Hexahedral Mesh Generation for Swept Splines Using Foliations

Caleb B. Goates*   Kendrick M. Shepherd†

Abstract

We introduce a method to create trivariate parameterizations of swept geometries from which we can create hexahedral cell complexes for trivariate splines and hex meshes. Starting with a linear tetrahedral mesh, we solve a discrete Laplace equation and use the level sets of the resulting discrete harmonic function as a two-dimensional foliation of the swept geometry. We can then extend an unstructured bivariate mesh over the sweep source surface to the entire swept geometry using bijective maps between foliation leaves. Our approach overcomes several difficulties found in harmonic function gradient tracing approaches. We also discuss under what conditions this method creates sweep-appropriate foliations, and the applications of these limitations to other harmonic-function-based approaches.

---

*Brigham Young University Department of Civil and Construction Engineering.

†Brigham Young University Department of Civil and Construction Engineering.