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The isogeometric analysis (IGA) represents a new method of computational analysis that merges design and analysis into one model by using a unified geometric representation. NURBS (Non-Uniform Rational B-Splines) and T-Splines are the most widespread technologies in today's CAD modelling tools and therefore are adopted as basis functions for analyses. In this work the isogeometric concept [1] is applied to study the large deformation multi-body contact problems, which still represent a significant challenge for the analysts in terms of robustness and stability of solutions. For this reason, the development of more efficient, fast and stable finite element contact discretizations is still a hot topic, especially due to the fact that engineering applications become more and more complex. Among the most important challenges that have to be met with respect to finite element discretization is the sensitivity of contact problem to the geometry accuracy.

Non-smooth, C^0-continuous finite element basis functions lead to convergence problems in the analysis of sliding contact and to highly oscillatory contact interactions even when convergence is achieved. Various contact smoothing techniques have been proposed in the literature to address this issue [2-6] which consider the smoothing of the master and slave surfaces as achieved by high-order finite element interpolation based on Lagrange, hierarchic, spline or NURBS interpolations. Within the isogeometric framework, a contact surface possessing C^1 or higher continuity is easily achieved and significant advantages over conventional finite element descriptions have been demonstrated in the last years by applying NURBS based isogeometric discretizations [4-7] to frictionless and/or frictional multi-patch contact problems.

A key problem of multivariate NURBS basis functions, in any case, is their rigid tensor product structure, which implies that refinement is a global process propagating throughout the domain. A possible way to improve the quality of contact results in terms of local pressures and global time-history curves with limited increase in the computational effort is represented by local refinement. This has been recently considered in [8] for frictionless contact applications by using analyis-suitable T-splines discretizations and here extended to large deformation Coulomb frictional contact problems. A Gauss-point-to-surface (GPTS) formulation is combined with the penalty method to treat the contact constraints in the discretized setting, as done in [9]. Using the Bèzier extraction, the suitable T-splines isogeometric discretizations are automatically generated for any analysis-suitable CAD geometry and easily incorporated into the finite element framework [10]. Some numerical examples show that the proposed contact formulation deliver accurate and robust predictions and demonstrate the potential of T-spline-based IGA to solve challenging contact problems in 2D and 3D.

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