Robust Quantization for Polycube Maps

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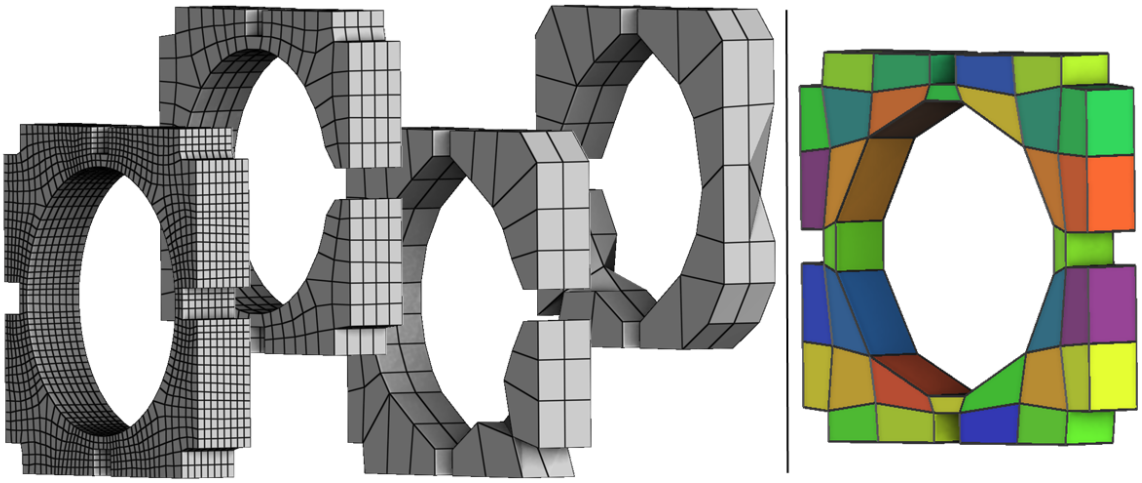

Figure 1: Polycube-based hexahedral meshing algorithms are able to produce very regular grids (left), but fail to capture important geometric features with a coarse grid (left → middle). Our method allows to produce a coarse mesh preserving important geometric features (right).

Abstract

An important part of recent advances in hexahedral meshing focus on the deformation of a domain into a polycube; the polycube deformed by the inverse map fills the domain with a hexahedral mesh. These methods are appreciated because they generate highly regular meshes. In this paper we address a robustness issue that systematically occurs when a coarse mesh is desired: algorithms produce deformations that are not one-to-one, leading to collapse of large portions of the model when trying to apply the (undefined) inverse map. The origin of the problem is that the deformation requires to perform a mixed integer optimization, where the difficulty to enforce the integer constraints is directly tied to the expected coarseness. Our solution is to introduce sanity constraints that prevent the loss of bijectivity due to the integer constraints.