Fall 2015

Report for Advance Algorithm Programming Assignment 1

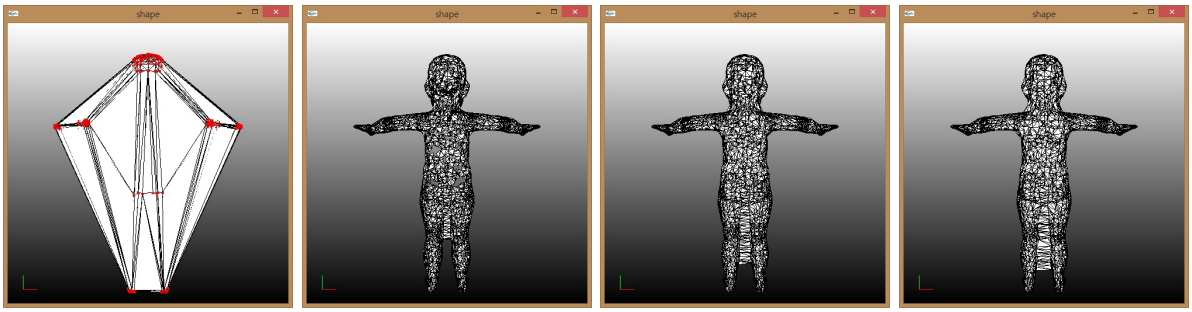
Youngeun Lee

1 Implementation Details

The goal of this assignment is to implement α-shape for a given value of α. Tetrahedrons in the Delaunay triangulation computed using the previous assignment. The program get the center of circumspheres of the tetragedrons by $qh_facetcenter()$ function in qhull. The center are computed in 4D then computed in 3D.

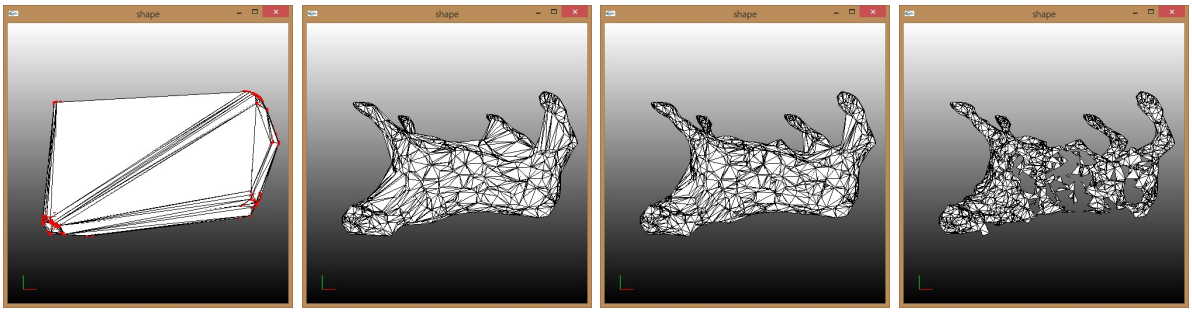
2 Example Output

Fig. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 show results of each test file. (a) in the figures show their Delaunay triangulation and (b)-(d) present α-shape with different values.



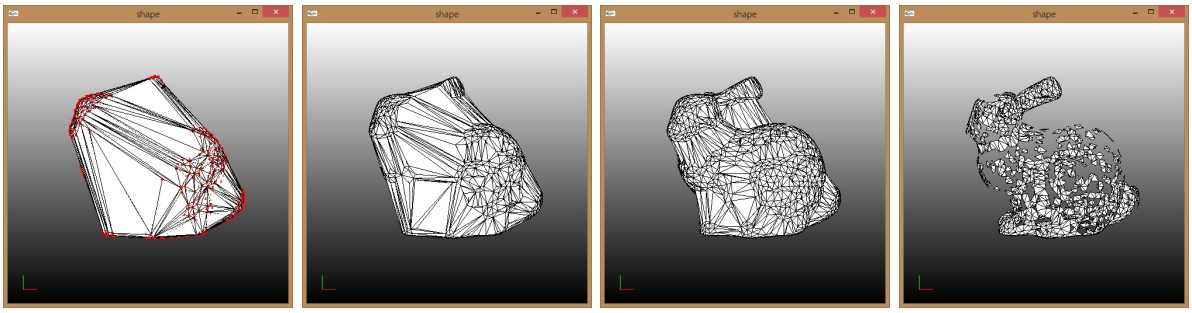
(a) Delaunay triangulation (b) $\alpha = 150$ (c) $\alpha = 100$ (d) $\alpha = 50$

