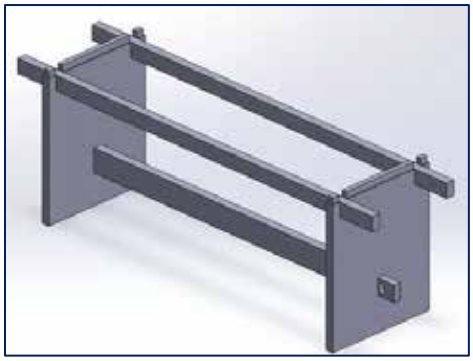
- Next, I need hardware to bind the two haves together. So, I roughed out the holes for the hardware.
- I'll add slots for removable biscuits to ensure proper alignment.
- Now, I want to add a slot on the bottom of the table for the frame that will support the tabletop.
- Now that the top is done, I can make the two legs. I love symmetrical designs. I can create one part that works for both sides, keeping the design simple and elegant.
- To keep the design easy to assemble, I need to make cuts for the cross members that will support the tabletop and add rigidity to the legs.
- Then, I'll need one more slot that is lower, but this is for one cross-member.



Let's put these in a SOLIDWORKS assembly and see how they look.

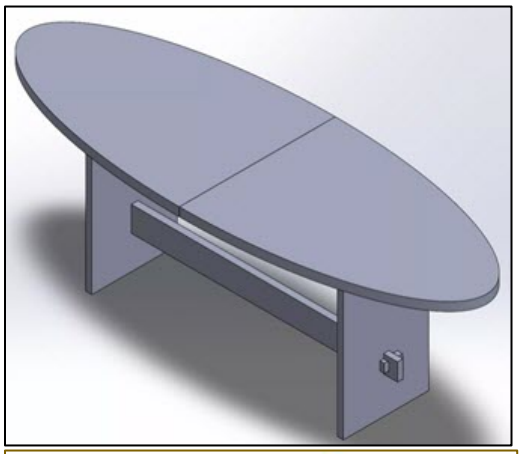
I can use the information I gather using the measure tool to determine the size of the cross supports.

- First, the tabletop cross supports that go just under the top of the table.
- Then, I'll design the center support for the slot I added near the bottom of the legs.
- To guarantee this won't fall apart, I added a few holes in this support for wedges to hold them in place, providing strength without additional hardware.



Now, I'll add these to the assembly, and see how things look.

Finally, I'll make those simple wedges for the bottom cross member.



After assembling all the files in SOLIDWORKS and making some tweaks, it is time to order the wood and fasteners.

Since I'm making three different sized tables I was able to configure the features and sketches in the parts to create all the sizes.

Here is the type of hardware I used to bind the two tabletop halves together.

Assembling the Tables at the Museum

After the tables were built and finished, we arrived at the museum to set up the displays.

First the tabletop. ...Then the legs, cross supports, and wedges...Now, I'll place the tabletop on the legs.

And here is the final result! My wife calls it 'dad' humor when I say this how I support her work. Now, on to the next project!

Want more SOLIDWORKS DIY? Check out other projects from our talented engineering team.

Additionally, join the GoEngineer Community to participate in discussions, create forum posts, and answer questions from other SOLIDWORKS users.

Remote full-time employment for our Ansys LS-DYNA Engineers!

Head over to Ozen Engineering – Why? Because they're looking for a Senior Level Engineer experienced with Ansys LS-DYNA. Many of you have used it extensively, a recent version, and are great helping customers, so visit their website for complete information!

If you want to be their ideal candidate, you should be able to present, speak to a wide range of customers, teach, be patient, be respectful, write well, love simulation day-in and day-out, and provide great technical support.

They are looking for someone who is passionate about simulations and being technical.

Complete information on the website including application form to fill in online for convenience.

Web – Ozen - Ansys LS-DYNA Senior Applications Engineer

Important: If you are applying you must meet U.S. ITAR regulations (required). Ozen Engineering is currently not sponsoring.

Ozen Engineering, Inc. is an Elite Ansys Channel Partner and a premier distributor of advanced CAE software.

Joining the team, your responsibilities as an Ansys LS-DYNA Applications Engineer will be to:

- **Answer**: Answer customer questions
- **Consult**: Work on Consulting/mentoring services
- **Demonstrate**: Demonstrating and presenting Ansys LS-DYNA to customers and clients
- **Teach**: Teaching training classes
- **Write**: Writing and creating blogs/videos/papers on simulation applications

Are you an enthusiastic learner who loves simulations and modeling using Ansys LS-DYNA?

Inform: Ozen would like to hear about:

- Your experience with Ansys LS-DYNA simulation software,
- Your unique industry/applications experiences.

Resume: A resume and a 2-page cover letter detailing Ansys LS-DYNA simulation software experience.

Benefits: Benefits and Perks are listed below and may vary depending on the nature of your employment with Ozen Engineering and the country where you work.

- Healthcare
- Retirement Savings
- Discounts on Products & Services
- Educational Resources
- Time Away

Complete the application form now! Ansys LS-DYNA Applications Engineer

Be part of the Ozen Engineering team that offers consulting services, technical support, and training classes. Your customers will be a diverse range of industries including Semiconductor, Biomedical, Automotive, Aerospace, and Manufacturing.

Welcome to the 5C's News Page. I'm unsure what the coyote wants to share with you each month, but I promised him I'd type it out while I drive my tractor.

The town voted the best April Fools Notice on social media? OASYS!

Our own town investigated: On April Fool's Day the Coyote reported a disguised visitor was at the local coffee shop. Why was this odd? The distinct English accent and the name Giraphe. The stranger part was that Giraphe was taking a to-go cup of English tea to a friend he traveled with named Gofer, AND buying post cards! Giraphe mentioned that they were on holiday. They came to the town meeting, did engineering on their laptops, and customer service.

Our town visitor department found the notice below. It seems to fit the M.O of our town guests on travel. They gave our engineers a quick webinar of who they are and then traveled home to the UK.

- Oasys Giraphe: **Geotechnical graphing for the digital age** - Smart, powerful and fast, Oasys Giraphe is our cloud-based dynamic graphing software, produced in partnership with Seequent. Giraphe works seamlessly with OpenGround, taking the hard work out of building the graphs you need for geotechnical reports.
- Oasys Gofer: **Next generation geotechnical analysis** - brings the advantages of cloud computing to geotechnical modelling. Easy to use, Gofer offers a seamless process, from first soil blocks to final results.

OASYS NOTICE - OASYS BREAKING NEWS:

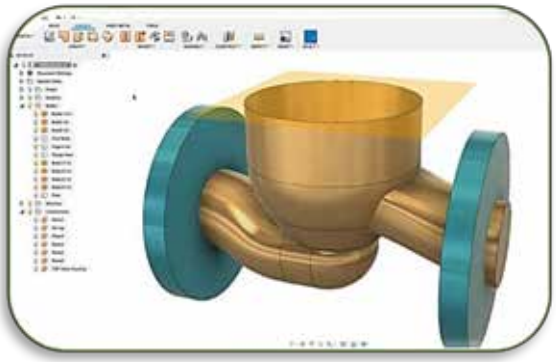
Oasys Gofer and Oasys Giraphe have gone AWOL and retreated to an oasis paradise!

They are currently out of office with no mention of their return. All graphing and geotechnical FEA has ceased due to their absence. We can only apologise for the inconvenience this may cause to our users.

We hope they come back soon, but until then, enjoy these snapshots from their vacation...

P.S. If you spot them, please send them back to work!

Website article by Shannon McGarry, "**Surface modeling aids in the creation of complex, aesthetically pleasing shapes using curves and splines**. Complementing 3D modeling, it enhances creativity and design iteration. Surface modeling is a vital 3d modeling technique that helps designers and engineers to create complex and aesthetically pleasing shapes. It allows for the creation of smooth, intricate surfaces that are often challenging to achieve with traditional solid modeling techniques.



Surface Modeling: Enhance Your 3D Modeling Experience with Autodesk Fusion - Shannon McGarry

Let's delve into what it is, why it's important, how it complements your 3D modeling experience, and how Autodesk Fusion is a great solution.

What is surface modeling? Surface modeling is a CAD method use create and manipulate the surfaces of a 3D object. Unlike solid modeling, which focuses on the volume of an object, it focuses on the creation and definition of an object's exterior surfaces. This involves the use of curves, splines, and surface patches to build complex shapes and forms.

It's particularly useful for designing objects with intricate geometries, including automotive bodies, consumer electronics, and industrial designs. Designers can create smooth, flowing surfaces that are essential for both functional and aesthetic purposes. The resulting models are typically referred to as "surface models" or "NURBS (Non-Uniform Rational B-Splines) models."

How does it work? Surface modeling works by defining and manipulating the exterior surfaces of a 3D object using mathematical curves and splines. Designers start by creating basic geometric shapes or curves, that serve as the foundation for the surfaces. The curves are then connected and adjusted to form surface patches. These can be further refined to achieve the desired shape and smoothness. By manipulating control points, tangents, and curvature, designers can fine-tune the surface to ensure it meets specific design requirements. These tools also provide features for blending, filleting, and intersecting surfaces. This allows for smooth transitions and seamless joins between different parts of the model.

Why is it important? Surface modeling is important for several reasons, including:

- Complex geometry creation: Surface modeling enables the creation of complex geometries, intricate shapes, and smooth surfaces.
- Aesthetics: Where appearance is important, surface modeling gives designers and engineers the tools they need to create visually appealing designs with smooth, flowing surfaces.
- Precision: For products that need to meet strict design and engineering specifications, surface modeling allows for a high-level of precision and control over the shape and curvature of surfaces.

- Function: Often, a product's aerodynamic or ergonomic performance relies on the smoothness and precision of its surfaces. Surface modeling helps designers to achieve the desired functional properties by meticulously fine-tuning surface curvature and continuity.
- Prototyping and manufacturing: 3D models are often used as a basis for prototyping and manufacturing processes such as CNC machining, 3D printing, and injection molding. Accurate surface models help to ensure the product can be manufactured to the desired quality and specifications.

How surface modeling compliments your 3d modeling process

Surface modeling is yet another tool for your toolbox that can enhance the overall design process. Explore complex shapes and forms that are not easily achievable with solid modeling alone, fostering innovation and creativity in design. The flexibility and precision you gain makes it easier to iterate on designs. This ultimately leads to a more efficient design process and better final outcomes. Surface models also provide a more accurate representation of the final product's appearance to help make better decisions.

Autodesk Fusion for surface modeling

Autodesk Fusion offers a comprehensive set of surface modeling tools, including spline, curve creation, surface patches, lofting, and surface trimming to ease the creation of intricate designs.

T-spline technology in Fusion allows for the creation of smooth, organic surfaces using a combination of polygonal and NURBS modeling techniques, simplifying the creation of complex shapes.

Fusion also includes surface analysis tools to help designs evaluate surface quality, curvature, and continuity to reduce the risks of errors during manufacturing.

Get started with Autodesk Fusion today. Experience seamless 3D modeling with the only integrated CAD, CAM, CAE, PCB, data management and cloud product development tool of its kind.

Website Quote, Liam McManus, "Don't try this at home – unless you're simulating it! Don't put Li-Ion batteries in an oven or smash a nail into them. (by a wise man) Ok it wasn't a wise man, it was me. But still, I would say this is general life-advice one should adhere to. Unless of course you are working in a lab investigating the thermal runaway behavior of batteries. These are essential tests to understand how batteries respond to overheating (i.e. "stick it in an oven and see what happens, or impact damage i.e. a "let's hammer a nail into this thing")

Before we talk about such tests in more detail, let's take a quick step back and recap on what Thermal Runaway is and why it's important."

We didn't start the fire. Battery thermal runaway chemistry simulation to fight the origins of disaster
By Liam McManus
Thermal Runaway: a recap - Thermal runaway of batteries is a dangerous phenomenon where the battery cell overheats uncontrollably. A self-sustaining feedback loop occurs where the battery receives a certain amount of heating, and if left unaddressed, this in turn triggers a series of chemical reactions inside the battery cell.

These reactions release even more heat and gases, which can result in huge pressure build up inside the battery. Extremely hot (over 1000oC!) and combustible venting gases are then emitted from the battery cell. When these gases ignite, fire spreads to other battery cells and catastrophic damage can occur to an electric vehicle, property and of course presents a high risk to life.

YouTube - Look at this short video which shows the violent nature of a thermal runaway event:

It should be clear that these scenarios should be avoided, and battery systems designed to ensure safe operation if a thermal runaway event occurs. Indeed, there are now various national and international regulations that cell makers and electric vehicle manufacturers must adhere to.

Time to test? – Accelerated rate calorimetry (ARC)

The most intuitive way to understand the behavior of batteries as they undergo a thermal runaway event is to replicate the causes of thermal runaway and see how the battery behaves. In the case of overheating, a common methodology to understand the heat release of the battery is an accelerated rate calorimetry ("ARC") test. These tests provide clear insights but come with some issues: primarily that the tests themselves are expensive, require access to test facilities and require a physical prototype of the battery cell! Of course, this is where simulation can fit in and allow for rapid design iterations early in the design cycle, with safety in mind.

