Adaptive Quad Mesh Simplification

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Presentation Overview

Mesh Structure

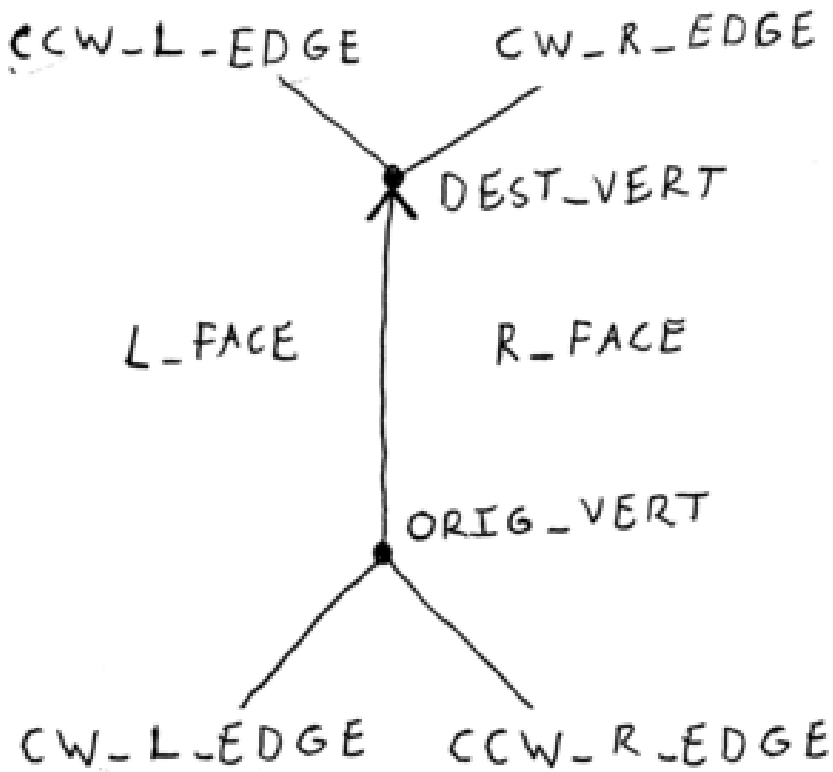
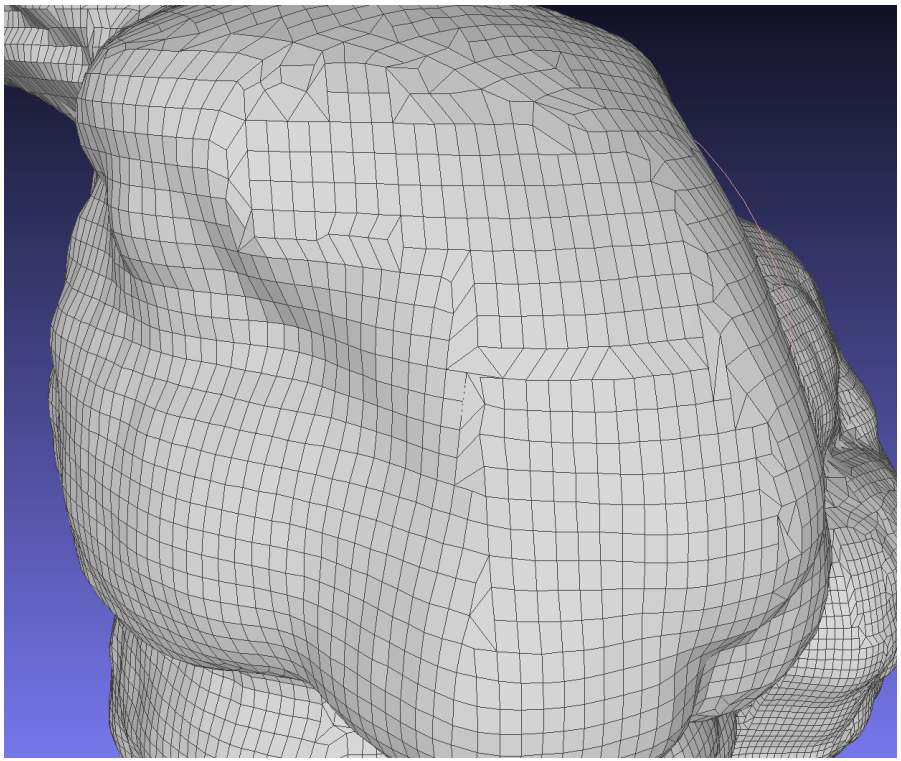