Figure 1: i.bb



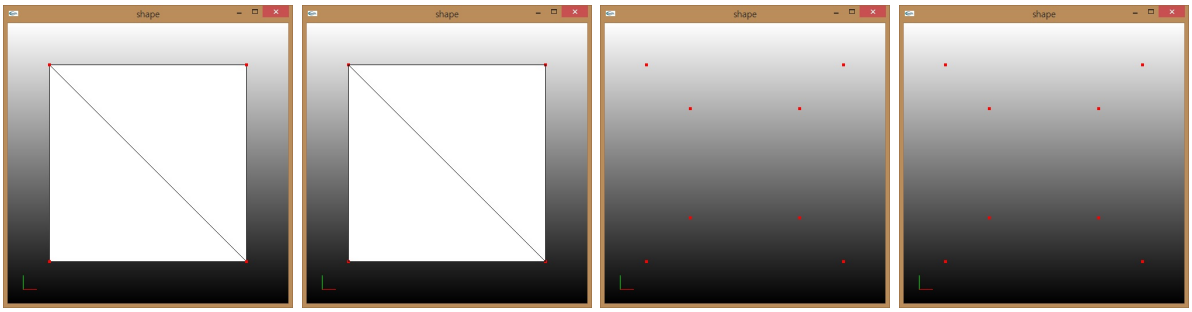
(a) Delaunay triangulation (b) $\alpha = 10^6$ (c) $\alpha = 510^5$ (d) $\alpha = 10^5$

Figure 2: i.bull



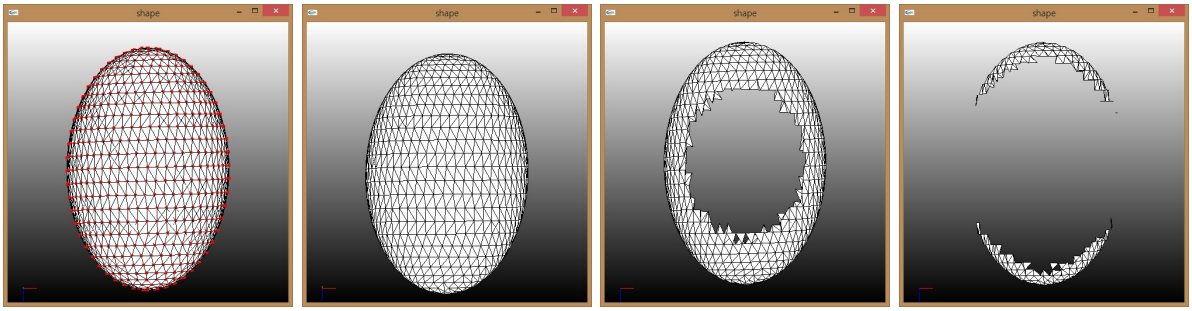
(a) Delaunay triangulation (b) $\alpha = 10^5$ (c) $\alpha = 10^4$ (d) $\alpha = 10^3$

Figure 3: i.bunny



(a) Delaunay triangulation (b) $\alpha = 76$ (c) $\alpha = 75$ (d) $\alpha = 74$

Figure 4: i.cube

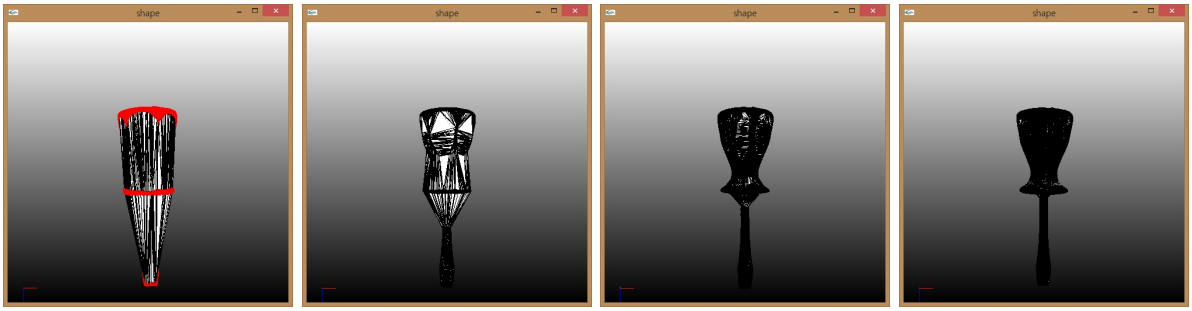


(a) Delaunay triangulation (b) $\alpha = 20000$ (c) $\alpha = 10000$ (d) $\alpha = 5000$