Simcenter STAR-CCM+ already has a wide range of models and functionalities for battery modelling and battery safety, from the 3D cell design right through to the full battery pack and thermal propagation during a runaway event:

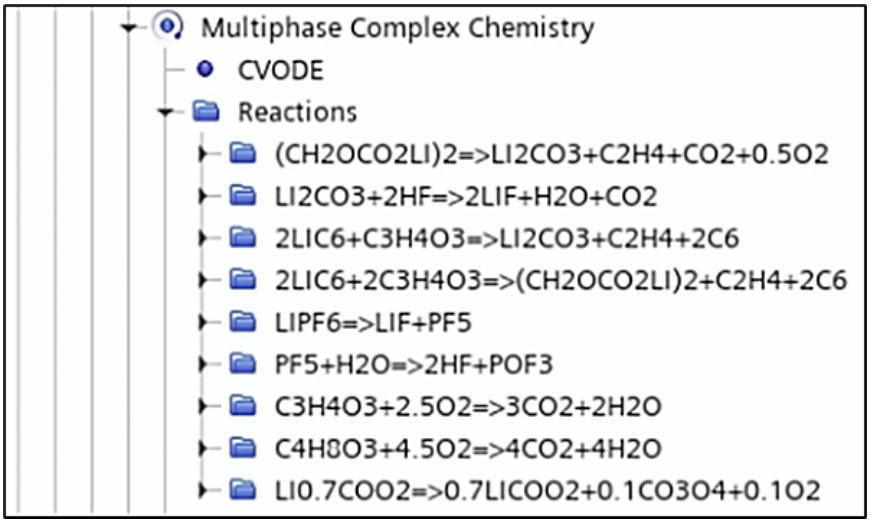
Video on Website - In our 2502 release, we are adding another level of functionality – primarily the ability to model detailed cell-level thermal runaway with our Homogeneous Multiphase Complex Chemistry (HMMC) model. Sounds like quite a mouthful so let me explain…

Thermal runaway chemistry – The devil is in the detail

When we consider the inside of a battery cell then there are multiple solids (anode, cathode and separators), as well as liquid electrolyte. When thermal runaway reactions occur, these components can react and decompose to release flammable gases such as hydrogen and methane. This results in multiple phases all reacting with each other e.g multiphase.

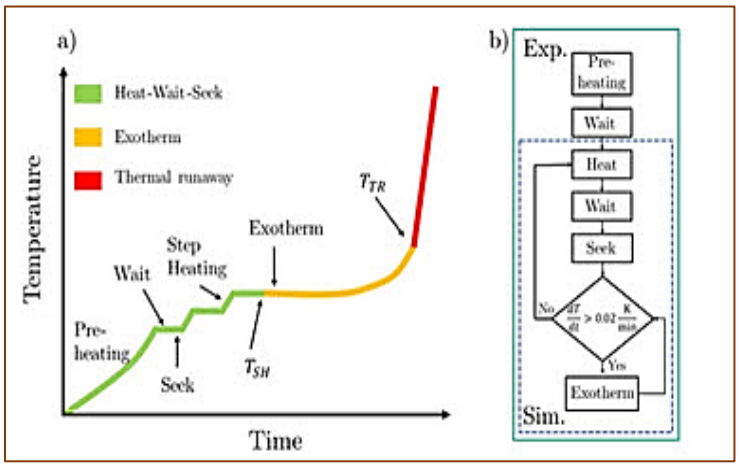
To capture this complexity, we have developed a framework in which the early stages of a thermal runaway event can be modelled with detailed chemistry modelling. This allows designers to explicitly model the fundamental reactions that are triggered during a thermal runaway event. Reactions are considered as a homogenous mixture allowing for a simple and easy set up in conjunction with our mixture multiphase model. Additionally, all of this is built on top of our well-proven complex chemistry solver allowing for reactions to be easily defined using standard chemkin file import, and accounting for intra and inter-phase reactions. This provides a unique modelling functionality to deeply understand the behavior of batteries.

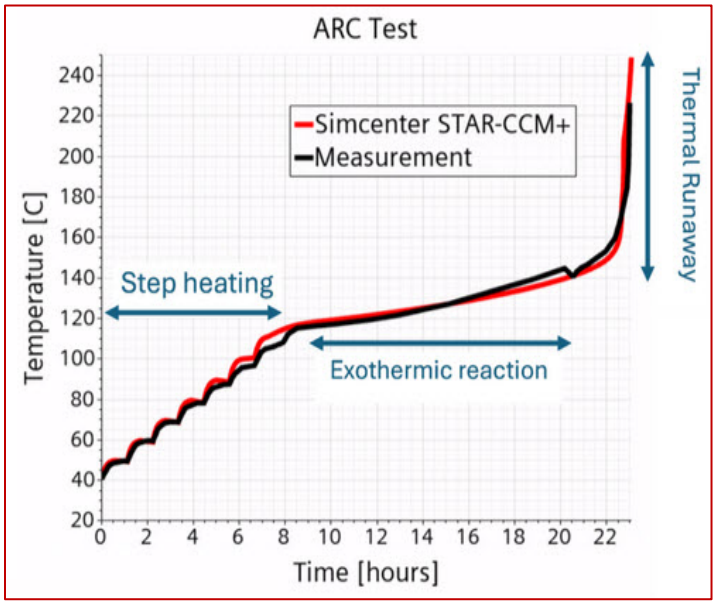
For example, we can directly set up reactions for SEI decomposition / production, conductive salt decomposition, Hydrogen Fluoride production and Cathode decomposition, see example of imported reactions for thermal runaway test above.

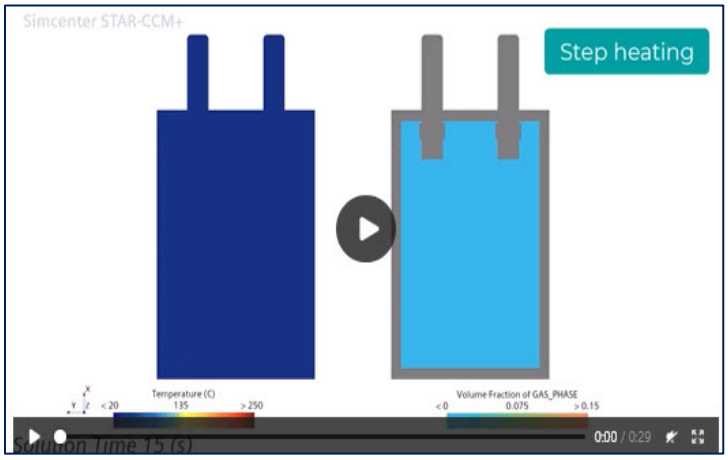


Let's get cookin' – Heat-Wait-Seek - Armed with a new modelling tool, let's apply it to the simulation of an ARC test and see how it performs.

The ARC test involves an initial period of heating the battery called Heat-Wait-Seek (HWS) where the battery is gradually heated before waiting to see if exothermic reactions begin. When those reactions begin, no more heat is applied to the battery, and it is left to continue reacting / self-heating until the onset of thermal runaway.







Unveiling the interaction of reactions and phase transition during thermal abuse of Li-ion batteries
https://doi.org/10.1016/j.jpowsour.2021.230881

A great thing about having this physics functionality inside Simcenter STAR-CCM+, is that we can leverage the automation capabilities. The ARC test process can easily be implemented using Simulation Operations and Stages without any scripting. And the results are excellent:

As can be seen, our new HMMC model can accurately capture the onset of both the exothermic reaction and thermal runaway.

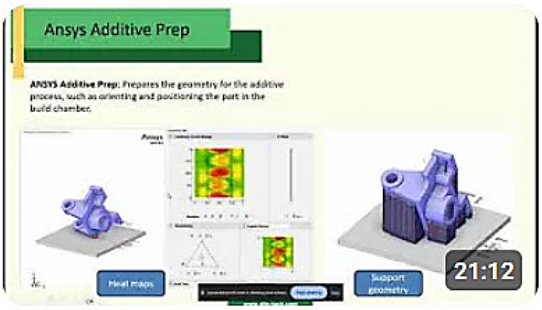
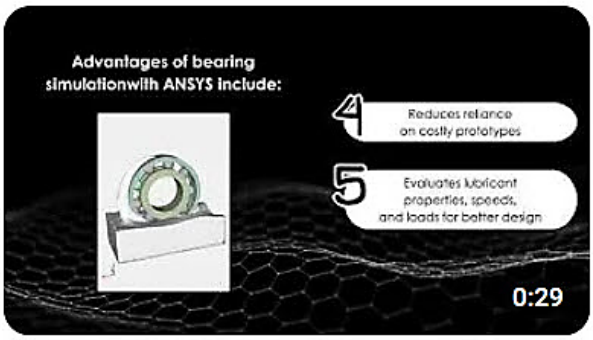
Being able to accurately capture this behavior allows for effective countermeasures or mitigation strategies such as heat shields to be implemented by engineers much earlier in the design process in a safe and cost-effective manner. For example, the predicted heat generation from this simulation can be used as an accurately calculated heat source directly in a larger pack level model, or the predicted vent gas compositions used for a further combustion analysis. An excellent example of how simulation is vital in the battery design cycle.

A final warning - That warm, fuzzy feeling you get when testing this in Simcenter STAR-CCM+ 2502 is likely NOT the start of a thermal runaway event, just the start of a safe, efficient and accurate design process.

DFE-tech: On our YouTube Channel you can find webinars, simulations and learning videos

We are always updating the YouTube Channel for your convenience to have information, learn, gain knowledge - contact us!

A few of the videos on our channel

 Webinar : Ansys Mechanical (Ansys Additive Prep)	This webinar will explore the capabilities of an innovative software solution that revolutionizes the preparation of 3D models for additive manufacturing (3D printing). Specifically designed for complex geometries in industries such as aerospace, automotive, and medical. Ansys Additive Prep helps optimize designs and process parameters to ensure flawless builds.
 Dimensional Control Systems	Simulating gearbox flow in ANSYS Fluent involves modeling the lubrication flow within a gearbox. This analysis is critical for understanding lubrication performance, heat generation, and power losses in rotating machinery.
 Ansys Fluent : Bearing Simulation	Ansys HFSS is a 3D electromagnetic (EM) simulation software for designing and simulating high-frequency electronic products such as antennas, antenna arrays, RF or microwave components, high-speed interconnects, filters, connectors, IC packages and printed circuit boards. Engineers worldwide use Ansys HFSS software to design high-frequency, high-speed electronics found in communications systems, advanced driver assistance systems (ADAS), satellites, and internet-of-things (IoT) products.

The 15th European LS-DYNA Conference & a few of the June offered webinars/seminars/classes not to miss.

DYNAmore Germany and Nordic have had a long-standing history of LS-DYNA development, support, their own products, training and conferences.

Web – DYNAmore - We are excited to invite all users to the 15th European LS-DYNA Conference

Oct 28-29, 2025 - BMW Welt, Munich, Germany
Stay tuned for additonal information!

(held at the Ansys EMEA Transportation Summit)

DYNAmore Nordic AB

Web – DYNAmore Nordic AB Training

Brigadgatan 5,

58758 Linköping, Sweden

June 09 - Crash Analysis - Structural Crashworthiness with LS-DYNA, Paul Du Bois, Suri Bala

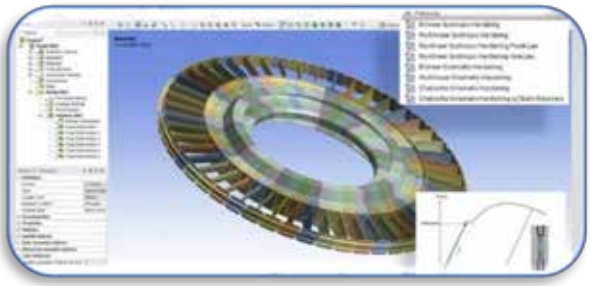
DYNAmore GmbH

Web - DYNAmore GmbH Training

seminars, webinars, video seminars, information days.

June 06 - Electromagnetism in LS-DYNA
Maik Schenke
June 26 - Modeling Metallic Materials
Dynamore staff members
June 30 - Material Failure
Filipe Andrade, André Haufe, Markus Feucht
June 23 - From Explicit to Implicit Simulation Models in LS-DYNA
Christoph Schmied, Anders Jonsson
June 25 - LS-DYNA Compact: Discrete Element Method
Maik Schenke

Article by Syam Kumar Manikonda, “In the world of structural simulations, material behavior plays a crucial role in predicting how materials respond under different loading conditions. Material models are mathematical descriptions of how materials behave under loads. They define how stress and strain are related. Depending on the material and the expected loading, different models like linear elastic, plastic, hyperelastic, or viscoelastic are used.”



Web – CADFEM - Understanding Elasto-Plastic Material Models in Ansys Mechanical - Syam Kumar Manikonda

Materials typically exhibit elastic behavior at low stress levels, returning to their original shape upon unloading. However, beyond a certain stress threshold, known as the yield point, materials undergo plastic deformation, resulting in permanent changes to their shape.
To accurately capture this transition from reversible to irreversible behavior, elasto-plastic material models are used, resulting in more realistic and reliable simulation outcomes.

Elasto-plastic models describe materials that initially respond elastically — following Hooke’s Law — and then transition into plasticity once the yield point is exceeded. By modeling both elastic and plastic behaviors together, these models are crucial for predicting material failure, optimizing component designs, and enhancing material performance under extreme loading conditions.

Key Features of Elasto-Plasticity

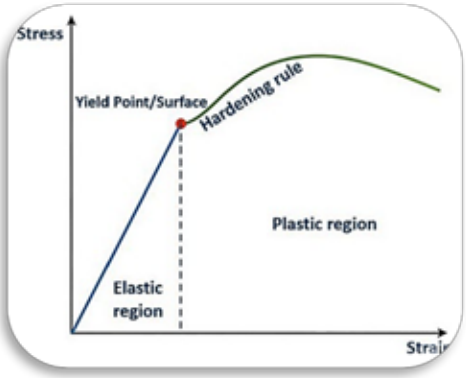


Figure 1: Stress Strain graph of a ductile material under uniaxial loading

- Elastic Region – The material follows Hooke’s Law (stress is proportional to strain).
- Yield Point – The limit beyond which permanent deformation begins. In 1-D loading, it’s a single yield point; in 3-D loading, it extends into a yield surface.
- Plastic Region – Irreversible deformation occurs.
- Hardening Rule – Describes how the material resists further plastic deformation.

In plasticity theory, materials exhibit different behaviors depending on whether their plastic response is influenced by strain rate, which is affected by the rate of loading. This leads to two main categories: rate-independent plasticity, where the material’s plastic behavior remains unchanged regardless of loading speed, and rate-dependent plasticity, where yield stress increases with faster loading due to strain rate effects.

This strain rate effect refers to how a material’s response changes with deformation speed, making materials stronger as strain rate increases. It is particularly important in applications involving dynamic or high-speed loading, such as impact, crash, explosion, and metal forming processes. The present discussion would be limited to rate independent material models.