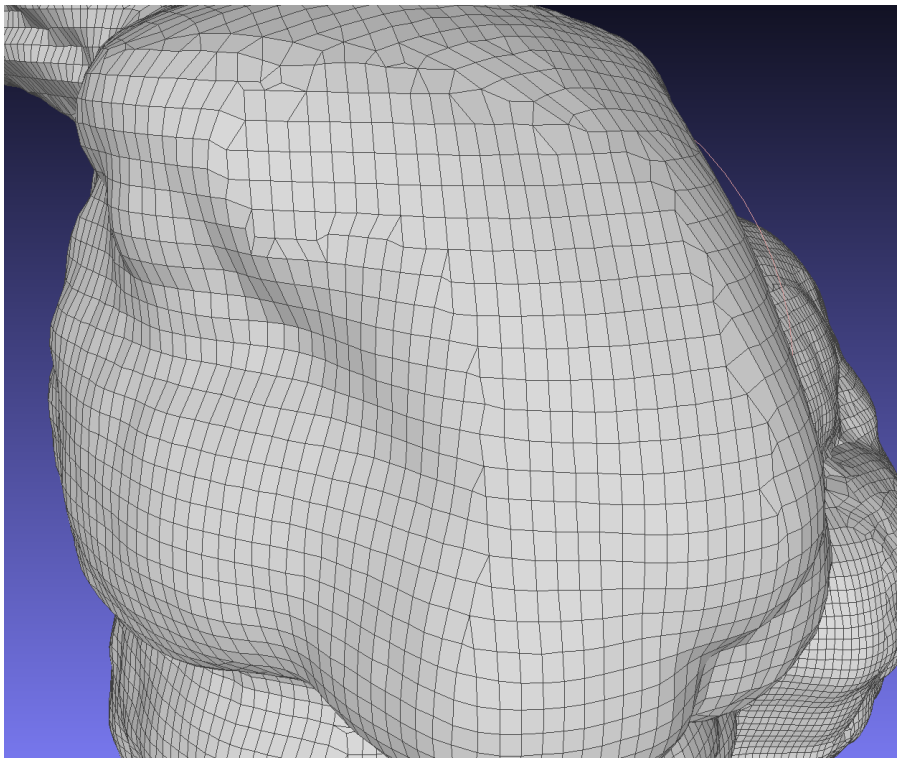
Figure: Winged edge mesh data structure

Triangular to quad conversion

- Quad dominant mesh $\rightarrow$ merge neighbours after ordering
- Then: Pure quad mesh $\rightarrow$ BFS + crawling triangles



(a) Our results

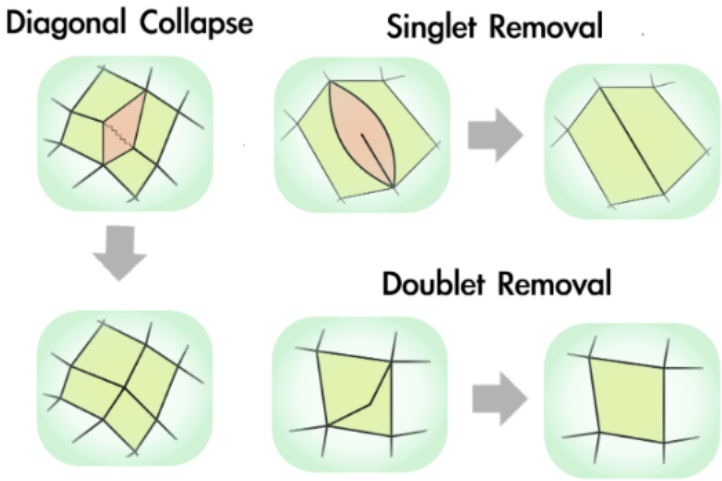


(b) Meshlab results

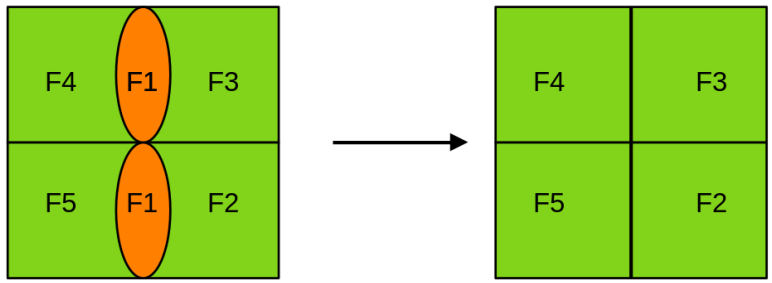
Figure: Triangular to Quad mesh simplification

