Two Fast and Robust Volume Meshing Techniques

Lorenzo Diazzi*

Istituto di Matematica Applicata e Tecnologie Informatiche, Consiglio Nazionale Delle Ricerche (CNR-IMATI), Genoa, Italy

Email address:

lorenzo.diazzi@cnr.it (Lorenzo Diazzi)

*Corresponding author

Abstract

Volume meshing amounts to subdivide a given three-dimensional domain into a collection of simple cells. Many existing volume meshing algorithms have major weaknesses which often depend on the choice of using floating point arithmetic rather than exact number representations. We consider two different problems: (1) meshing domains with "defects" and (2) computing Constrained Delaunay Tetrahedrizations (CDT) of well-formed domains. Algorithms that robustly solve the former problem exist, but they are too slow for a widespread use. Conversely, tools that quickly compute the CDT exist but are not robust. For both the problems, we have re-designed state-of-the-art methods by integrating implicit points and indirect predicates: this approach made it possible, for the first time, to combine and guarantee both robustness and efficiency.

Keywords

Mesh Models, Volume Meshing, Numeric Robustness and Representability