Volumetric NURBS Parameterization from CAD Boundary Representations for Isogeometric Analysis

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We present an automatic algorithm for constructing a volumetric NURBS parameterization from boundary representation CAD models, while also allowing the user to improve the parameterization.

Based on pants decomposition, the input surface is automatically decomposed into pairs of pants, i.e. regions that are topologically equivalent to spheres with three boundaries [1]. An optimization is then performed to automatically detect any symmetry and to improve the quality of the segmentation.

By solving a harmonic field with proper boundary conditions, each pair of pants is converted into generalized polycubes. Generalized Polycubes is a novel parametric domain and consist of a set of regular cube domains topologically glued together [2].

With these polycubes, a volumetric NURBS parameterization is obtained and optimized using a fitting algorithm. The volumetric NURBS mesh can be then used for isogeometric analysis [3].

REFERENCES