Segmentation based on Skeleton

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Summary

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

For the face –level methods, I implement some methods based on hierarchy clustering. HFP [M.Attene 06] and HFC [M.Garland 01] give good results on segmentation. HFC uses dual graph and merge faces with greedy choice. HFP is based on HFC and uses primitives fitting for merging faces. Following is one of the examples of my implementation.

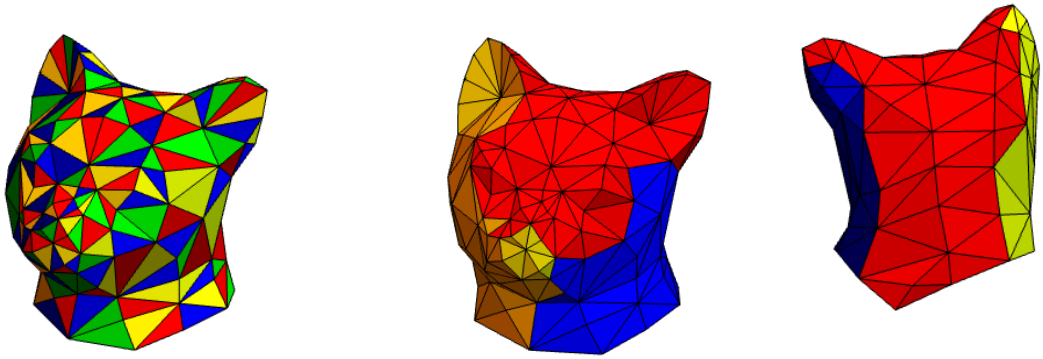

Figure 1: Cat heads from left to right: input mesh, front, and back of 3 patches after clustering.

For the part-level method, Blowing Bubbles [MPS 03] sets a sphere at each vertex and cluster vertices based on the intersections between the spheres and the surfaces. I haven't finished the implementation of part-level method so there're no pictures for this kind of approaches.

Analysis of Work

For update 1, my goal set up in the proposal is to implement and compare different kinds of existing segmentation algorithms.

I've implemented the face level methods but not the part level. HFC gives a greedy framework for the clustering. Many works have been done for the evaluation part of HFC. I can change it into different fittings like planar or other basic shapes. For part-level, I haven't find as many methods as face-level to compare and surveys of [M.Attene 06] and [A.Shamir 07] focus more on former one.

Plan for Completion

Update 2

Take on part-level methods and compare them to face-level ones. Blowing Bubbles [MPS 03] and [MPS 04 06] are the range and Bubbles is the main framework. Try to use skeletons to get part-level segmentation, where skeletons may either be given or implemented by some standalone methods such as Voronoi Skeletons.

Final

Use exoskeleton [F.Goes 10], which means the gaps between the patches, as the guide to divide mesh for face-level segmentation. 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.