Bridging the gap between CAD and FEM solvers with interfaces and data treatment for the use of the isogeometric B-Rep analysis

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ABSTRACT

Within the previous years, isogeometric analysis has grown to an important and large research field in computational mechanics. However, in many cases it is still restricted to small scientific benchmark cases and the full scope of possibilities coming from CAD-integration are not exploited. At this point, the isogeometric B-Rep analysis, introduced by Breitenberger et al. [2], provides a very promising approach, as it enhances IGA with the boundary representation (B-Rep) of industrial CAD models. This implies the use of trimmed NURBS multipatches and allows to simulate based on a large range of complex models.

To close the gap between CAD and solver additional interfaces need to be extracted [1]. The CAD model has to be extended to be analysis suitable and specific properties have to be applied to the respective geometry objects. Further, IBRA can be fully integrated in existing solvers. This requires additional CAD-like functionalities for the treatment of NURBS-based entities and topologies.

Within this contribution the data enhancement possibilities and additional geometrical preparation inside CAD are discussed, in order to allow a full analysis integrated CAD workflow. Further, a design for a structural analysis solver, which is fully integrated to a is presented: this requires a systematic and robust treatment of trimming and multipatch coupling. In the design process, also many other features coming from CAD-integration can be beneficial. This implies, e.g. surface-coupled multiphysics simulations based on the exact geometry, keeping CAD-interfaces, connectivities and identifiers throughout the entire simulation procedure.

The newly proposed approaches will be shown and explained by the implementation in the open source solver Kratos Multiphysics [3]. Finally, the contribution will be concluded up with some show cases for CAD-integrated simulation of industrial models.

REFERENCES

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