Segmentation based on Skeleton

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Summary

Segmentation methods can mainly been classified to two types: patch-level and part level. Each has some representative approaches.

Last time, i.e. in Update 1, I implemented a patch level segmentation method (HFC). This time I implement part level method which has strong link to skeleton extraction. Hierarchical Fuzzy Clustering [Katz 03] computes a decomposition into meaningful components of a given mesh. It uses geodesic distance and dihedral angles to define weight between faces and cluster faces into several parts. Following if one example of my implementation.
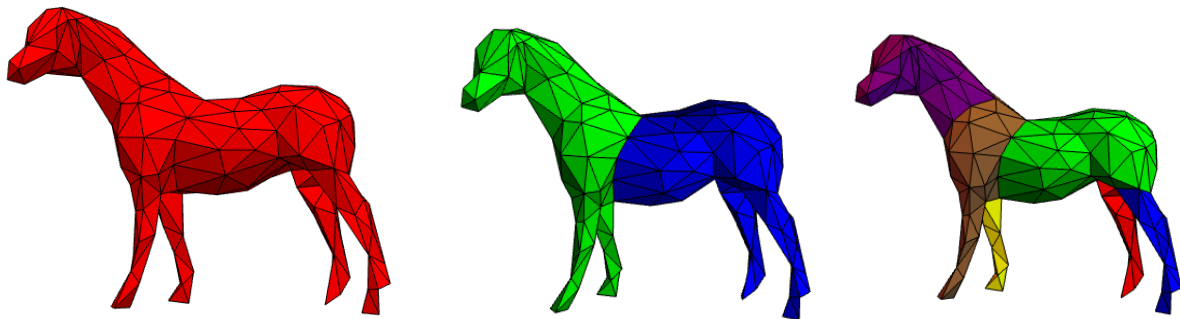

Figure 1: Horse from left to right: input mesh, first level decomposition, second level decomposition.

Blowing Bubbles [MPS 03] is also a part-level method which sets a sphere at each vertex and cluster vertices based on the intersections between the spheres and the surfaces.

Analysis of Work

For update 2, my goal set up in the proposal is to implement part level methods and compare them to patch level methods and then link them to skeleton extraction.

Part level algorithms decompose meshes into more meaningful parts, which looks like decomposition with volume data. Patch level works on the surfaces and split surfaces into small units homeomorphic to a disc. So it's easier to use part level to extract skeletons, for example, just pick out the mass center of each part and link them.

I haven't try to get a skeleton from the segmentation yet, which I set up as a goal for update 2 in update 1. So I would work on all the skeleton extraction parts at the final step of this project.

Plan for Completion

Final

Link part level segmentation methods and skeleton extraction. Build a relationship between them. Then for each manifold mesh, find a segmentation using the iterative method that computing segmentations and skeleton and see if they will converge to a stable pair.