

# Adaptive Local Surface Refinement Based on LR NURBS and its Application to Contact

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## ABSTRACT

An adaptive local surface refinement technique based on *Locally Refined Non-Uniform Rational B-Splines* (LR NURBS) is presented [1]. LR NURBS can model complex geometries exactly and they are based on the concept of LR B-splines [2]. The local representation of the parameter space overcomes the drawback of non-existent local refinement in standard NURBS-based isogeometric analysis. For a convenient embedding into a general finite element code, the Bézier extraction operator for LR NURBS is formulated. A technique is presented that determines the domain for adaptive refinement. This technique is automatically controlled and allows a robust adaptive local refinement and coarsening of LR NURBS discretizations.

LR NURBS are applied to frictionless and frictional sliding contact. The numerical examples consider membranes and 3D solids. The membrane formulation is taken from [3], and it is straightforward to combine with LR NURBS, since they are linearly independent in 2D. In 3D, the linear independence has not been proven yet for arbitrary, locally refined meshes. Therefore 2D LR NURBS are combined with an enrichment technique along the third direction [4], in order to model 3D solids.

Various numerical examples are shown, and they demonstrate the benefit of using LR NURBS: Compared to uniform refinement, LR NURBS can achieve high accuracy at much lower computational cost.

## REFERENCES

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