Simplification

Basic operations



(a) Diagonal collapses



(b) New local operation

Figure: Operations to simplify and correct the mesh

Simplification

OpenGL

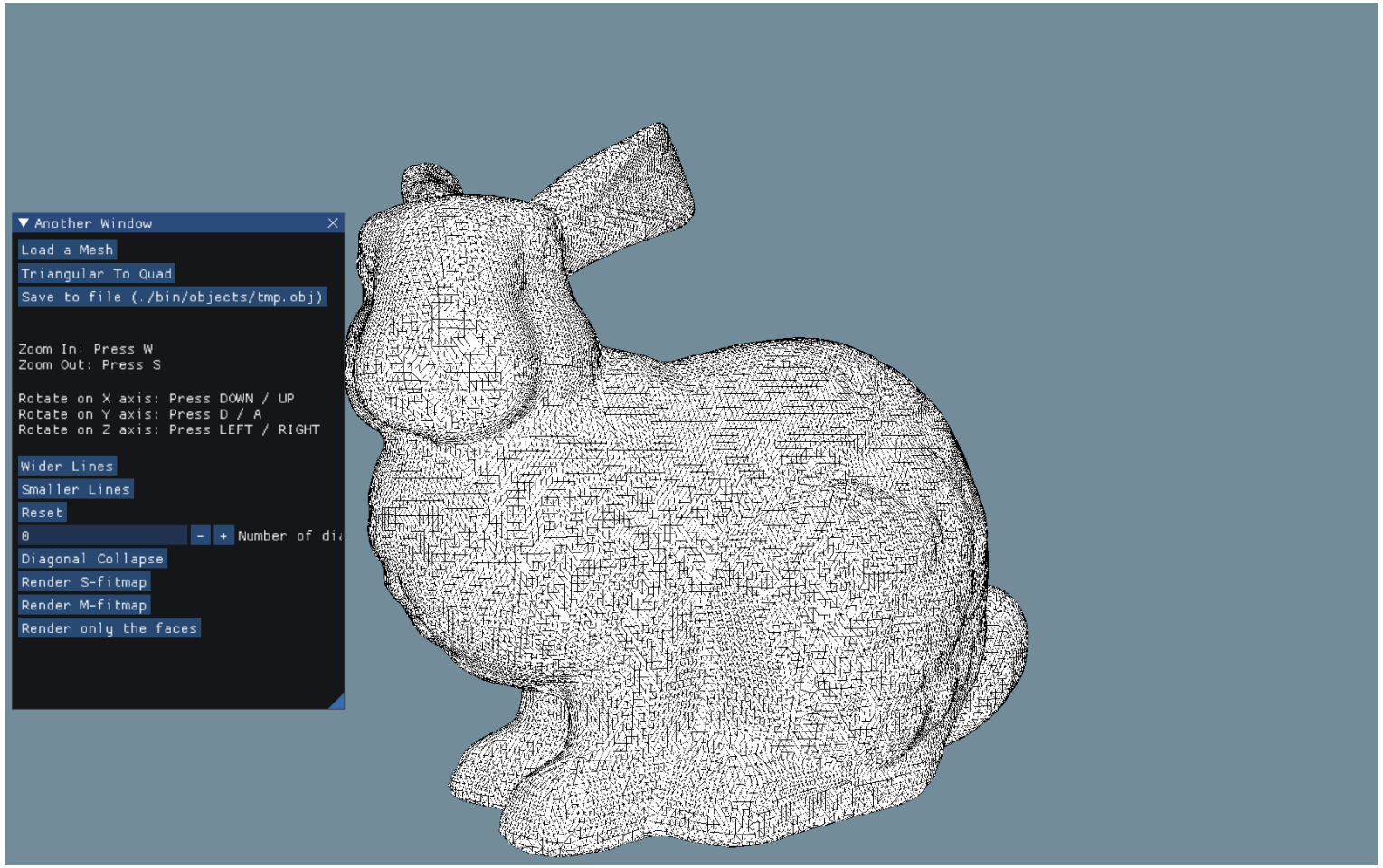


Figure: The OpenGL scene with the Imgui box

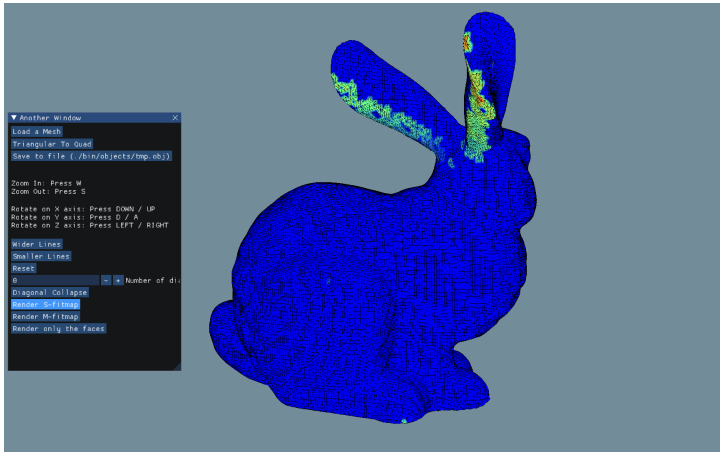
Simplification

Fitmaps

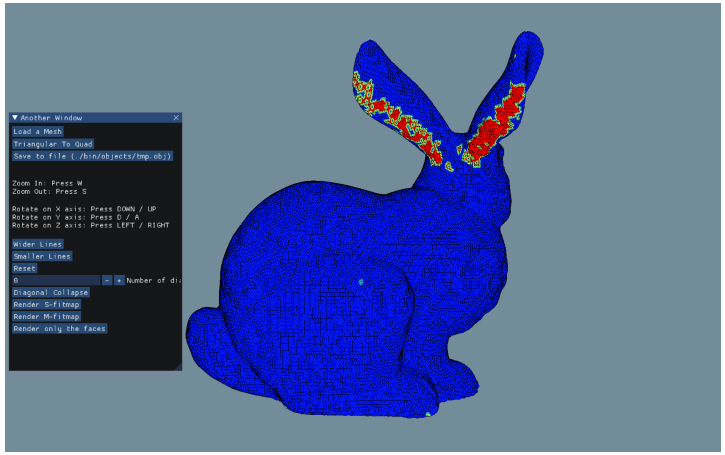
- Radii initializations $\rightarrow$ AABB bounding box + exponential serie
- S-Fitmap $\rightarrow$ OLS to find plane + quadratic function for the errors
- M-Fitmap $\rightarrow$ saving faces normals + get positive dot products

Simplification

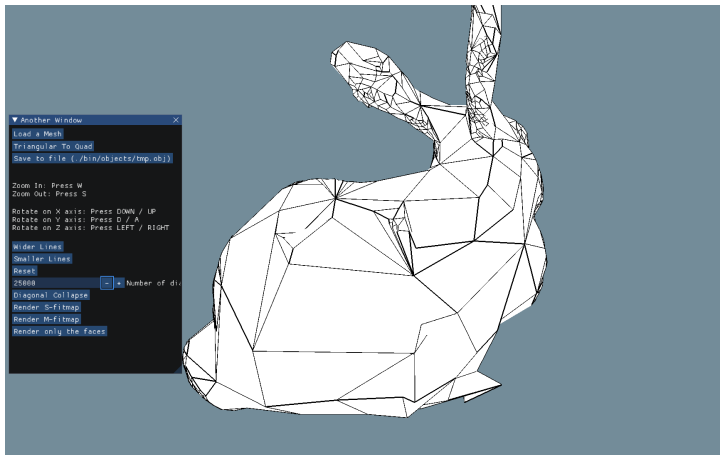
Fitmaps



(a) S-fitmap



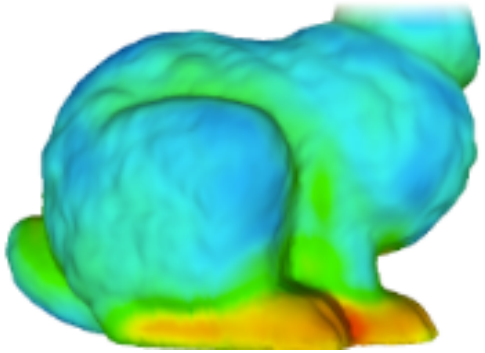
(b) M-fitmap



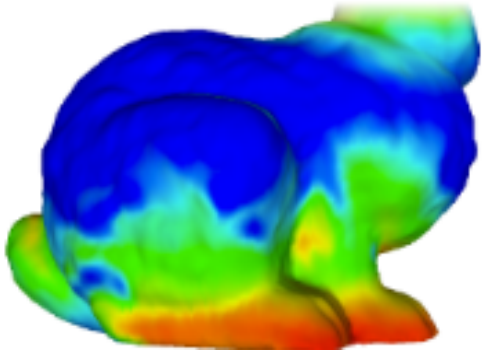
(c) After collapses

What to improve

- Fitmaps $\rightarrow$ not matching expected results
- Better projection $\rightarrow$ sharp edges
- Problems after too many collapses $\rightarrow$ weird behaviour + crash
- Implementing rotations ...



(a) Expected S-fitmap



(b) Expected M-fitmap

Figure: Expected fitmaps for the bunny

References

Agostino Bozzo, Daniele Panozzo, Enrico Puppo, Nico Pietroni and Luigi Rocca (2010)
Adaptive Quad Mesh Simplification
European Interdisciplinary Cybersecurity Conference.

Marco Tarini, Nico Pietroni, Paolo Cignoni, Daniele Panozzo and Enrico Puppo (2010)
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Computer Graphics Forum 29.

Daniele Panozzo, Enrico Puppo, Marco Tarini, Nico Pietroni and Paolo Cignoni (2011)
Automatic Construction of Quad-Based Subdivision Surfaces Using Fitmaps
IEEE Transactions on Visualization and Computer Graphics 17, 1510 – 1520.

Thanks for listening

Feel free to ask questions?