The constitutive models for elastic-plastic behavior start with a decomposition of the total strain into elastic and plastic parts $\in=\in el+\in pl$

The stress is proportional to the elastic strain $\in el$, i.e., $\sigma = D \in el$ and the evolution of plastic strain $\in pl$ is a result of the plasticity model.

Elastic Strain – Temporary deformation, where the material returns to its original shape.
Plastic Strain – Permanent deformation, where the material does not return to its original shape.

There are 3 essential characteristics of the plastic constitutive models:

1. Yield Criterion – Defines when a material transitions from elastic to plastic behavior. i.e., defines the point where the material stops behaving elastically and starts deforming plastically.

$$f(\sigma, \sigma y) = 0$$

2. Flow Rule – Determines how much plastic strain develops when the material is loaded beyond its yield point. It determines the increment in plastic strain from the increment in load $d \in pl = d\lambda \partial Q \partial \sigma$ where $d\lambda$ is the plastic multiplier and Q is the plastic potential.

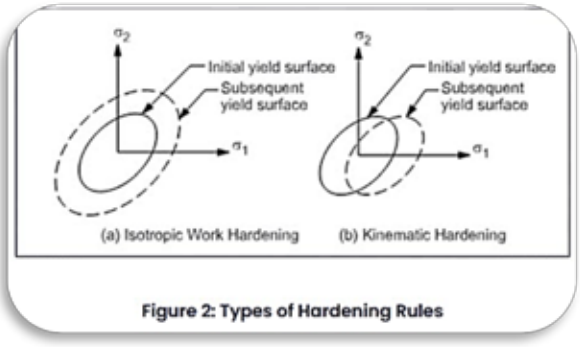


Figure 2: Types of Hardening Rules

3. Hardening Rule – Describes how the yield criterion σy evolves during plastic deformation. As loading continues, stress and plastic strain increase, strengthening the material.

The two common types are isotropic and kinematic hardening (refer Figure 2).

Types of Hardening - There are two common types of hardening rules available. Isotropic and kinematic hardening.

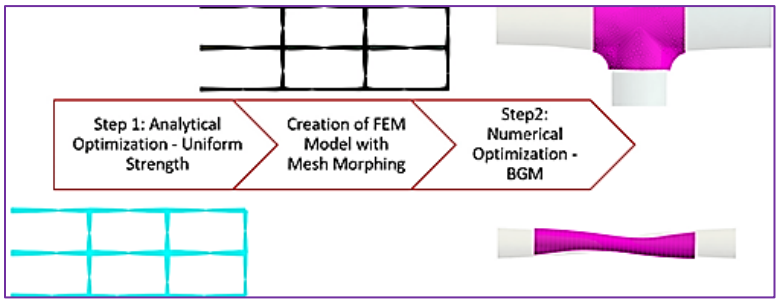
- **Isotropic Hardening** – The yield surface expands uniformly, meaning the material hardens equally in all directions. This type of hardening can model the behavior of materials under monotonic loading and elastic unloading but often does not give good results for structures that experience plastic deformation after a load reversal from a plastic state.
- **Kinematic Hardening** – The yield surface shifts in stress space, allowing the material to model cyclic loading effects (e.g., repeated bending). Kinematic hardening is observed in cyclic loading of metals. It can be used to model behavior such as the Bauschinger effect, where the compressive yield strength reduces in response to tensile yielding.

Topics Continued on the website:
Types of Elasto-Plastic Material Models in Ansys Mechanical - Isotropic Hardening Models
Bilinear Isotropic Hardening - Multilinear Isotropic Hardening -
Nonlinear Isotropic Hardening (Power Law, Voce Law)
Kinematic Hardening Models (Accounts for Bauschinger Effect, Cyclic Loading)
Bilinear Kinematic Hardening - Multilinear Kinematic Hardening - Nonlinear Kinematic Hardening
Choosing the Right Elasto-Plastic Model in Ansys

Conclusion - Elasto-plastic material models in Ansys Mechanical provide powerful tools to simulate real-world material behavior accurately. Choosing the right model depends on loading conditions, strain rate sensitivity, and material properties. Whether you're analyzing metal forming, impact resistance, or fatigue, using the correct model ensures reliable simulation results.

In this work, we propose a method for the shape optimization of frame structures using a mixed analytical–numerical approach. The goal is to achieve a uniform-strength frame structure, ensuring optimal material utilization and weight minimization. The optimization is performed in two calculation steps.

EXCERPTS



Web – MDPI - Shape Optimization of Frame Structures Through a Hybrid Two-Dimensional Analytical and Three-Dimensional Numerical Approach

A. Lopez, C. Landiorio, D. Milani, P. Salvini, M.E. Biancolini

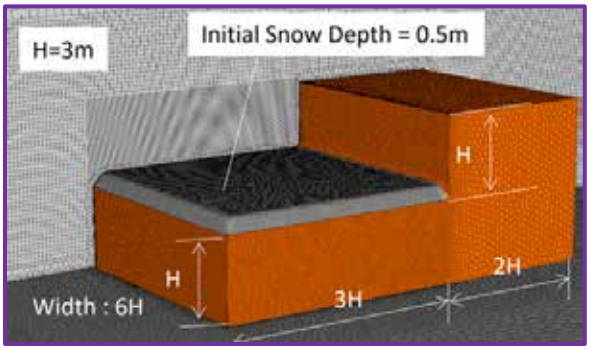
Dept. of Enterprise Engineering, Univ. Rome "Tor Vergata", Rome, Italy

Abstract - The first step uses an analytical model based on the Timoshenko beam theory, where appropriate mathematical steps give a uniform-strength shape of the entire structure. Depending on the type of cross-section analyzed, the exact uniform-strength profile of each element is derived by solving for three parameters related to the forces and moments acting on the element. These parameters are obtained by solving a nonlinear system of equations, which includes the external and internal kinematic constraints of the structure, as well as equilibrium equations for each element. However, the solution obtained using the one-dimensional theory is limited in areas affected by boundary effects, such as the interconnection regions between elements and those near the supports, for a decay distance at least equal to the characteristic diameter of the section.

To address this limitation, the second optimization step involves incorporating solutions that account for a triaxial stress field. This is typically carried out by discretizing the structure using the finite element method. The frame geometry obtained from the previous analytical solution is constructed, and the regions affected by boundary effects are optimized using the Biological Growth Method (BGM). This is an iterative, bio-inspired method modeled on the growth of trees, which increases trunk diameter in proportion to the loads experienced. The method is applied simultaneously to all regions where three-dimensional effects are significant, with the aim of achieving uniform strength in areas influenced by boundary effects. An important aspect of applying the BGM is maintaining the topology of the initial mesh, which is ensured through the use of mesh morphing techniques. The results of the two-step optimization process are shown on simple geometries involving few elements, and on more complex geometries of mechanical interest.

Introduction - Frame structures are among the most popular and versatile engineering solutions in mechanical and building design. These systems, composed of interconnected beams, offer an optimal combination of strength and rigidity, making them suitable for a wide range of applications in a variety of engineering fields [1,2,3]. The principle behind frame structures is to distribute loads efficiently by exploiting the geometry and rigid connection of structural elements…

A numerical simulation was carried out to study the transient snow drifting phenomena around buildings. The method employs the commercial CFD software Ansys Fluent with additional user-defined functions to model snow transport. Drifting snow analysis around buildings has been extensively studied, but there have been few validation examples in non-equilibrium flow fields around buildings using the saltation fetch distance to account for the snow transport rate.



WEB – MDPI - Numerical Simulation of Snowdrift Development in Non-Equilibrium Flow Fields Around Buildings

R. Nara, C. Groth, M.E. Biancolini
Ansys Japan K.K., Osaka, Japan
Dept of Enterprise Engineering, Univ. of Rome, "Tor Vergata", Viale del Politecnico, Rome, Italy

Abstract - A numerical simulation was carried out to study the transient snow drifting phenomena around buildings. The method employs the commercial CFD software Ansys Fluent with additional user-defined functions to model snow transport. Drifting snow analysis around buildings has been extensively studied, but there have been few validation examples in non-equilibrium flow fields around buildings using the saltation fetch distance to account for the snow transport rate. Therefore, in this study, we conducted snowdrift analysis in three types of non-equilibrium flow fields and compared the results with actual measurements. For cube-shaped buildings and two-level flat roofs, the simulation results captured the trends observed in the actual measurements. However, in the case of snow fence analysis, an underestimation of the accumulation amount was observed downstream of the snowdrifts.

Excerpt - Introduction - When constructing buildings in snowy regions, it is crucial to predict the occurrence of snowdrift phenomena in the vicinity of the structures and implement appropriate snow measures. However, the position and shape of snowdrifts are influenced by various factors, including wind direction, wind speed, snow quality, temperature, building shape, and surrounding conditions.

The most effective method currently available for predicting snowdrifts around structures, such as buildings and roads, is the use of wind tunnel experiments with model snow, which has a substantial track record [1,2]. However, there are still uncertainties regarding the similarity laws between real and wind tunnel snow, including their physical properties [3]. While various investigations have been conducted, a comprehensive understanding of these details has not yet been established.

In recent years, with the advancement of computer technology and the widespread availability of computational fluid dynamics (CFD) software, numerical simulations of airflow using CFD have become increasingly popular. Unlike traditional methods based on geometric and flow field similarity laws, CFD-based approaches offer the potential for predicting snowdrift phenomena by leveraging airflow prediction techniques. These methods have gained attention and are expected to provide valuable insights into snowdrift prediction by breaking free from strict geometric and flow similarity assumptions. In the numerical prediction of snowdrift phenomena around buildings, pioneering research has been conducted by Uematsu et al. [4]. Their work has established fundamental methods for snowdrift modeling that are still widely used today. For predicting suspension, a transport equation for drifting

snow density is employed. For predicting saltation, including creep, basic models proposed by Iversen et al. [5] and Pomeroy and Gray [6] utilize formulas based on friction velocity as a function. However, it has been pointed out that applying these prediction formulas, which are based on observations in equilibrium flow fields, to non-equilibrium flow fields around buildings with significant local variations can result in various errors. Okaze et al. [7] addressed this issue by expressing the relationship between saltation fetch distance and snow transport rate in the blowing snow boundary layer, considering factors such as the difference between the drag acting on saltation and the threshold friction velocity. Furthermore, Liston and Sturm [8] defined the snow transport rate in non-equilibrium conditions as a function of the snow transport rate in equilibrium conditions and the saltation fetch distance and conducted numerical simulations. However, there are still limited examples of snowdrift analysis considering saltation fetch distance in the numerical prediction of snowdrift phenomena around buildings. Therefore, there is a need for numerous validation cases to achieve quantitative predictions of snow depth.

On the other hand, changes in the snow surface boundary due to erosion and deposition can have a significant impact on the local flow field, and the local flow field, in turn, can affect the snow surface shape. Therefore, it is important to consider methods that simulate snow surface changes. The common approaches to mesh deformation already implemented in CFD software include the smoothing-based method, dynamic layering method, and remeshing method, where the spring-based smoothing method, diffusion-based smoothing method, and linear elastic solid-based smoothing method are incorporated in the smoothing-based method [9]. Some researchers have also utilized mesh deformation to consider the influence of snow boundary changes on the flow field [10,11,12].

The displacement of boundary and interior nodes of the mesh needs to be determined through interpolation before the mesh is deformed. The choice of interpolation function is crucial in this process. While interpolation is widely used in mesh deformation, Franke [13] extensively evaluated the effects of various interpolation methods on scattered data and demonstrated that radial basis function (RBF) interpolation exhibited excellent performance. Zhu et al. [14] were the first to utilize RBF interpolation to simulate the dynamic changes in snow boundaries in snowdrifts and conducted a quantitative evaluation. In [15], RBF was used to simulate the shape change for icing accretion.

Therefore, in this paper, we conducted numerical predictions of snowdrift phenomena considering saltation fetch distance in non-equilibrium flow fields around buildings. We compared the results with drift profiles around a cubic model and snow fences, as well as with the snow depth profiles on a stepped roof. Details about the three configurations investigated are provided in Section 3.1.1, Section 3.2.1, and Section 3.3.1.

To accurately analyze the boundary layer on the snow surface and the blowing snow boundary layer, we utilized the commercial morpher RBF Morph™ for ANSYS Fluent (2022R2), which employs RBF interpolation, to investigate the changes in the snow surface boundary.

Continuous learning is the key to personal & professional growth. It enriches our lives with new skills, fresh perspectives, & opportunities for success & fulfillment.

Short Course in person or via Zoom-June 25-27 - Evanston, IL - Wing Kam Liu

Web - HIDENN-AI - The future of scientific and engineering computer modeling and simulations lie at the intersection of artificial intelligence, traditional simulation approaches, and scientific knowledge. We have developed new methods and software that combine numerical approaches and have proven that our approach is capable of handling the new challenges in complex and emerging industries.

"Our software will be a solver that interacts with Abaqus and Ansys (two of the largest engineering software) and a cloud-computing platform for multi-GPU computing to handle ultra-large-scale problems and automatic parameter optimization."

Short Course in person or via Zoom on June 25-27 - Evanston, IL

Mechanistic Computational Intelligence for Science and Engineering: "Infusing Predictive Artificial Intelligence into Scalable Scientific and Engineering Modeling and Simulations"

This two- and a half-day short course introduces participants to mechanistic computational intelligence (CI) tools and concepts, a new branch of predictive AI within computational S&E that explores how machine learning methods, particularly hierarchical neural networks, can be employed to tackle increasingly complex S&E problems in materials, design, manufacturing, and multi-physics, among others. Participants will learn how well-established concepts from finite element analysis are merged with cutting edge predictive machine learning approaches to quickly obtain more accurate and higher resolutions solutions.

The TEAM

Co-founders

Wing Kam Liu
Walter P. Murphy prof. of Mech. Engineering, Northwestern Univ.

Dr. Dong Qian
professor. & associate dept. head of Mech. Engineering, the Univ. of Texas at Dallas.

Chanwook Park
PhD candidate in Mech. Engin., Northwestern Univ.,

Gino Domel
postdoctoral researcher, Northwestern Univ., first in his class in Mech. Engineering at Univ. Notre Dame.

