11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20–25, 2014, Barcelona, Spain

EDGE GRAPH BASED VOLUME SEGMENTATION FOR ISOGEOMETRIC ANALYSIS

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Key words: *Isogeometric analysis, volume segmentation, isogeometric discretization, edge graph.*

We consider the discretization problem of a solid given by a boundary representation for isogeometric analysis. Our strategy for tackling the problem includes the following four steps: 1) decompose the solid into contractible solids; 2) construct a sufficiently connected edge graph for each contractible solid; 3) segment each contractible solid with a 3-vertex-connected edge graph into new solids without non-convex edges; 4) segment each new solid into topological hexahedra; 5) parameterize each resulting topological hexahedron.

In this presentation, after addressing each of the steps, we will focus on the third one. We will present a segmenting algorithm that relies on a search for a cutting loop, a cycle of vertices which helps to subdivide a contractible solid into two new contractible solids. We will provide a vertexwise criterion for a valid cutting loop. We will show that the algorithm terminates by proving that there always exist a valid cutting loop passing through a given non-convex edge. We select the cutting loop using a cost function. For this cost function we propose terms which help to select geometrically and combinatorially favorable cutting loops. We demonstrate the effects of these terms using a suite of examples.