

Creating Hybrid B-Reps and Hybrid Volume Completions from Trimmed B-Spline B-Reps

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Abstract

This paper proposes a method for converting a non-watertight trimmed B-spline B-rep model to a watertight hybrid model representation that preserves the original model's parameterization, representation, and geometry, except within a banded region along the trimming curve. Also, it addresses the problem of volumetric model completion. Solutions to both of these problems are important to have a conformal representation for analysis, in particular, isogeometric analysis, and for describing material attributes. The approach for the boundary representation modifies the original B-spline bases to take into account the trimming curves and introduces new functions along the trimming curves to preserve independence and the convex hull property. Then a volumetric completion algorithm with the new hybrid boundary is introduced. Outside of this research, volume representation completion has witnessed few advances for trimmed B-spline B-rep models. Building on the approach of [21] that is proposed only for untrimmed B-reps, this research generalizes the methodology and solves related issues to make it appropriate for the ubiquitous trimmed B-rep models. The efficacies of both the hybrid B-rep and the hybrid volumetric method are demonstrated on trimmed B-rep models.