

Volume Parameterization Methods for Isogeometric Analysis

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Abstract: Isogeometric Analysis (IGA) is a method introduced by T.J.R. Hughes et al (2005) providing the possibility of integrating Finite Element Analysis (FEA) into NURBS-based CAD design tools. The discretization space in IGA is spanned by NURBS basis composed with the inverse of parametrization mapping from a parametric domain to a computational domain. Therefore, IGA requires an injective (or bijective to its image) parametrization mapping. In this talk, we present and compare three methods that generate an injective mapping from a simply connected domain to the unit cube. The first method uses a sequence of harmonic maps and guarantees the injectivity in the limit. The second method employs the product of B-splines to find a truly injective mapping. The third method transforms the Laplace equations on the computational domain to the nonlinear elliptic equations on the parametric domain and solves these equations by relaxation methods.

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