

CCSWEEP: AUTOMATIC DECOMPOSITION OF MULTI-SWEEP VOLUMES

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CCSweep is a new method to automatically decompose multi-sweepable volumes into many-to-one sweepable volumes. Multi-sweepable volumes contain both multiple source and multiple target faces. In hexahedral mesh generation, most sweeping techniques handle many-to-one sweepable volumes that contain multiple source faces, but they are limited to volumes with only a single target face. Recent proposals [1-3] to the multi-sweep problem have several disadvantages, including: indeterminate edge sizing or interval matching constraints, over dependence on input mesh discretization, highly constrained node matching during the imprinting process, and unstable loop imprinting when interior holes exist. This paper will demonstrate how these problems are overcome through CCSweep.

In CCSweep, the linking faces are first discretized with a structured mesh. Next, the target faces are projected layer by layer to the source faces. Then the projected target faces are imprinted onto the source faces using intersections of the boundary. When interior holes are present, Delaunay triangulations of the projected target faces are employed to enable robust interior loop intersections. After imprinting the source faces, interior faces are constructed from triangulations of the interior nodes generated during the target projection process. The interior faces are used to decompose the volume into several, new, non-manifold volumes. The new volumes have only single target faces and are represented in the meshing system as real, solid geometry; enabling them to be automatically meshed using existing many-to-one hexahedral sweeping approaches. The results of successfully applying CCSweep to a number of problems are shown in the paper.

References

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