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Report for Youngeun Lee

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1 Implementation Details

Firs, I construct the convex hull of the given point set S using *qhull*.I find out which sample point is bounded or unbounded on the Voronoi diagram and compute the normal of unbounded s as the average of adjacent triangle normals in the convex hull. Then I construct the Delaunay triangulation $DT(S)$ in 4D to get the Voronoi diagram. I select poles and antipoles from the adjacent voronoi vertices. The adjacent voronoi vertices are the center of the adjacent tetrahedrons in $DT(S)$. I only use poles and antipoles of which distance from s are less than a threshold. In the program, the threshold is 1000. The pseudocode of my program is below:

Algorithm 1 Crust
Input: a point set S
Output: a surface of S constructed by Crust

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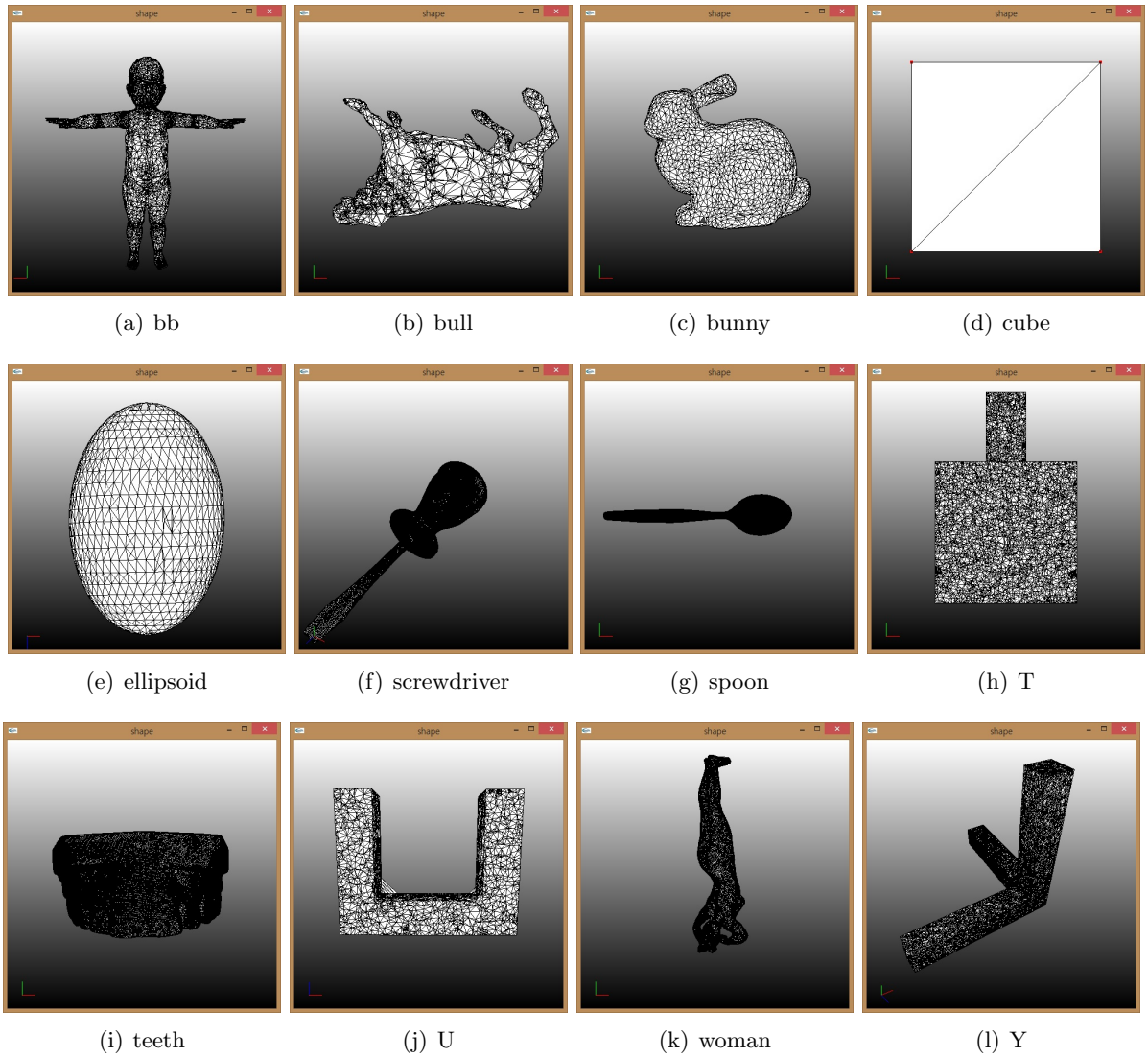
1: Poles := ∅
2: Antioles := ∅
3: CH(S) := convex hull of S;
4: for each triangles T in CH(S) do
5:    for each s in triangle T do
6:       s.is_on_convex := true;
7:       s.normal += the normals of T;
8:    end for
9: end for
10: construct a Voronoi diagram of P;
11: for each sample point s do
12:    if s.is_on_convex then
13:       p := the farthest Voronoi vertex of V_s form p_i
14:       if distance of p-s is less than a threshold then
15:          Insert p into Poles;
16:       end if
17:       s_i.normal := p - s_i
18:    end if
19:    ap := the Voronoi vertex of V_s with negative projection on s_i.normal that is farthest from s
20:    if distance of ap-s is less than a threshold then
21:       Insert the antipole of ap into Antioles;
22:    end if
23: end for
24: compute the Delaunay triangulation of P ∪ Poles ∪ Antipoles;
25: return triangles for which all three vertices are sample points in P;
```

2 Example Output

Fig. 1 shows the results.



(a) bb (b) bull (c) bunny (d) cube

(e) ellipsoid (f) screwdriver (g) spoon (h) T

(i) teeth (j) U (k) woman (l) Y

Figure 1: results

3 Know bugs/limitations

I have to clip the poles and antipoles to get correct result. In theorically, the poles and antipoles should be inside of the models. However, many poles and antipoles is far from the models. There are some holes in the results.