

Software for Automated Generation of Cartesian Meshes

Ames Research Center, Moffett Field, California

Cart3D is a collection of computer programs for generating Cartesian meshes [for computational fluid dynamics (CFD) and other applications] in volumes bounded by solid objects. Aspects of Cart3D at earlier stages of development were reported in "Robust and Efficient Generation of Cartesian Meshes for CFD" (ARC-14275), NASA Tech Briefs, Vol. 23, No. 8 (August 1999), page 30. The geometric input to Cart3D comprises surface triangulations like those commonly generated by computer-aided-design programs. Complexly shaped objects can be represented as assemblies of simpler ones. Cart3D deletes all portions of such an assembled object that are not on the exterior surface. Intersections between components are preserved in the resulting triangulation. A tie-breaking routine unambiguously resolves geometric degeneracies. Then taking the intersected surface triangulation as input, the volume mesh is generated through division of cells of an initially coarse hexahedral grid. Cells are subdivided to refine the grid in regions of increased surface curvature and/or increased flow gradients. Cells that become split into multiple unconnected regions by thin pieces of surface are identified.

These programs were written by Michael J. Aftosmis and John E. Melton of Ames Research Center and Marsha J. Berger of the Courant Institute of Mathematics at New York University. For further information, access the Technical Support Package (TSP) free on-line at www.techbriefs.com/tsp under the Software category.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Technology Partnerships Division, Ames Research Center, (650) 604-2954. Refer to ARC-14275-1.