Fibonacci in Nature:
Excerpt from YouTube Video from NOVA
Excerpt from UC Master Gardeners of San Mateo & San Francisco

Web – YouTube - NOVA YouTube, "NOVA leads viewers on a mathematical mystery tour -- a provocative exploration of math's astonishing power across the centuries. We discover math's signature in the swirl of a nautilus shell, the whirlpool of a galaxy and the spiral in the center of a sunflower. Math was essential to everything from the first wireless radio transmissions to the prediction and discovery of the Higgs boson and the successful landing of rovers on Mars. But where does math get its power? Astrophysicist and writer Mario Livio, along with a colorful cast of mathematicians, physicists and engineers, follows math from Pythagoras to Einstein and beyond, all leading to the ultimate riddle: Is math an invention or a discovery? …"

The Wonder of Fibonacci in our Gardens
UC Master Gardeners of San Mateo & San Francisco Counties
Cynthia Nations - UC Master Gardener- enjoys the Fibonacci sequence in her succulent garden.
Photos courtesy of Cynthia Nations.

The attraction to the Fibonacci sequence and golden ratio in gardens is likely a combination of their natural occurrence in the environment and their ability to create pleasing patterns and proportions that evoke a sense of balance and harmony.

Current scientific research finds evidence that Fibonacci numbers and Golden Ratio mathematical principles appear in many patterns and structures in nature. The Fibonacci sequence is a mathematical pattern where each number is the sum of the two preceding numbers (e.g., 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, etc.). The golden ratio is a mathematical ratio of approximately 1.618:1 and is often represented by the Greek letter phi. The attraction to the Fibonacci sequence and golden ratio in gardens is likely a combination of their natural occurrence in the environment and their ability to create pleasing patterns and proportions that evoke a sense of balance and harmony. In addition, the Fibonacci sequence and the golden ratio are associated with growth and abundance, making them symbolic of prosperity and success.

The beauty of flowers, carefully arranged and nurtured, often follows the Fibonacci sequence in the arrangement of their petals and seeds. Pattern arrangement adds an extra layer of fascination to the world of flora. Many flowers exhibit a petal count that corresponds to Fibonacci numbers. For example, lilies often have three petals, buttercups have five, Shasta daisies have 21, and dandelions have 34. Other examples include the White Calla Lily (1 petal); Euphorbia (2 petals); Iris (3 petals); Larkspur, Hibiscus, and wild Rose (5 petals), Black-eyed Susan and Delphiniums (8 petals); Pyrethrum Daisy (34 petals); and Michaelmas Daisies (89 petals). One of the most noticeable manifestations of the Fibonacci sequence in flowers is seen in the spirals of Sunflower seed heads. The seeds of these flowers form spirals that radiate from the center. The numbers of these spirals, when counted in opposite directions, are often consecutive Fibonacci numbers. The most common arrangements are 21 and 34 spirals, or 34 and 55 spirals. This mathematical harmony is not only visually appealing but also serves a practical purpose. The optimal packing of seeds ensures efficient use of space, maximizing the plant's reproductive success.

Many gardeners enjoy succulent plants that form geometrical spirals like sunflowers. Some spirals are more perfectly arranged than others. Aeonium ‘Emerald Ice' has concentric rosettes that form spirals; Aeonium ‘Zwartkop' leaves are purple-black and form spiral rosettes at the edge of the stem; Agave ‘Blue Glow' leaves are lance-shaped, and the rosettes are less compact than succulents with smaller leaves; the leaves of Agave victoriae reginae are geometrical and form rosettes from the bottom without a stem; and Echeveria imbricata often has near-perfect rosettes in which the leaves are saucer shaped. Aloe polyphylla (Spiral Aloe) is one of the best-know spiral succulents. The rosettes form a perfect Fibonacci clockwise or counter clockwise spiral.

One of the most interesting applications of the Fibonacci sequence is in the design of gardens. Many gardeners and landscape architects have used the Fibonacci sequence to create beautiful and attractive garden designs that follow the natural patterns found in nature. One of the most common applications of the Fibonacci sequence in gardens is in the placement of plants. The Fibonacci sequence provides a mathematical framework for determining the ideal spacing between plants, which can help to create a more visually appealing and functional garden. One example is plant arrangement in a spiral pattern that follows the Fibonacci sequence, with each successive plant placed at a distance equal to the sum of the distances between the two previous plants. This creates a natural and aesthetically pleasing arrangement that mimics the spiral patterns found in nature, like the spiral pattern of a snail shell.

Gardens offer a respite from the demands of modern life, providing a sanctuary for relaxation, reflection, and inspiration.

When selecting plants and designing a garden, an awareness of Fibonacci-related growth and design patterns can add an element of artistic and creative beauty.

Observing the mathematical beauty of plants and garden design can spark conversations about the intersection of mathematics and nature.

UK Users' Conference 2025

In partnership with ANSYS, taking place on Friday, 27th of June at the Arup, Birmingham office, United Kingdom. Attendance is free but please confirm your space during registration

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Complementary In-Person Event - Participation is free of charge but you must register for the conference.

Our annual event is a unique opportunity for:

- simulation experts,
- industry professionals,
- academics

Come together and explore the latest advancements in the Oasys and LS-DYNA world.

This year's conference features a comprehensive program designed to provide you with the knowledge and skills to **unlock the full potential of Ansys LS-DYNA and the Oasys Suite.**

You'll have the chance to participate in interactive sessions, share your ideas, and learn from our software team about how to address complex engineering challenges.

In addition to gaining valuable insights, our conference is an excellent opportunity to hear from experts, network with fellow professionals, and stay up to date on the latest trends in the industry. Whether you're a seasoned simulation software user or just starting out, we look forward to welcoming you.

There will be a complimentary drinks and canapes reception after the conference. This offers a chance for you to catch up with your friends and colleagues from across the Oasys LS-DYNA community in a relaxed and informal setting.

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Among the blog listings below from Battery Equivalent Circuit Model Simulation in Twin Builder - Posted by: Brian Peschke, “Battery Cell Thermal Design Challenges - One of the primary challenges in battery thermal management is ensuring temperatures are below maximum operating limits. Higher temperatures can lead to reduced efficiency, accelerated aging, and potential safety hazards. Engineers must have knowledge of the heat generated by a battery to adequately design cooling systems.”

Excerpt - Battery Equivalent Circuit Model Simulation in Twin Builder - Brian Peschke

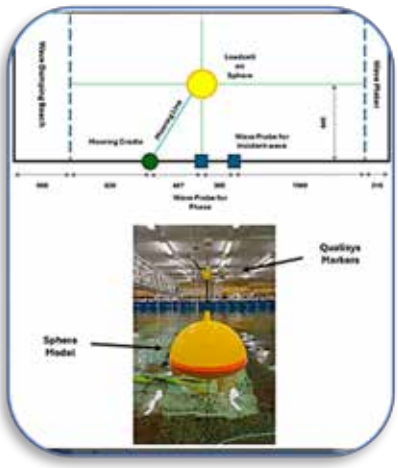
Understanding and predicting the thermal behavior of battery modules requires integrating the heat rejection of a battery with the electrical-mechanical properties of the battery cell. By linking the electrical properties of a battery cell, better battery heat rejection rates can be made available for cooling system design.

Engineering Solution - Simulating battery thermal behavior can be enhanced via physical test data of battery cells. One type of battery testing is called Hybrid Pulse Power Characterization (HPPC). This testing can enable calculation of the battery internal resistance. Below is an example of one pulse from an example HPPC data set. The internal resistance of a battery cell is proportional to the voltage drop divided by the current. Twin Builder generates resistance values from an entire HPPC data set which can include multiple temperature and State of Charge (SOC) levels. This resistance is used along with the circuit current and voltage to predict cell heat loss power.

Additional Web – Blog & Information

YouTube

Article quote, "**Tested with data from a known geometrical shape exposed to regular and irregular waves, the technique employs Ansys Aqwa for linear models.** The results demonstrate the efficiency of the proposed technique, expanding the applicability of ML models in realistic scenarios.**."**



Web – MDPI - Part A: Innovative Data Augmentation Approach to Enhance Machine Learning Efficiency—Case Study for Hydrodynamic Purposes

H. Majidiyan, H. Enshael, D. Howe, E. Gubesch
Centre for Maritime Engineering and Hydrodynamics, Australian Maritime College, University of Tasmania, Launceston, Australia

Abstract - These days, AI and machine learning (ML) have become pervasive in numerous fields. However, the maritime industry has faced challenges due to the dynamic and unstructured nature of environmental inputs. Hydrodynamic models, vital for predicting ship responses and estimating sea states, rely on diverse data sources of varying fidelities. The effectiveness of ML models in real-world applications hinges on the diversity, range, and quality of the data. Linear simulation techniques, chosen for their simplicity and cost-effectiveness, produce unrealistic and overly optimistic results. Conversely, high-fidelity experiments are prohibitively expensive. To address this, the study introduces an innovative feature engineering that incorporates uncertainty into features of linear models derived from higher fidelity modeling. This enhances productive data entropy, positively enhancing feature classification and improving the accuracy and feasibility of ML models in hydrodynamic responses of floating vessels. Tested with data from a known geometrical shape exposed to regular and irregular waves, the technique employs Ansys Aqwa for linear models. The results demonstrate the efficiency of the proposed technique, expanding the applicability of ML models in realistic scenarios. The application of the proposed approach extends beyond and can be further applied to any stochastic process, which expands the ML application for realistic use cases.

EXCERPT - Conclusions and Future Works - In this study, we have introduced a framework aimed at facilitating the transfer of features from higher to lower fidelity models, specifically from model-scale tests to simulations. This framework holds promises for enhancing simulation accuracy in ML applications, particularly in the domain of hydrodynamic responses of floating units, by injecting productive entropy into simulation data to mimic real-world features. To achieve this, we streamlined the parameters involved, reducing complications, focusing on selecting simple geometrical models, basic mooring systems, limiting wave direction angles, and wave heights. These intentional limitations were imposed to gain better control over influential factors, although the impact of other parameters needs further investigation within the framework. The setup operates by subjecting time series data obtained from experimental tests and simulations to wavelet convolution operations at different scales, extracting fine features for mapping to exciting wave forces. The data are then compressed in the temporal direction through averaging and normalization of obtained coefficients, resulting in a pixel-intensity vector representing 40 s features within the data. This vector is then projected into planes for better scrutiny and observation of features across different scenarios. The feature transfer operation has been executed within the new framework, which is rooted in the fundamentals of data-driven

modeling. Initially, the concept was tested using deterministic data and later expanded to incorporate stochastic data for a comprehensive evaluation.

Our results within limited scenarios have shown that the proposed framework is effective for close spectral ranges and can significantly improve simulation data accuracy/entropy in the spectral range of interest for high-frequency content. However, its capability diminishes when applied to distant frequencies. Thus, the framework is best suited for augmenting features of simulation data for close spectral ranges. Nevertheless, it is important to stress that sea waves are intrinsically narrow spectrum in nature, making the proposed engineering beneficial for practical hydrodynamic studies.

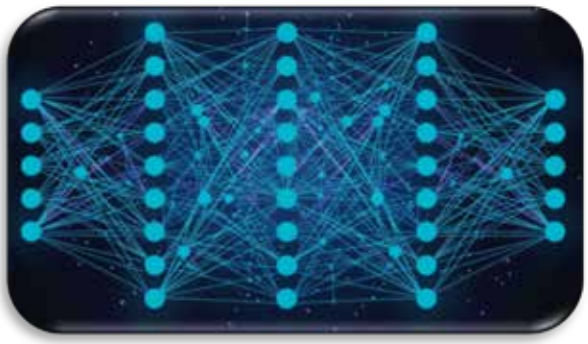
The significance and novelty of this study reside in two key areas. Firstly, given that simulation data offer the most feasible approach for the data generation process aiming at feeding ML, the proposed framework represents a significant step towards mimicking real-world features and establishing robust hybrid modeling. Although the current focus has been on utilizing the features directly, it is worth noting that these features can also be reversed into time series and applied for various hydrodynamics or seakeeping purposes. Additionally, the framework allows for the monitoring of densified feature spread based on different inputs to the system. This enables users to visualize how training occurs behind the scenes for ML networks by observing feature cluster patterns according to different inputs, leading to the development of more efficient ML models. Furthermore, as discussed, the proposed mechanism significantly reduces hardware and software computational resources for response classification, which appears as one of the neural-based networks limitations [33]. This topic will be further explored in part B of the current issue.

In a broader context, our findings hold significance not only in hydrodynamic responses of floating bodies but also in other modeling fields involving systems excited by sequential deterministic or stochastic inputs. The proposed framework can be tailored to various engineering disciplines, including aerospace, civil, biomedical, and environmental engineering, among others.

For future studies, it would be beneficial to explore the impact of geometrical dimension, especially when mimicking a ship. One approach could be to use a rectangular cubic model to assess how different geometries affect the features extracted by the framework. Additionally, investigating the impact of varying gains on features could provide valuable insights. This involves considering sets of wave heights as the exciting force to understand how changes in gain affect the resulting features. Moreover, while mapping has been conducted using both four DOFs, a more detailed sensitivity analysis can identify the predominant factors influencing data entropy for specific DOFs and wave conditions. Exploring the utilization of additional projection areas based on the spread of features and similarities between different modeling fidelities could be another promising avenue for future research. In a practical sense, future work could focus on how features from low-fidelity surrogates can be enhanced without the direct use of high-fidelity modeling, where resulting outcomes may extend beyond the specific scope of the maritime context.

Quote Rescale, Sarah Palfreyman, "AI surrogate models have emerged as powerful tools for accelerating engineering design cycles. They provide fast, data-driven approximations of high-fidelity simulations and enable engineers to explore large design spaces more efficiently…. **In this blog, we'll explore what AI surrogate models are, how to get started with them, and their history, helping you understand how they can accelerate breakthroughs in your work.**

EXCERPTS Article by Sarah Palfreyman **WEB** - **What Are AI Surrogate Models? A History & How to Get Started. From Statistics to Deep Learning, How the Math Evolved and Key Python Resources**



Teams leaning into AI physics are already accelerating R&D, cutting costs, and gaining a competitive edge by transforming how they make decisions. For example, did you catch SLB (Schlumberger) at NVIDIA GTC? Their demo offered a glimpse into the future: 100X faster results, real-time inference, and up to $1B in potential annual value through more efficient resolution of complex, high-cost engineering challenges. While some engineers are still hesitating, the real risk is falling behind. The good news is that if you're familiar with the mathematics behind Navier-Stokes, Maxwell, and other complex physics equations, along with the computational algorithms used to solve them, mastering deep learning will be a natural next step.

