

ISOGEOMETRIC ANALYSIS IN LS-DYNA: PUSHING THE FRONTIERS OF MODERN SIMULATION

¹Lukas Leidinger*, ¹Stefan Hartmann, ²Frank Bauer, ³Dave Benson, ³Attila Nagy

¹DYNAmore GmbH, an ANSYS company, Germany, ²BMW Group, Germany,

³ANSYS, United States

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ABSTRACT

Isogeometric Analysis (IGA) is a Finite Element Analysis (FEA) technology that uses spline basis functions known from Computer Aided Design (CAD). Within IGA, both the geometry and the solution field are described by (smooth) splines, for example by Non-Uniform Rational B-Splines (NURBS). This isogeometric approach may allow a tighter integration between CAD and analysis, a more accurate geometry description, improved solution quality due to higher-order and higher-continuity elements, and a larger time step size in explicit time integration schemes.

In the last few years, IGA in LS-DYNA has made huge steps forward towards productive applicability in (automotive) industry. Key enablers for this accelerated progress were the IGA model generation capabilities for shells in ANSA, and the close collaboration between the LS-DYNA developers, the ANSA developers and industry partners like the BMW Group. The current backbone of IGA in LS-DYNA is the jointly developed and CAD-inspired *IGA keyword data structure that considers both geometry and topology information of the model. With these IGA capabilities in ANSA and LS-DYNA, users can now generate and run hybrid IGA/FEA body-in-white models with hundreds of IGA shell components (trimmed multi-patch NURBS shells) in full vehicle crash simulations.

In this contribution, we will give an overview about the latest IGA developments and applications in LS-DYNA, with a focus on trimmed (multi-patch) NURBS shells, explicit crash simulations, connection technology and material damage. Finally, we provide an outlook to trimmed IGA solids and postprocessing on NURBS geometries.