Fixing Singular Vertices

Monday, January 28, 2008
11:12 AM

How to remove a singular vertex by cutting through the singularity

1) Allocate new vertex index
2) Copy new vertex coordinates
   From original vertex
3) Fix coordinx array corner values

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Corners are indices of elements of the coordIndex array
2) We need a data structure to maintain a partition of the corners
3) For each regular edge, not marked as a cut, join the two pairs of twin corners
4) Enumerate the subsets of resulting partition
5) The partition indices are the output vertex indices
6) While traversing the input coordIndex array, write on the output coordIndex array:
   for each corner, the partition index it belongs to; keep the -1's
1) Efficient implementation based on Tarjan's Union-Find data structure
2) Maintains a partition of N numbers \{0,...,N-1\}
3) Implements two operations: get(i) and join(i,j)
4) get(i) does not return a partition number, but an element of the partition subset \( I \) belongs to chosen as the representative for the subset, so that \( I \) and \( j \) belong to the same subset if and only if get(i)==get(j)
5) After a number of these operations have been applied, the remaining partitions can be enumerated
These corners are identified because they are opposite to each other through a regular edge.

These corners are not identified because the incident edge is singular.

Singular vertices are automatically fixed.
The StaticHalfEdge class

Efficient implementation of HalfEdge data structure

Original coordIndex array

New array of same length as coordIndex array is used to store the twin edges as corner indices

-1's indicate boundary edges

Face array allows fast access to faces

Since the end-of-face markers are already stored in the coordIndex array, store face indices here
This allows for fast mapping from corner to face index

Replace the -1's in coordIndex with -n where n is the number of vertices of the current face
This enables fast cyclical traversal of vertices within each face.