Isogeometric treatment of multi-patch contact and debonding problems including local refinement with T-splines

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ABSTRACT

NURBS-based isogeometric analysis has been recently applied to the solution of 3D large deformation contact problems, leading to a number of significant advantages over conventional contact treatments based on Lagrange polynomial interpolations. This contribution reports on further recent advancements in the area of isogeometric contact. Most notably, the possibility of local refinement by the use of T-splines is introduced and applied to the solution of 2D plane stress and 3D shell-to-shell contact problems. Also, the contact formulation is extended to multiple patches taking special care to ensure a sufficient degree of continuity at the inter-patch boundary. These two extensions enable the treatment of complex contact problems of engineering interest. Moreover, the purely geometric enforcement of the non-penetration condition in compression is generalized to encompass both contact and mode-I debonding. The advantages over the use of conventional Lagrange interpolations, as well as Lagrange interpolations with blending functions and Bézier discretizations based on Bernstein polynomials, are highlighted.