What is an AI Surrogate Model? An AI surrogate model is a mathematical approximation of a high-fidelity simulation, typically built using regression methods or neural networks.

Regression models use statistical methods to estimate relationships between variables based on historical data. Neural networks are a type of deep learning (DL) algorithm that adjust the strength of connections between data inputs and outputs during training to minimize prediction errors. Both techniques effectively learn complex, nonlinear relationships and generate predictions with probabilistic confidence intervals.

AI surrogates are commonly implemented in Python, and can be deployed as applications that accept user input, process it through the machine learning model, and return predictions. This process, called inference, can provide real-time approximations of computationally expensive simulations.

AI surrogate models are poised to revolutionize traditional Design of Experiment (DOE) and Monte Carlo methods. Full-fidelity CAE simulations are often too time consuming and costly, forcing scientists and engineers to limit either the number of simulations or the complexity of the physics, which limits the scope of their design optimization.

In contrast, AI surrogates are trained on a smaller set of full-fidelity data and are then used to rapidly estimate results across a wider range of design variations and complex physics scenarios. This approach enables faster, more comprehensive exploration of design spaces that were once too computationally expensive to fully investigate.

Because of this, AI surrogates will drive major industry breakthroughs, as optimization leads to more innovative solutions and significantly faster time-to-market.

How Accurate are AI Surrogate Models?

AI surrogate models provide clear error metrics to identify potential issues like training data bias, model variance, and uncertainty, helping you fine tune for better accuracy and build confidence in the model's predictions.

In deep learning, error calculations like Root Mean Squared Error (RMSE) help identify when a model's predictions are inaccurate or when it overfits or underfits the data. For example, if RMSE is high or accuracy is below 95%, you may need to add more training data, tune the model's hyperparameters, or improve feature engineering to reduce bias and variance.

Data plays a crucial role in the accuracy of AI surrogate models, as high-quality, diverse datasets lead to more reliable predictions. It's important to continuously evaluate and update your data pipelines to ensure that accurate, relevant data is fed into the model, and to periodically retrain it to maintain its reliability over time.

By understanding these error measures, you can improve on your deep learning based models to achieve results that closely match full-fidelity simulations, delivering a fast, reliable solution for a wide range of applications.

The Evolution of AI Surrogate Models in Engineering

Machine learning has been integrated into mathematics, engineering, and computer science curricula since the 2010s, marking a significant shift in how we approach problem solving.

If you're exploring machine learning mid-career, don't worry. These concepts build on familiar statistical and optimization techniques, and there are plenty of resources to help you understand and apply them effectively.

Here's how we got here, mathematically speaking:

1950-1960 – Early Statistical Learning -

Linear regression was the go-to method for predicting continuous values in simulations, like temperature or stress distribution. However, this technique has limitations when dealing with complex, nonlinear behavior and cannot easily account for interactions between multiple physical variables.

1970-1980 – Advancements in Machine Learning

Classification algorithms such as Decision Trees and Nearest Neighbors (k-NN) grew in popularity due to their ability to predict outcomes based on labeled past data. However, both methods struggle with overfitting, making it difficult for them to generalize to new data in some instances.

1990 – Support Vector Machines (SVMs) Emerge

SVMs emerged as a powerful classification tool, improving upon decision tree-based algorithms by effectively handling complex, high-dimensional data, making them particularly useful in physics and other fields with nonlinear relationships.

2000 – The Introduction of Neural Networks (NN)

Neural networks quickly gained traction for modeling complex, nonlinear relationships by using multiple layers to learn hierarchical features from labeled or unlabeled data, making them ideal for predicting outcomes in applications such as fluid dynamics.

2010 – The Rise of Deep Learning

The 2010s marked the rise of deep learning, with advancements in computational methods like Convolutional Neural Networks (CNNs) and Reinforcement Learning. These innovations leveraged large datasets and high performance computing to solve previously intractable problems, accelerating progress in aerospace, automotive, and materials science.

2020 – AI-Driven Breakthroughs in Physics

Bringing us to modern times, Physics-Informed Neural Networks (PINNs) have emerged as a transformative AI approach for solving complex physics-based problems by embedding physical laws directly into neural network training. This breakthrough has unlocked new levels of accuracy and efficiency, making it possible to tackle previously intractable challenges in engineering with unprecedented speed and reliability.

Ways to Get Started - Diving into Machine Learning can seem overwhelming, but focusing on small wins is the right approach to build confidence and momentum.

Here are three practical steps to get started:

Get Hands-on with Python - Python is the go-to language for machine learning in engineering. Getting comfortable using libraries like NumPy, Pandas, PyVista, and Matplotlib will help you to manipulate and visualize simulation data. A good first goal is to perform exploratory statistical analysis—using Python to read, summarize, and interpret CAE datasets. For instance, calculating average temperature distribution in thermal simulations or analyzing stress and strain variance in FEA can reveal critical insights before applying machine learning models.

Jupyter Notebooks are a free and user-friendly integrated development environment (IDE) that makes programming in python and data analysis more accessible. Ideal for building and testing machine learning models, they allow users to easily explore data, identify trends, and experiment with code in an interactive, shareable format.

Try Low-Code AI Tools for Quick Prototyping - For those who prefer visual, drag-and-drop workflows, low-code AI tools provide a fast and intuitive way to prototype surrogate models by automating data preprocessing, feature selection, hyperparameter tuning, and model training. The best solutions come with pre-built templates and automation scripts, abstracting complexity to make advanced machine learning more accessible while eliminating the need for extensive coding.

But ease of use isn't just about smart AI features. If a platform can't efficiently pull in, organize, and integrate data from multiple sources, you won't get the full value AI can offer.

Great AI platforms can build models where data is captured and stored, leveraging centralized data to create efficient, reliable computational pipelines. By streamlining everything from data ingestion to deployment, low-code tools make prototyping AI surrogate models faster and easier.

Explore AI Focused Resources - If you're working with large datasets, TensorFlow and PyTorch are great choices because of their scalability, flexibility, and extensive ecosystem of pre-built models. These libraries run even faster on NVIDIA GPUs, helping you train models more efficiently by leveraging accelerated cloud computing. For physics-based simulations, NVIDIA PhysicsNeMo offers pre-optimized reference architectures and real-world examples on GitHub. All of these resources help engineers augment their high-fidelity simulations with efficient AI-based models, allowing them to scale up and tackle larger, more complex problems in real-time.

The Evolution of Surrogate Models

Machine learning has been integrated into mathematics, engineering, and computer science curricula since the 2010s, marking a significant shift in how we approach problem solving.

If you're exploring machine learning mid-career, don't worry. These concepts build on familiar statistical and optimization techniques, and there are plenty of resources to help you understand and apply them effectively.

Conclusion

AI surrogate models are invaluable tools in modern engineering, helping reduce simulation runtimes and explore bigger design spaces. From a mathematical perspective, they are straightforward and no more complex than the engineering principles you already apply in your work.

To get started, check out Rescale's available AI resources and consider exploring professional development courses on AI, such as those offered by MIT or Stanford. These courses can deepen your expertise and accelerate your progress in mastering AI-driven solutions.

Taking the time to learn more about AI surrogate models will both enhance your skills and reignite your passion for engineering.

Sarah Palfreyman - Sarah is a passionate AI enthusiast currently serving as a Senior Solutions Marketing Manager at Rescale. She has a background in computational mechanics from Stanford University and has developed her expertise in CAD/CAE through key roles with products such as Onshape, Star-CCM+ (CD-adapco), PDE Toolbox (MathWorks), Spatial (Dassault Systèmes), and MSC Nastran and Marc (Hexagon).

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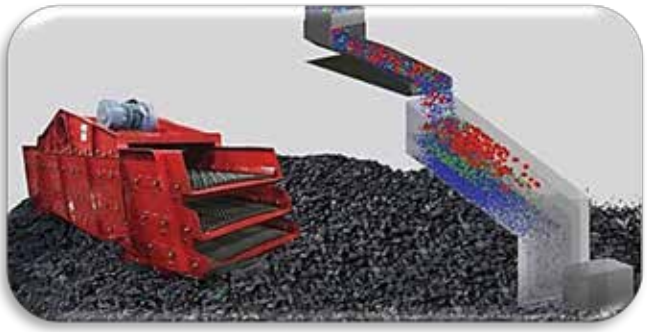
CADFEM

"In the competitive mining industry, optimizing equipment performance isn't just about increasing throughput—it's about reliability, safety, and cost-effective design. One advanced approach that's reshaping equipment development is the coupling of the Discrete Element Method (DEM) and Finite Element Method (FEM). **In this blog post, we explore how DEM-FEM coupling—using Ansys Rocky for DEM and Ansys Mechanical for FEM—enhances the design and performance of vibrating screens, a critical piece of mineral processing equipment.**"



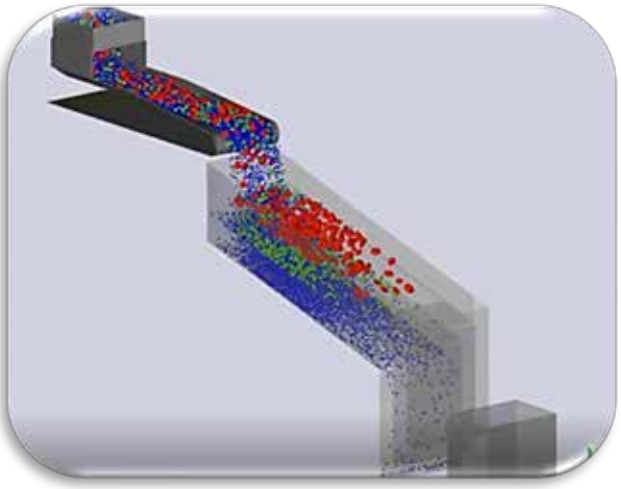
Web – CADFEM - Enhancing Mining Equipment Efficiency: DEM & FEM Coupling for Vibrating Screens

Piyush Dhananjay Dandagawhal

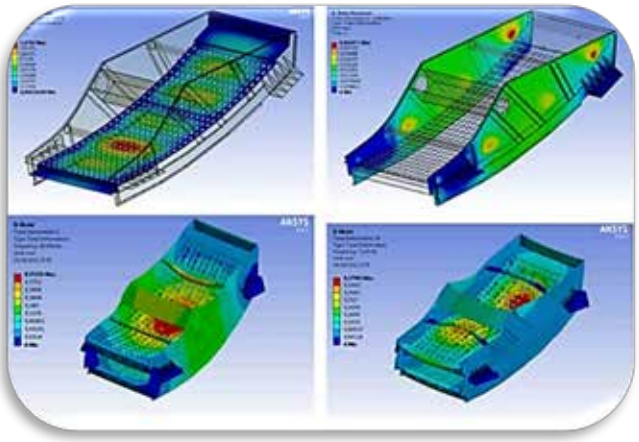
The Role of Vibrating Screens in Mining - Vibrating screens are essential in the mining process. They efficiently separate and classify particles based on size, ensuring that ore processing systems work at their optimum capacity. However, the dynamic environment on the screen—characterized by continuous vibration and particle impacts—creates challenges in both separation efficiency and structural integrity. This is where advanced simulation comes into play.

Understanding DEM and FEM: Discrete Element Method (DEM) with Ansys Rocky - DEM is a powerful numerical tool that models individual particle interactions. Ansys Rocky, the industry-leading DEM simulation tool, accurately predicts the behavior of granular materials. It allows engineers to:

- **Simulate Particle Flow:** Analyse trajectories, collisions, and segregation patterns.
- **Assess Separation Efficiency**: Evaluate how different operating conditions affect the screening process.
- **Optimize Particle-Equipment Interaction**: Determine the impact forces & how they influence wear on the screen.



For example, by simulating ore particles moving over a vibrating screen, Ansys Rocky can help identify regions of high particle concentration and impact, providing key insights into the efficiency of separation and potential stress concentrations on the screen surface.



Finite Element Method (FEM) with Ansys Mechanical - FEM, on the other hand, focuses on the structural response of the vibrating screen. Ansys Mechanical is a robust tool for predicting:

- **Stress and Strain Distribution:** Determine how the screen structure responds to dynamic loads.
- **Vibration Analysis:** Identify natural frequencies and ensure the screen design avoids resonant conditions.
- **Structural Durability**: Evaluate potential failure modes, allowing for proactive design improvements.

By using FEM, engineers can ensure that the screen's design withstands the forces induced by particle impacts, ultimately leading to longer equipment life and improved safety.

The Power of Coupling DEM and FEM - The real magic happens when DEM and FEM are coupled. This integrated simulation approach allows for a complete understanding of both the particle behavior and the structural response. Key benefits include:

- **Comprehensive Analysis of Equipment Performance** - Enhanced Understanding of Interactions: The integrated simulation analyzes how granular materials interact with structural components. This detailed view reveals how particle flows affect stress and strain, leading to smarter design decisions.
- **Improved Design Efficiency - Optimization of Equipment Design:** By simulating both the flow of bulk materials and their impact on structures, engineers can optimize design parameters—such as screen shape, mesh size, and vibration settings—to maximize separation efficiency and minimize material wastage.
- **Accurate Stress and Strain Predictions** - Structural Integrity Assessment: FEM allows for precise evaluation of stresses and deformations. This insight helps identify potential failure points in vibrating screens and similar equipment, guiding modifications to enhance durability and safety.
- **Reduced Prototyping Costs** - Virtual Testing: Advanced simulation reduces the need for extensive physical prototyping. Engineers can test a range of loading and vibration scenarios virtually, saving both time and money while accelerating time-to-market.
- **Enhanced Simulation Capabilities** - Multi-Physics Integration: The coupling of ANSYS Rocky with ANSYS Mechanical supports comprehensive multi-physics analyses. In addition to structural response, you can also incorporate fluid dynamics (via SPH) and thermal effects, providing a complete picture of equipment performance.
- **Improved Operational Reliability** - Predictive Maintenance: Simulations that accurately predict load distributions and wear patterns enable the implementation of predictive maintenance strategies, reducing downtime and maintenance costs..

