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AUTOMATIC ISOGEOMETRIC ANALYSIS SUITABLE TRIVARIATE MODELS GENERATION FROM STANDARD B-REP MODELS

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We present an effective method to automatically construct trivariate B-spline models of complicated geometry and arbitrary topology. Our method takes as input a B-rep solid model defined by its triangulated boundary. Using cuboid decomposition [1,2,3], an initial polycube approximating the input boundary mesh is built. The polycube can be used to approximate very roughly the geometry of a model while faithfully replicating its topology. Due to its highly regular and trivariate structure, the polycube is suitable for serving as the canonical domain of the volume parameterization required for trivariate NURBS construction. The polycube's nodes and arcs decompose the input model locally into quadrangular patches, and globally into hexahedral domains. Using cross fields [4] and aligned global parameterization [5,6], the position of the polycube nodes and arcs are optimized across the surface in a way to achieve low overall patch distortion, and alignment to principal curvature directions and sharp features. Based on the optimized polycube and parameterization, compatible B-spline boundary surfaces are reconstructed. Finally, the interior volumetric parameterization is computed using Coon's interpolation and the B-spline surfaces as boundary conditions. The efficiency and the robustness of the proposed approach are illustrated by some examples.

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