6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

NON-INTRUSIVE IMPLEMENTATION OF IGA IN INDUSTRIAL FEM CODES

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Keywords: *Isogeometric Analysis, NURBS, Finite Element Method, Non intrusive implementation*

Isogeometric analysis (IGA), introduced by Hughes et al., intends to directly link the geometry of CAD with the analysis by using the same shape functions. IGA has proven its efficiency in a large amount of domains and has shown a per-degree of freedom accuracy and robustness superior to the standard Finite Element Method (FEM). However the development of IGA in industrial software still remains limited. Indeed, the global definition of the shape functions in an intermediate space (composed of several knot-span elements) questions the element-wise structure of standard FE software.

In order to fill the gap between IGA and FEM from a numerical and implementation point of view, and following the existing link between these two methods [1], we propose a global strategy to link IGA with an industrial FE codes. From an initial NURBS definition of the geometry it is hence possible to find a corresponding FE description thanks to some global operators. The created FE mesh associated with its Lagrange shape functions is an input mesh for standard FE software. Following the projection steps back, a relation between the FE stiffness operator and the NURBS one can be found. The proposed technique was validated on linear and nonlinear cases in two- and three dimensions in an industrial FE software. Furthermore, the technique can be efficiently used in case of "non intrusive" coupling methods. Indeed, a global NURBS geometry, which comes from the CAD and is never modified, can be easily coupled with a local FE geometry constructed through the IGA-FEM bridge. This allows local enrichment and can be very interesting when using complex or non linear local model for which competitive FE software already exist. All these different aspects will be discussed during the talk.

REFERENCES

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