Figure 5: i.ellipsoid

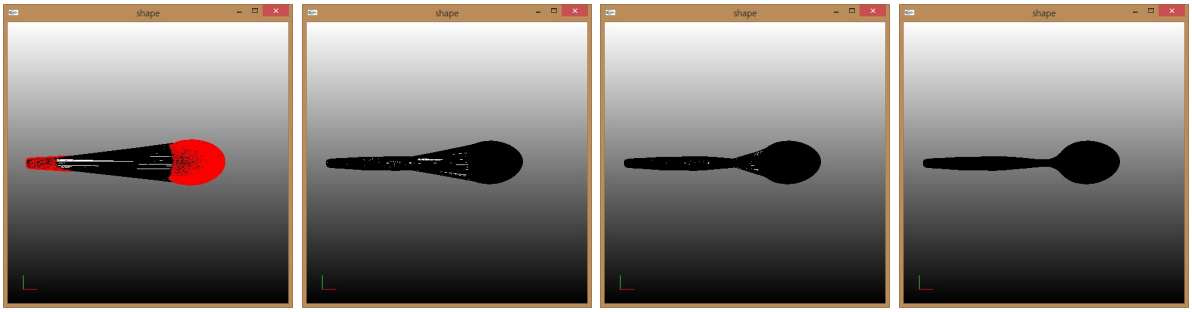
3 Know bugs/limitations

α-shape can compute more precise surfaces from the given points than Delaunay triangulation. However, if a point set is not dense enough, it makes holes.



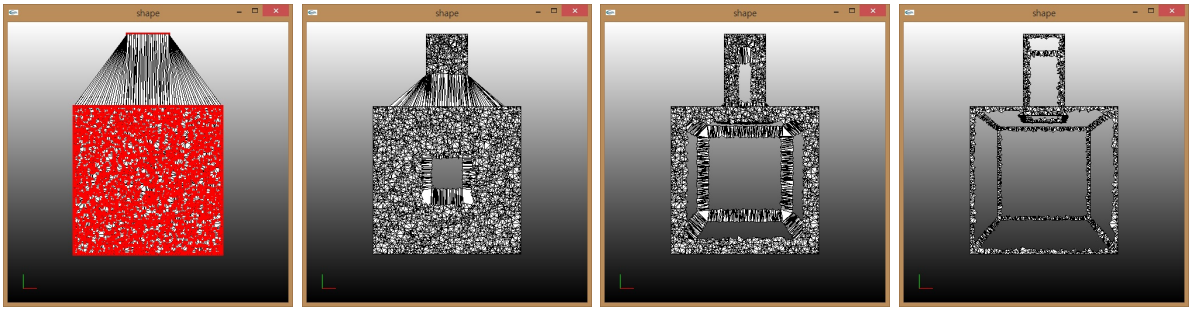
(a) Delaunay triangulation (b) $\alpha = 10^7$ (c) $\alpha = 10^6$ (d) $\alpha = 10^5$

Figure 6: i.screwdriver



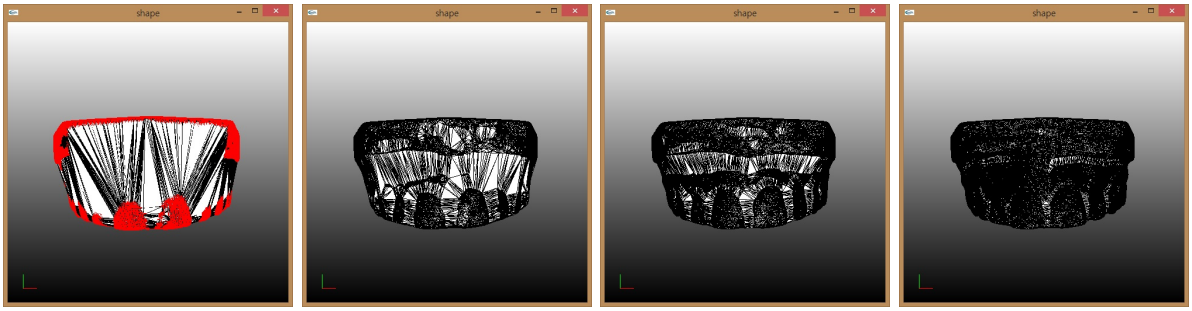
(a) Delaunay triangulation (b) $\alpha = 10^8$ (c) $\alpha = 10^7$ (d) $\alpha = 10^6$

