

FROM CAD TO IGA READY GEOMETRY AND MODEL BUILD, FOR VEHICLE CRASH SIMULATION

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ABSTRACT

Isogeometric Analysis (IGA), is maturing and becoming capable to be incorporated in industrial applications. Widely used in automotive industry for crash analysis, LS-DYNA is the first commercial solver to provide IGA features. The original premise of analysis directly on the CAD data though, is not easily applied or straightforward due to the complexity of the CAD data. On the other hand, there are well established methods and processes followed during the model build of modern complex automotive crash models that would have to be adapted for the IGA era.

The current process for model build up in the automotive industry, starts from the CAD data import, translation, clean up and meshing. In the next phase the FE meshes are connected in subassemblies and the subassemblies are assembled to the final models. During the “meshing” procedure a great deal of information from the CAD side is lost while the procedure itself is time consuming. However, the original CAD data is not suitable for IGA analysis. An automotive part usually consists of hundreds of trimmed surfaces while at the same time there are surfaces that are not NURB based but rather have an analytical description. Methods for fitting a new surface over the whole part while same time keeping the reference to the original CAD data have been developed. Thus, a model can be created where every part consists of either one or a few connected trimmed surfaces.

In the next phase, at the areas where parts are connected, initial and boundary conditions are applied. Having a pure geometric description of the model provides new opportunities for a better definition of all those needed elements that connect the model, apply loads, and set up the boundary and initial conditions. Not only we can remove the current discretization phase that inserts approximations, but we can better capture the intention of the analyst or the designer when all model entities are defined and attached to the original geometrical entities.

Developing all the tools and data formats needed to capture these processes have been an ongoing effort for BETA CAE Systems. This presentation will demonstrate the available solutions, for from CAD to IGA ready geometry for vehicle crash simulations.

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