ISOGEOMETRIC CONTACT ANALYSIS IN G+SMO WITH PREPROCESSING IN ANSA.

[1,2]Dipl. -Ing. Christos Karampatzakis[*], [2]Dr. Angelos Mantzaflaris, [3]Dr. Ioannis Chalkidis, [4]Prof. Christopher Provatidis, [1]Prof. Athanassios Mihailidis

[1]Aristotle University of Thessaloniki, Greece, [2]Inria Sophia Antipolis, Université Côte d'Azur, France, [3]BETA CAE Systems SA, [4]National Technical University of Athens, Greece

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ABSTRACT –

Geometry + Simulation Modules (G+Smo, pronounced gismo) (1) is an open-source C++ library implementing multiple families of splines as well as providing the assembly and solution procedures required to perform simulation on these geometries. While it offers a lot of functionality, it currently has no graphical user interface (GUI), thus the creation of models is a time consuming procedure. Since ANSA offers preprocessing capabilities for B-Spline geometries in its last few versions, an ANSA / G+Smo interface is proposed and implemented, in order to ease this workflow, in the sense that files can be exported from one platform to the other.

Isogeometric analysis is a relatively new simulation paradigm (2) , which is starting to gain traction in industrial applications. The main advantage of the method is that the simulation domain is not approximated by linear elements as in the Finite Element Method, but represented exactly, since it uses the same discretisation as in CAD systems. The exactness of geometry is especially important for contact simulation, since the problem is highly sensitive to the domain's geometry. Also since the bases most commonly used in Isogeometric analysis are of higher degree, they possess higher inter-element continuity, which ensures a continuous field of normals within a patch. This alleviates the need for smoothing procedures that are very commonly employed in the Finite Element Method.

The Gauss Point to Surface (GPTS) (3) has been implemented in G+Smo, along with two of its variants. This algorithm has been selected due to its relative simplicity in implementation and accuracy of results. The proposed workflow is showcased through an example where the B-Spline geometry for some characteristic mechanical contact problems is prepared in ANSA and simulation is performed within G+Smo.

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