Figure 7: i.spoon



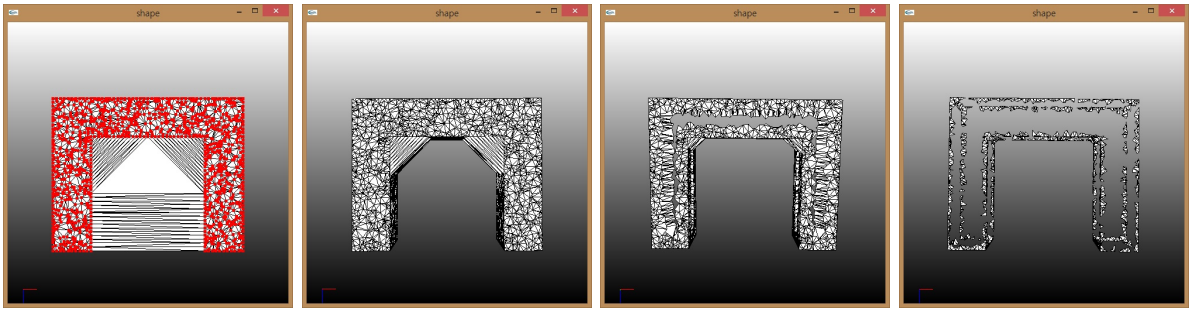
(a) Delaunay triangulation (b) $\alpha = 10000$ (c) $\alpha = 1000$ (d) $\alpha = 100$

Figure 8: i.T



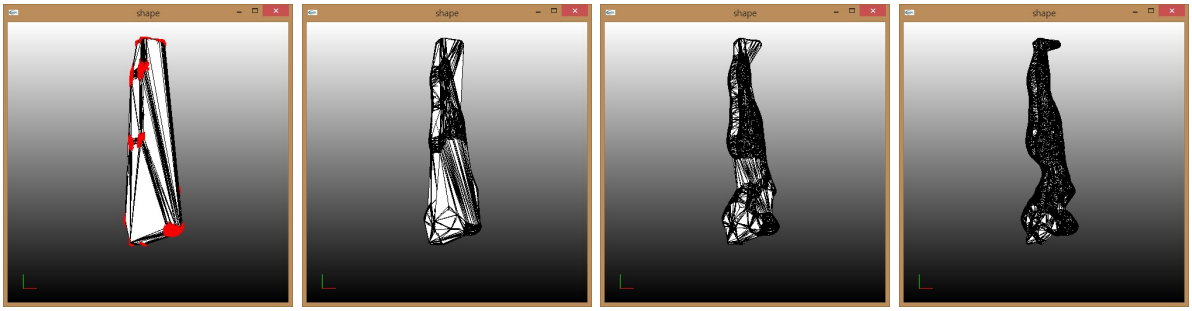
(a) Delaunay triangulation (b) $\alpha = 100000$ (c) $\alpha = 10000$ (d) $\alpha = 1000$

Figure 9: i.teeth



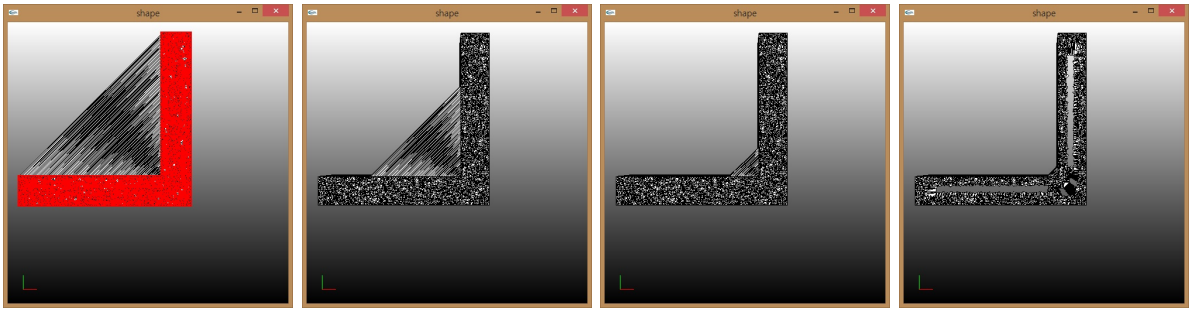
(a) Delaunay triangulation (b) $\alpha = 10000$ (c) $\alpha = 1000$ (d) $\alpha = 100$

Figure 10: i.U



(a) Delaunay triangulation (b) $\alpha = 100000$ (c) $\alpha = 10000$ (d) $\alpha = 1000$

Figure 11: i.woman



(a) Delaunay triangulation (b) $\alpha = 100000$ (c) $\alpha = 10000$ (d) $\alpha = 1000$

Figure 12: i.Y