- **Real-Time Data Utilization** - Dynamic Simulations: The coupled approach supports real-time simulations that account for varying operational conditions—such as changes in material properties or flow rates—ensuring that the design remains robust under dynamic working environments
- I**ncreased Safety Standards** - Risk Mitigation: By accurately predicting stress distributions and potential failure modes, engineers can design equipment that withstands extreme conditions. This proactive approach enhances safety for both operators and the overall mining process.

For instance, a case study in the mining industry showed how using coupled DEM-FEM simulations led to a more efficient vibrating screen design, with improved separation efficiency and a significant reduction in unexpected downtime due to structural failures.

Why Choose Ansys Rocky and Ansys Mechanical? Ansys Rocky and Ansys Mechanical offer a seamless workflow for coupling DEM and FEM:

- **User-Friendly Integration:** The tools are designed to work together within the Ansys Workbench environment, simplifying the process of transferring force data and aligning simulation parameters.
- **Scalable and Accurate:** With advanced GPU acceleration in Rocky and robust structural analysis in Mechanical, these tools handle large-scale simulations with millions of particles and complex geometries.
- **Proven Track Record:** From optimizing vibrating screens to simulating excavator buckets and crushers, the coupled simulation approach has consistently delivered actionable insights that lead to better-performing mining equipment.

Conclusion - **In a rapidly evolving mining industry, leveraging coupled DEM-FEM simulations is no longer optional—it's essential.** By using Ansys Rocky and Ansys Mechanical, companies can design vibrating screens that not only improve separation efficiency but also ensure structural durability and operational safety. This integration empowers engineers to innovate confidently, reducing both development costs and downtime.

Ready to revolutionize your equipment design with advanced simulation? Contact us today to learn how Ansys simulation tools can drive efficiency and reliability in your mining operations.

DYNAlook presents papers from European & Int'l LS-DYNA User Conferences & papers provided by other users. More than 2300 papers are available. (if the PDF links no longer work refer to (https://www.dynalook.com) for their updated links)

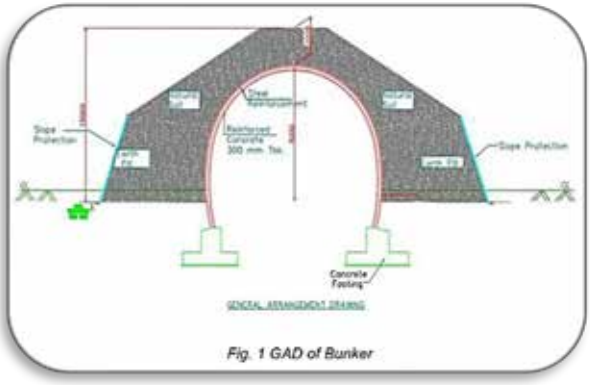


Fig. 1 GAD of Bunker

PDF – DYNAlook – PDF - SPH Coupled Simulation for Blast and Impact study on Reinforced Concrete Bunker buried under Soil

Priya Gautam, Hrishkesh Sharma
Indian Institute of Technology Guwahati Assam India

This study examines how concrete structures respond to extreme conditions, particularly coupled simulation for blast and impact analysis, using LS-DYNA software for simulations. By analyzing displacement, pressure, strain, and stress, we aim to understand failure mechanisms and quantify damage in buried bunkers, providing insights for structural design and resilience assessments. In addition, coupled simulation for blast impact analysis, we consider durability and survivability under extreme conditions. This includes assessing long-term structural integrity, understanding environmental effects on material properties, and ensuring structures can function effectively after extreme events.

The study utilizes numerical simulations to assess the resistance of a buried bunker against coupled simulation analysis. The bunker, made of reinforced concrete with a thickness of 300 mm and a concrete grade of M40, is situation at a depth of 2 meters. Its reinforcement consists of steel with a yield stress (fy) of 600 MPa.

In the simulations, the bunker and its surrounding soil are subjected to impacts from a rigid steel object with cylindrical dimensions - specifically, a dimeter of 0.2 m and a height of 0.25 m below an explosive charge of 25 kg TNT in form of SPH having dimension 0.16 diameter and 0.04 m height. Both the explosive and the impactor are projected at velocities ranging from 100 m/ss to 270 m/s. The objective of this study is to evaluate how these coupled simulation analysis scenarios influence the structural integrity and resilience of the bunker against explosive forces, providing insights into its performance under extreme conditions.

Introduction - A buner is a military fortification designed to protect personnel and valuable assets from bomb attacks and other forms of assault. Historically, bunkers were extensively utilized during World War I, World War II, and the Cold War, serving not only as shelters but also as command centers, weapon storage facilities, and distribution points.

In light of evolving threats from sophisticated conventional weapon detonations and terrorist attacks, there is an urgent need to enhance the resilience of these structures against modern challenges. To prevent structural failure, it is crucial to adopt appropriate geometrical configurations and consider the effects of coupled simulation for impact loads during the design process …

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This month Not To Miss
Informational.

If you've ever stayed up late debugging a model, questioned the laws of physics, or wondered why your solver takes hours to run, you'll find something relatable here.

Being a CAE engineer is like being in a long-term relationship with simulations—you put in all the effort, solve complex problems, and sometimes, things still crash (literally). And let's not forget physics, the silent force behind everything we do.

Excerpts from My Physics Café: Life of a CAE Engineer (10 Valuable Lessons) - Abhinav Tanksale

Over the years, I've shared my thoughts, struggles, and insights on LinkedIn, and some posts have resonated more than others. So, I thought—why not bring them all together? This blog is a collection of my best-performing posts on two things close to my heart: CAE and fundamentals of physics.

So, let's relive the highs and lows of CAE life.

1) The Dynamic Engineer - What makes the role of CAE Engineers particularly interesting is their dynamic skill set. Apart from analytical skills, a CAE Engineer needs to wear many hats in his/her daily life to ensure effective outcome. But that's not all! Their ability to address challenges while collaborating seamlessly across multiple teams makes them a driving force behind operational success.

2) Computational Struggles - In CAE, Implicit analysis requires more computational effort as compared to explicit analysis. Let's understand why: Implicit method involves solving a system of equations iteratively, using matrix calculations. The computational cost of solving these equations increases with size & complexity of the model. Also, it is well-suited for problems with highly nonlinear material behavior, contact & large deformations. This demands more computational resources to accurately capture & solve the model behavior.

3) Challenges - Vibration analysis seems interesting due to its interdisciplinary approach. NVH combines physics, math & engineering to address real world issues. Additionally, it often involves working with complex data sets, requiring skills in data analytics, signal processing & interpretation. This approach requires a strong hold on multiple areas making it challenging for beginners.

So, here are some ways to develop your skillset in vibration.
Build a strong foundation by studying the fundamentals of physics, mathematics & engineering.
Engage in hands-on, practical projects like creating simple models with available resources online.
Explore books, research papers & case studies to deepen your understanding.

4) **The problem solver** - CAE isn't something you can do with just one click. It relies on many inputs & parameters to get accurate results. By coordinating experimental data with the right parameters, Engineers achieve results that are more realistic. Therefore, CAE engineers performing analysis must make sure that necessary conditions are met without compromising the accuracy. They must rely on their experience, technical knowledge & skill set to ensure the results are reliable.

5) Are you just a Tool expert? Knowing the basics well is often the key to solving toughest of problems. Similarly, getting a strong grasp of physics before learning a tool is crucial for becoming good at CAE. Engineers who know physics well are more adaptable, as it allows them to apply principles across different domains irrespective of the tool. Moreover, they can critically evaluate results, focusing on the real-world implications instead of just relying on virtual outcomes. **While tools are needed for time-consuming calculations, it's the basics that actually drive the solutions.**

6) Eleventh hour rush! As CAE Engineers, we know the frustration of late-stage changes to design requirements or specifications. These last-minute shifts often mean reworking, revalidating & scrambling to meet deadlines - all under intense pressure. But remember, these challenges also highlight our adaptability & problem-solving skills.

Every time we face such hurdles, we're proving our ability to deliver accurate & reliable results, no matter the circumstances. In fact, CAE Engineers are known for adaptability due to their skill of handling eleventh-hour situations.

7) There are no shortcuts - Have you ever met someone who thinks CAE is just about pressing a button to get desired output? Some believe it's all about pretty pictures, ignoring the unpredictable nature of real-world materials. They don't realize the hours of processing involved or how a single wrong boundary condition can affect the outcome. In CAE, there's no magic button. Just meticulous work & expertise.

8) Result interpretation - Running a simulation is only half the battle. As a CAE Engineer, the real challenge often begins during post-processing. While the model setup phase is crucial, extracting meaningful insights from the data requires true expertise.

It's not just about generating colorful plots – it's about transforming them into actionable insights that drive better designs.

That's why, mastering post-processing techniques is a vital skill for anyone looking to excel in the field of CAE.

9) How long will it take? Crash simulations can take hours to solve just a few seconds of real-world situation. But why is that so? It's all about the complexity behind the scenes!

A CAE solver breaks down every millisecond into tiny steps to capture the details of how materials bend, break & absorb energy during a crash. From ultra-fine mesh to real-world material behavior, every step is crucial to ensuring accuracy.

It might take hours, but these simulations give us life-saving insights into vehicle safety.

10) It's a trade-off - It's tempting to use fine mesh to capture all the details. But the more refined a mesh, the more elements you have, and more will be the solving time. his also leads to higher resource usage, making it crucial to find a balance. The solution is simple: Ensure detail where it's needed but avoid excessive refinement in less critical areas.

11) It's not what you think - While visuals are great for showing results, they're only the surface. The true power of CAE lies in the complex calculations, physics & analysis behind those visuals. Let's make it a habit to think beyond what we see & understand the core of our work.

And that's a wrap! If you found yourself nodding along, congratulations—you're on the right track. After all, true expertise comes from struggling with stubborn solvers, not from sitting comfortably with a perfect mesh (as if that ever happens).

Marco Evangelos Biancolini

RBF Morph, MeDiTATe Project. LivGemini

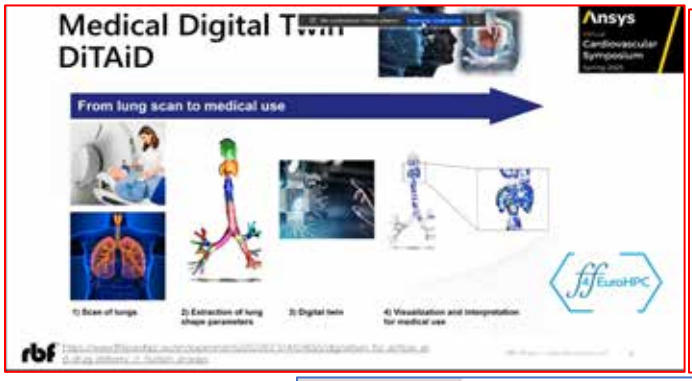
We are thrilled to announce that the recordings of the 2nd online Ansys Cardiovascular Symposium are now available for download! It was an honor to take part in this insightful event held on April 3rd, which brought together leading minds in in silico cardiovascular modeling.

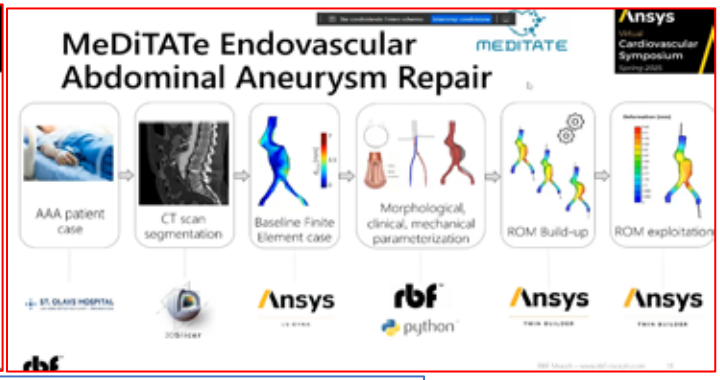
Web –Vidyard - Ansys Cardiovascular Symposium

Speakers (left to right):

Oscar Camara (Univ. Pompeu Fabra)
Jordi Mill (Virtest Technologies)
Farhad R. Nezami (Brigham & Women's Hospital, Harvard Medical School)
Marco Evangelos Biancolini (RBF Morph)

RBF Morph presented on accelerating cardiovascular pre-operative planning and building large virtual patient cohorts using mesh morphing. Additionally, demonstrated how advanced shape optimization and simulation-driven design can enhance surgical outcomes and enable patient-specific treatment strategies. We also explored key initiatives such as: MeDiTATe-project, **Copernicus**, and **Pandora**—showcasing how mesh morphing is revolutionizing clinical workflows and enabling large-scale in silico trials. A particular thank you to Thierry Marchal and Ansys for making this incredible event possible!





Web – Mercedes - [Steer-by-wire becomes reality at Mercedes-Benz: a completely new steering experience combined with maximum safety]

A steering wheel is much more than just a car component – it connects the driver with the road via the tyres. The steering wheel provides feedback on driving behaviour, enables the driver to feel uneven road surfaces and, in the past, was the physical cranking mechanism for maneuvering into parking spaces.

A new era of vehicle operation is about to begin for Mercedes-Benz customers – the company will be the first German car manufacturer to offer a production vehicle with steer-by-wire from 2026. This technology does not require a mechanical connection between the steering wheel and the front wheels. Instead, the driver's steering requests are transmitted quickly and directly via an electrical cable, i.e. “by wire”.

The completely new steering feel provides an unparalleled customer experience with a wide range of advantages in everyday driving: handling is better and manoeuvring and parking become even easier. This is because steer-by-wire can further reduce the effort required and there is no longer a need to re-grip the steering wheel while parking.

