Knowledge Acquisition and Reuse for Robust Engineering

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Simulation-driven design industries (manufacturing industries) such as Automotive, Aeronautics and Defence, Energy, Consumer Goods are working with a multitude of different tools (CATIA®, ENOVIA®, ANSYS®...). However, these software tools are each working separately based on their own rules and models that cannot be used in other tools. As a consequence, knowledge sharing between design and simulation tools is not possible or at least limited within the current state of art. Common problems that large organizations are facing during R&D as well as engineering projects include inconsistencies related to exchange of parameters and their correct usage across engineering tasks resulting in work done using wrong or outdated parameters as well as re-invention of design and engineering approaches instead of best-practices re-use.

To handle and solve these technical issues, it becomes more and more necessary to get access to technologies that are complementing and bridging the gaps between various approaches such as Product Lifecycle Management (PLM), Computer-Aided design (CAD), Computer-Aided Engineering (CAE) or Design Space Exploration (DSE), therefore providing the ability to capture and reuse engineering knowledge about behavior, enabling collaborations which combine these different areas into a cohesive, coordinated Simulation-Driven Design project.

KARREN (**K**nowledge **A**cquisition and **R**euse for **R**obust **EN**gineering) offers a technology aiming to address these technological bottlenecks by ensuring consistent use of design parameters and rules while enabling knowledge capture and reuse in order to warrant best practices for product performance studies across multiple disciplines for "Behavior Based Collaboration".

This presentation will first focus on KARREN technical concepts and orientations such as:

- Knowledge Management & reuse as well as handling conflicts in a context involving several companies.

- Knowledge reuse to perform what-if investigations based on a common baseline.
- Leveraging simulation to enable trade-off studies for final architecture choices.

In a second part, it will describe its further deployment throughout industrial applications, briefly described below:

- *Create, design, optimize and manage automotive heat exchanger configurations in regard of an OEM's constraints and requirements* – Based on a CAD generic baseline, designers generate and adapt new designs by simply reading a KARREN configuration. This CAD model will then be verified by analysts running various types of simulations in parallel (thermal, mechanical, acoustics, fluid dynamics and so on…) that need to be supported by tools and methods enabling data sharing as well as data management to ultimately manage the actual same dataset.

- *Knowledge Management, Reuse and Conflicts resolution* – The tool is there used as a knowledge repository in which business rules, parameters and constraints will be smartly organized to further be dispatched in regard of different actors' activities, roles and needs to ultimately foster compliant design of doors.

  Designers rely on CATIA V5 templates in which architectures and key dimensions have been previously defined. These models are being fed and can vice versa feed KARREN data configurations, therefore being checked if they are compliant with database constraints. After several iterations, this approach helps converging towards an optimal performance.

  Architect can finally compare concurrent configurations and make assessments upon which will be the optimal design.