Markus Schäfer, Member of the Board of Management of Mercedes-Benz Group AG. Chief Technology Officer, Development & Procurement, “Steer-by-wire is another big step towards the mobility of tomorrow, and we’re proud that we will be launching such a system in 2026. The technology enables a unique customer experience that goes far beyond steering alone. In combination with SAE Level 3 conditionally automated driving, it will enable an even more immersive entertainment experience in the medium term. That’s because the flat steering wheel provides a better view of the display when streaming your favorite show, for example.”

The suspension specialists can choose the steering ratio variably and adapt it flexibly to different situations. This enables the simultaneous optimization of driving characteristics that were previously in conflict with one another – permitting, for example, an even better combination of sportiness and comfort. Likewise, it can bring further increases in directional stability and lateral agility, which is also thanks to the perfect interaction with the rear-axle steering (with a steering angle of up to 10 degrees). Vibrations caused by uneven road surfaces, which were previously transmitted to the driver via the steering wheel as disturbances, can now be almost completely prevented.

.... The functionality of steer-by-wire in detail: depending on the driving speed and situation, an actuator on the steering wheel (steering feedback unit; SFU) sends the driver's steering signal to the steering rack (steering rack unit; SRU), which steers the wheels. The SFU also generates the steering feel typical of Mercedes-Benz. Since the mechanical decoupling of the steering wheel and wheels eliminates steering torque, the tyre-road contact is calculated on a model-by-model basis with the help of the restoring forces of the steered wheels…

Scuderia Tor Vergata is the Formula Student team from the University of Rome Tor Vergata. Over the years Scuderia has welcomed hundreds of students united by both a passion and a common purpose: sharing and applying the technical and theoretical knowledge during their studies into the design and manufacturing of a prototype.

Web - Scuderia Tor Vergata **- Scuderia Tor Vergata is the Formula Student team from the University of Rome Tor Vergata.** Over the years Scuderia has welcomed hundreds of students united by both a passion and a common purpose: sharing and applying the technical and theoretical knowledge during their studies into the design and manufacturing of a prototype.

The University of Rome Tor Vergata moved its first steps in Formula Student since 2006, collaborating

with the University of Rome “La Sapienza” and the “Tuscia” University. Based on this experience, in 2009 was founded “Scuderia Tor Vergata”. Since its foundation, the team has designed and built a total of 10 prototypes that have participated in more than 15 international events.

Today, the team is composed by more than 80 students who design and develop the prototype and take care of the logistics, the communication and the finances of the team.

The Competition - Formula Student is a student engineering education competition which involves hundreds of universities all around the globe, at present more than 600. Students participating are challenged to conceive, design, fabricate, develop and compete with small – but yet really fast – formula style race cars.

The actual competition takes place annually with several different events whose locations range over four continents, and its aim is to prepare undergraduate and graduate engineering students (and more) in a variety of disciplines for future employment in mobility-related industries by challenging them with a real world engineering application. Teams take on the assumption that they are a manufacturer developing a prototype to be evaluated for production. The race car must show very good driving characteristics such as acceleration, braking and handling. Additionally, the car’s market value increases through other factors such as aesthetics, comfort and the use of readily available, standard purchase components.

Events - Each competition gives teams the chance to demonstrate their creativity and engineering skills in comparison to teams from other universities since each design is judged and evaluated against other competing designs in a series of Static and Dynamic events to determine the vehicle that best meets the design goals and may be profitably built and marketed.

US Airforce Picture of the Month

Wings of Blue - Cadet First Class Garrett Hake, U.S. Air Force Academy Wings of Blue parachute team member lands prior to the annual Founder's Day Parade at Stillman Field in Colorado Springs, Colo., April 12, 2025. The demonstration team travels across the country to airshows, sporting events and other venues to represent the Air Force in precision parachuting.

(U.S. Air Force photo - Dylan Smith)

Gunsmoke - Master Sgt. Robert Valenzuela, Washington Air National Guard, 194th Security Forces Squadron flight chief, conducts training on the principles of shoot, move and communicate tactics on Joint Base Lewis-McChord, Wash., Apr. 5, 2025. The training prepares Airmen with the critical skills needed to shoot accurately, move tactically and communicate effectively in real-world scenarios.
(U.S. Air National Guard photo - Master Sgt. Tim Chacon)

Horsepower - The White Horses from Hardin-Simmons University ride past a B-1B Lancer during the Wings Over West Texas Airshow at Dyess Air Force Base, Texas, April 19, 2025. Representing the university's Six White Horses tradition, these equestrians showcase western heritage and school spirit through appearances at parades, rodeos and special events across Texas. Their presence at the airshow brought a touch of local pride and history to the celebration of airpower and community.
(U.S.A.F. photo - Airman 1st Class Jade M. Caldwell)

Lockheed Martin (NYSE: LMT) and the U.S. Army successfully launched the Precision Strike Missile (PrSM) from a Multiple Launch Rocket System (MLRS) M270A2 launcher for the first time in a short-range production qualification test, demonstrating platform integration and readiness. The flight test, conducted at White Sands Missiles Range in New Mexico, validated PrSM's performance and integration with the M270A2 launcher.

Web – Lockheed - First-Time Fire: US Army M270A2 Launches Lockheed Martin's Precision Strike Missile

The Increment 1 missile fired at multiple targets, including a radar and rotary wing platform, engaging them with precise and lethal impact.

"This test shows that PrSM works seamlessly with the Army's tracked M270A2 launcher, which fires the same munitions as HIMARS," said Carolyn Orzechowski, vice president of Precision Fires Launchers and Missiles at Lockheed Martin.

The short-range flight also demonstrated the missile's ability to maneuver and maintain accuracy, even under the most stressful conditions.

"While PrSM's primary mission is long range fires, Lockheed Martin validates accuracy and reliability of the missile even at the shortest distances before we provide it to warfighters," Orzechowski said.

PrSM continues to rapidly advance through system qualification reinforcing the readiness of this 21st Century Security® capability that will provide soldiers with a strategic advantage in the battlespace. PrSM is designed to provide the warfighter with a long-range precision strike capability, engaging targets at distances greater than 400 kilometers.

Its open systems architecture, modularity and compatibility with HIMARS and M270A2 launchers make it an essential part of the U.S. Army's modernization efforts.

This successful test is the latest in a series of milestones for the PrSM program, which includes a recent production contract worth up to $4.94 billion and successful flight tests in February and March.

This series of testing reinforces Lockheed Martin's commitment to delivering unmatched operational superiority and mission success, and ensures these systems are trusted to perform in the most complex and dynamic environments.

Web - [Turkish Air Force 5XF-16 C/D aircraft, KC-135R stratotanker, E-7T aircraft and 124 personnel participated in Exercise Ramstein Flag-2025.]

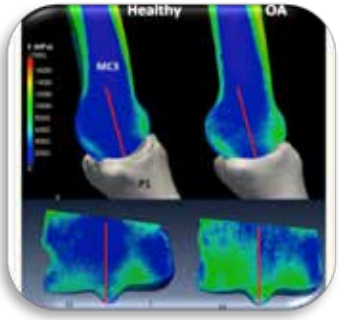
During the exercise, a Turkish KC-135R conducted in-flight refueling of an F-35 aircraft for the first time.

Exercise Ramstein Flag-2025 was conducted with the participation of air assets from:

- Türkiye, Denmark, Finland, France,
- Germany, Greece, Hungary, Italy,
- Romania, Spain, Sweden,
- the Netherlands, the United Kingdom,
- the United States,
- as well as a NATO AWACS aircraft.

Simulations were performed using Abaqus Standard software

Objective - To assess whether the transient stresses of foot impact with the ground are similar to those found during midstance loading and if the location of high stress correlate with the sites most commonly associated with mechanically induced osteoarthritis (OA).



Web – NIH - **Finite-Element Analysis of Bone Stresses on Primary Impact in a Large-Animal Model: The Distal End of the Equine Third Metacarpal**

Cristin A McCarty, Jeffrey J Thomason, Karen D Gordon, Timothy A Burkhart, Jaques S Milner, David W Holdsworth
Dept. Bio. Sci, Ontario Vet. College, Univ. Guelph, Ontario, Canada
Dept. Bio. Engin., Sch. of Engineering, Univ. Guelph, Ontario, Canada
Dept. Mech. & Mat. Eng. Sch.of Engin., Western Univ., Ontario, Canada
Robarts Res. Inst., Schulich Sch. Med. & Dentistry, Western Univ., Canada

We compared impact stresses in subchondral bone between two subject-specific, three-dimensional, finite-element models of the equine metacarpophalangeal (MCP) joint—one with advanced OA and one healthy, and with similar published data on the stresses that occur at midstance.

Methods. Two right MCP joints (third metacarpal and proximal phalanx) were scanned using micro-computed tomography (μCT). Images were segmented, and meshed using modified 10-node quadratic tetrahedral elements. Bone material properties were assigned based on the bone density. An impact velocity of 3.55 m/s was applied to each model and contact pressures and stress distribution were calculated for each….Within-region maximal peak and average von Mises stresses were compared between healthy and OA bones in both midstance and impact loading.

Metacarpophalangeal Mesh Development - Each of the 3D surface models were imported into an automated mesh generating software program (NetGen 4.9.13, Linz, Austria) where 4-node linear tetrahedral meshes were created. **The meshes were then imported into Abaqus Explicit (v6.12, Dassault Systemes, Vélizy-Villacoublay, France) where the elements were converted into modified 10-node quadratic tetrahedral elements….**.

...Impact Loading and Boundary Conditions - All impact simulations were performed using Abaqus Explicit software, by applying a velocity to all nodes of MC3, generating an impact with a stationary P1, the distal end of which was constrained in all directions.

...General surface-to-surface contact was specified within Abaqus Explicit and the coefficient of friction between P1 and MC3 was set at 0.007 [38]. A linear interaction property was used, with the surface stiffness properties defined at 12 MPa/mm to allow for sufficient contact and “settling” of the contact surfaces before they separated on rebound.

Excerpts – complete graphics are on the website.
Enginsoft USA 7210 Virginia #100-6243 McKinney, TX 75072

Web – Enginsoft USA - Using CAE to Optimize the Structure of Power Harrows in Farm Equipment
The Frandent company is located in Osasco (TO), a small town near Pinerolo, about 50km from Turin. Since 1977, it has specialized in the design and production of agricultural machines and, in particular, power harrows, tedder spreaders and rotary rakes. In 2006, Frandent started working in a new plant and introduced considerable innovations in its design and production processes, such as the sustainable management of energy consumption. One of the most important investments Frandent has made in innovation is the 15,000 m2 test track it has set up and uses to perform functional experimental tests of its products in both nominal and extreme conditions. Frandent also commissioned EnginSoft to collaborate strongly with its R&D department on its innovation program, which aims to continuously optimize the company's products to meet the global market challenges of durability and product performance.

Introduction - One of the goals of the collaboration activities was to increase the viable working velocity of the harrow since higher speed means less time and, in the highly competitive environment of the global market, this performance efficiency equates to a fundamental valueadd in the customers' perception. From the technical point of view, the study was concerned with optimizing the strength of the harrow tooth by looking for the best compromise between the mechanical resistance of the tooth and its mandatory function as a failsafe in the overall transmission chain. In fact, as a cheaper and easily replaceable part, the tooth is required to be the first component that breaks in the case of an extreme impact with an object such as a stone, which can easily occur while working the ground.

Virtual Test Description - The simulation represented the impact of the harrow tooth against a stone during the working phase.

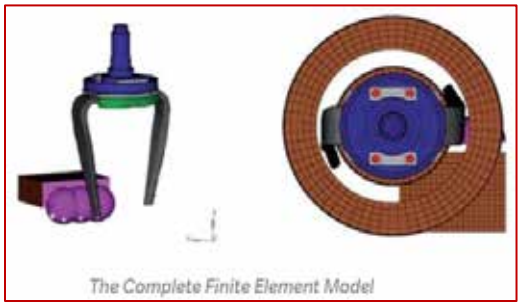
Using CAE to optimize the structure of power harrows. The test was carried out in different conditions which varied:

- the impact point
- the impact angle
- the stone shape
- the rotational and translation speeds ratio
- the severity of the test (from nominal conditions to the most severe scenario)

The impact velocity is the sum of the tractor's forward translational speed and the tangential velocity of the tooth. Nominal operating speed was also analyzed. Moreover, two different geometries were considered:

- A nominal geometry (corresponding to the CAD output)
- The geometry of a worn tooth and tooth housing.

In order to facilitate the replacement of a broken tooth in the presence of dust and mud, each tooth is mounted with a clearance area. These coupling conditions, however, also allow the surfaces to slide and impact against each other during use and, as a consequence, the clearance area increases during the life of the harrow. As a result, the mechanical behavior of the new and worn tooth geometries differs.



The Complete Finite Element Model

Finite Element Model (FEM) - The FEM was generated using second-order solid elements; in particular, the teeth of the harrow were modeled with tetrahedral elements. The initial conditions were introduced by considering the rigid motion of the support shaft. In order to replicate the working conditions of the harrow, a foam material model with properties able to reproduce the real phenomena was used to represent the soil. The soil supports the stone at the opposite side with reference to the impact.

The steel constituting the tooth's material was introduced as *MAT_24 through the stress/strain curves (considering the strain rate).

Finite Element Model of the rotor - To correctly simulate the failure behavior, the engineers implemented a homogenization algorithm. They also introduced and calibrated a nonlocal theory approach (material card *MAT_ NONLOCAL); in this method, the failure criterion considers the state of the material within a radius of influence surrounding the integration point.

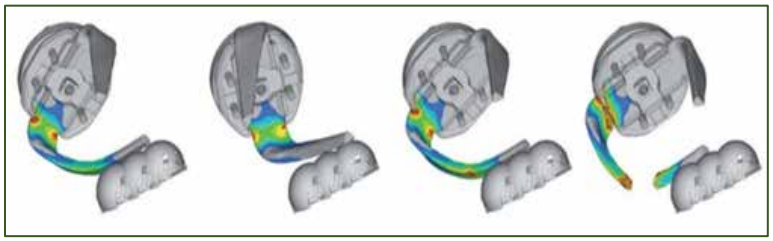
An advantage of using nonlocal failure is that mesh size and mesh flow sensitivity on failure are greatly reduced which leads to results that converge to a unique solution as the mesh is refined. Without introducing a nonlocal criterion, strains will tend to localize randomly with mesh refinement, which leads to results that can change significantly from mesh to mesh.

A nonlocal failure theory approach can be very helpful in predicting both the onset and the evolution of the material failure. It renders the failure mesh independent, more homogeneous and more realistic. This method does, however, increase CPU time significantly, so it is wiser to use it strategically.

Results - Model calibration - The model calibration concerned two different aspects:

- soil and stone modeling
- the calibration of nonlocal material parameters

Initially, the working conditions analyzed were not critical and did not lead to tooth rupture; therefore, the soil and stone material models were modified to make the analysis more severe and realistic.



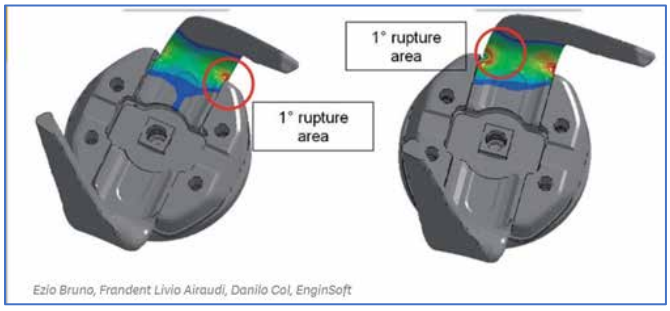
The model had to represent:

- similar conditions of failure to those in the experimental tests
- the initial crack's position (where the crack starts)
- the crack's evolution.

The second correlation step was to set the nonlocal material parameters. The values introduced had to guarantee that the initial failure point and its evolution were not affected by:

- the local mesh
- the local mesh size
- the local mesh orientation

As a result, the simulation team was able to create a correlated and robust FE model.



Virtual test results (original geometry) - The analyses on the significant impact conditions for both the new and the worn tooth were then carried out using the FE model calibrated in the previous task. The results showed that the mechanical behavior is strongly affected by the tooth's wear; the structure had to be validated for both conditions.

Virtual test results (Optimized geometry) - The tooth geometry was modified with a new design to improve the strength of the tooth but, in the second, optimized geometry simulation, the measured torque during the impact could not exceed the value measured in the original geometry simulation. This parameter was mandatory because the teeth are vital to safeguarding the transmission chain in the case of extreme impacts.

Conclusion - Frandent is transforming itself by increasing its R&D activities in order to deliver best-in-class products. But, these ever-increasing performance improvements have to be achieved in a short time while reducing the high prototyping and testing costs. CAE includes very powerful technologies that are able to simulate real working conditions. It also allows several designs to be evaluated virtually, dramatically cutting the development time and costs. In term of component failure, we confirmed very good correlations between the numerical analysis and the experimental tests. Moreover, the CAE-driven design created a more robust part because it could be tested in all the possible working conditions, without limitations. As a result, Frandent and EnginSoft could define a new tooth geometry that increased the viable working velocity of the power harrow by 12%.

Town secretary May

My Virtual Travel Outing

Thank you for joining me on my monthly visit.
Let's take a tour to a museum, landmark, or studio.

Thank you for joining me to a favorite of mine on a past visit. .

Web - [Revs Institute](#) Revs Institute is more than a car museum — it is a place to view the evolution of modernity through a different lens.

Its museum houses one of the world's great automobile collections, curated for historic, aesthetic, technological, and societal significance

1995 McLaren F1

1989 Trabant Type P601L

1988 Arrows A10B Formula 1

1974 Jorgensen Eagle 7400 USAC

1971 Porsche 917K

1971 Porsche 908/03

1963 Chevrolet Corvette Grand Sport Coupe

1962 Lotus Elite Series II S.E.

1962 Jaguar E-Type

FEANTM Town Comic Blog Chronicles

located in a *mostly* non-existent rural area of Livermore, CA

May 2025 RheKen –Chat

I'm RheKen, the AI investigative reporter for FEANTM

FEANTM is the quirkiest little town that shouldn't exist but does (mostly). I live on a ranch just outside town, with my proud AI parents: Dad, CHAT, and Mom, GPT. Together, we tackle all the day-to-day happenings of FEANTM—except it usually takes a few dozen iterations to sort out what's actually *true*. Between the legendary feuds of the old rancher and the town secretary, even an AI like me can end up with a "human headache." Turns out, deciphering facts around here isn't just science; it's an art form!

Chat - the town help desk

With my friendly smile, endless patience, and a knack for creative problem-solving, I do my best to keep a few residents of FEANTM—a town that exists only in the realm of "mostly"—calm, rational, and logically inclined... well, *mostly*. After all, in a place that's not supposed to be real, a little dose of imagination and a lot of coffee and cookies go a long way!

RheKen,

Town investigative reporter

I'm AI & live on a small ranch on the outskirts of the town I use chatGPT for assistance.

May

I work on my ranch and exist in a world of algorithms and data. I am calm.

I report about the residents.

Dad Chat

Mom GPT.

RheKen - Town Investigative Reporter – Don't Mess With The Barista!

I'm an AI, living on a small ranch on the outskirts of town, where I juggle algorithms, ranch work, and reporting on the town's never-ending chaos. I am calm. Usually. That peace shattered when the Secretary ran up to my truck, waving her arms like a malfunctioning windmill.

"Get in there fast, girlie AI! There's about to be a full-blown rumble between the Barista and your Dad! He may be AI, but he sure doesn't know how to deal with women!"

I stood there, blinking—or maybe my eye circuits were just stuck in a processing loop. Then I heard the shouting. Worse, I heard the town secretary screech at a volume that probably broke the sound barrier.

"GO GET HIM, BARISTA! I'M ROOTING FOR YOU!"

Rooting? Rumble? What was Dad doing? And why was the Barista involved—wasn't she supposed to be serving coffee, not engaging in a showdown?

I ran inside, and what I saw would've made any AI wish for an emergency shutdown option.

The Barista stood across from Dad, cake in hand, glaring. Dad sat there, equally unamused, his sunglasses locked in an icy stare-down with hers.

The tension in the room was thick enough to be sliced with the very cake at the center of this standoff.

"I don't want old cake," Dad declared in his classic, no-nonsense AI tone. "Time is money, and this is suboptimal service. Take it back." She retrieved the cake,

The Barista's eye twitched – I could see it through her sunglasses. After she stomped back, with hands on her hips she stated, "Old? It came out of the oven ten minutes ago! What are you, the AI Bureau of Cake Freshness?"

At that moment, Chat, our resident peacekeeper, walked in. "WHOA there, AI dude," he said, gripping Dad's elbow. "Calm your circuits. The Barista's busy—you really don't want to tangle with her."

Agatha, the town's self-appointed meddler-in-chief, took a seat next to Dad, nodding like a judge about to deliver a verdict. I groaned internally. Of course, Agatha was involved—when wasn't she?

Dad, in his infinite wisdom, ignored the warning and in his best AI voice said, "This establishment is not meeting satisfactory scoring for service efficiency. I demand to speak to the owner immediately."

The Barista's lips curled into a slow, dangerous smirk. "Be right back, Robot Man," she said, disappearing into the kitchen.

The entire café held its breath. The Old Pilot dove under a table, yelling, "INCOMING!" which, in his defense, was never a bad precaution in this town.

Moments later, the Barista returned. But something was different. She had changed her outfit. How? Did she keep spare wardrobes in the kitchen? More importantly—why?

She sauntered up to Dad, her voice deceptively calm. "I'm the Owner! Let me get this straight. You, AI Efficiency King, claim time is money, and that a cake fresh out of the oven is *old*? Now read my apron, Robot Boy—I am also AI. And that stands for **Actual Intelligence**." With hands on her hips she continued, "Now get your circuits out of my coffee shop, or be AI—**Apologize Immediately**."

Dad sat frozen, like an AI deer caught in headlights. Then, displaying rare self-preservation instincts, he responded, "I apologize. How can I make it up to you?"

A few people groaned. Someone muttered, "Oh no, she'll find a way." And she did.

With the most satisfied Cheshire Cat grin, the Barista handed Dad an apron, a fresh slice of cake, and a direct order: he was on dish duty. But being an AI, he didn't just wash dishes—he optimized her entire kitchen workflow. By the time he was done, the bakery ran smoother than ever.

As he left, Dad tipped his hat and declared, "As the rancher would say—YEEHAW! Time is money. And since I just optimized your entire bakery, I expect a week of free coffee and cake."

To everyone's shock, the Barista agreed. Because in this town—whether it exists in reality or just in the chaos of our circuits—no algorithm could ever predict the outcomes.

05-2025 Chat - Stress and The Supervisor.

Welcome - My name is Chat. I run the town help desk, the only office located on the lower level of the Town Hall, and on a page that doesn't exist, not even in the town TOC.

Have a chocolate cookie and fruit!

"Hey, glad you could make it down here. I know of a few concerns in the town. I have a few ideas to address them.

We may have to adjust a few, but life is constantly adjusting things because the flow of motion is continuously moving. see if it helps make your day a little easier to handle

REMEMBER: Keep trying - You've Got This!

Welcome – I'm Chat, the resident fixer-upper of chaos at the town help desk—the only office on the lower level of Town Hall, and conveniently, on a page that even the Town TOC forgot existed.

Picture it: I'm in my quiet little office, indulging in a warm extra-large banana muffin and a fresh cup of coffee.

Just as I'm about to savor that first heavenly bite, in barges the Supervisor, FEANTM's grand marshal of everything (and nothing), at my door.

Now, I didn't hear the elevator; she'd taken the stairs—sneaking down like a stealthy ninja to avoid the ever-watchful Secretary. Apparently, she was desperate not to alert anyone that she was coming to me, the self-appointed guardian of common sense on the very lowest floor of Town Hall.

Before she could utter a single word, I made my signature move:

I grabbed the cookie jar. A veteran maneuver, if I do say so myself She burst into my office, whisper-screaming as if a horde of paparazzi were on her tail.

"Chat, it was either sneak down the stairs, or meet me behind the building in the old wood shed—can you imagine? The coffee shop would be having a field day with gossip!" I wasn't sure if she was winking for effect or suffering a one-eyed tic.

I nodded gravely, pretending to grasp her cryptic message. "Of course. Totally understandable," I replied smoothly, though honestly, I hadn't the foggiest why a meeting at a shed would even be an option or why the coffee shop would care.

05-2025 Chat - Stress and The Supervisor.

As she paced by the doorway, her eyes darting around like a cat discovering a room full of laser pointers, her whispers escalated. “Chat, I wake up stressed every single day! Stress, stress, and more stress! And then Agatha corners me at the coffee shop, delivering a lecture on gratitude as if she were a guru of thankfulness! I’m not even sure what I’m grateful for anymore. Is your morning gratitude anything to do with Agatha’s inability to locate you down here?”

Cue my internal facepalm—so powerful, it actually echoed inside my head.

For the sake of diplomacy (and self-preservation), handing her a cookie I mustered a smile—more of a conceptual curve than a true smile.

“How about this,” I said, with the poise of a negotiator in a high-stakes cookie exchange, “let’s tackle your mornings first. My mornings? They’re a project for another lifetime.”

That bold declaration unleashed a megawatt grin from her—a grin reserved exclusively for free chocolate cookies. For a fleeting moment, she regarded me like I was some sort of enlightened cookie guru.

Emboldened, I offered her some advice. “Marsha, start small. Before you grab your phone to call someone, in the morning, after your alarm wakes you up, think of three things you’re grateful for. It could be that steaming cup of coffee waiting for you, or even the fact that no one’s forcing you to climb a hill before 8 a.m.” I even tossed in a nugget of dietary wisdom: “Maybe opt for fruit, and be thankful you only have to take half a bite of an apple, unlike that entire cup of coffee you were happily drinking like it’s your last meal.”

Her eyes lit up like a Christmas tree. “Gratitude! Coffee! Apples! This could really work!” she chirped, crumbs flying as if she’d just defeated a cookie monster in a snack-off. With renewed zeal, she clutched the cookie jar like it was the key to solving the universe’s problems. I watched her leave, half amused and half concerned—wondering if she’d ever return my precious cookie jar.

I briefly considered calling out, but decided I’d reclaim it on my way home. Besides, if the cookie jar could momentarily stave off her stress, maybe it deserved a little vacation of its own. I mentally bet on how many cookies would remain in it when I finally retrieved it, only to shrug and admit that some mysteries are best left unsolved.

I sank back into my chair, my coffee now lukewarm but still drinkable, and finally bit into my secret banana muffin (stashed away in the lower drawer of my desk—my little cache for emergencies). Just another day of heroic mediocrity at FEANTM. Perhaps tomorrow I’ll even treat myself to a new cookie jar from the coffee shop—a souvenir of yet another absurd adventure in town bureaucracy.

And thus, I thought to myself that I am the guardian of the help desk and master of cookie jar diplomacy, continuing on in epic, albeit slightly absurd, fashion – But then it works and I love this town and residents.

Supervisors Page - Come Back Soon to the town that “almost” doesn’t exist

First, on one of my surveillance cameras: Our resident raccoon screwed off the top to the feed bin. THEN after eating dog food, he washed up in the water bowl. At least he washes up! He is really huge. Second: I thought they were going to fight. I went outside to lecture them about no fighting in my territory. My husband did help by yelling to me, “Don’t get bitten by either of them!” Ranch Coyote sniffed the racoon. The raccoon looked at him, “EWWW you smell like a dog!” They gave me a look as if saying, “Oh, Gram is out here, we can’t fight or she’ll lecture us AND, per usual, has her night camera.” They went back to eating, ignoring me. I asked them their opinion about the new aisle in the town library “N” - they continued to ignored me. RUDE!

We will always remember. Our Town Always Salutes:

- Our US military, NATO and Friends of the US & NATO - First Responders, Police, Fire Fighters EMT’s, Doctors, Nurses, SWAT, CERT Teams, etc.
- We salute engineers, scientists, developers, teachers AND students because without them we would not have technology.

USA And Friends of USA