CS3242 Modeling Lab Assignment

Final Submission

We will expect some minor suggestions or improvements in the previous Zoom presentations. After you polish your projects, please submit your code and any .obj files (or other files) that you used to prove your work.

For your code, please zip up your project in one zip file **AFTER** you clean up your project. Cleaning up means removing all the debug information, etc. For example, you can find "clean" under the project tab. And upload your .zip to the "Final Task Submission Folder" in Luminus.

Again, please **prepend your student number before your file name** for both .zip file and .obj files.

You should submit all your work **before 26th April 11:59pm**.

Final Submission form

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Task Checklist

Please state your percentage of completion for each items. If it's not 100%, please state clearly what you have done or what you have not done.

Tasks	*Completion Level*	
Computing Normal Vectors (main, 20 marks)	100%	Automatically computed
Compute Angle Statistics (main, 30 marks)	100%	Automatically computed
Write an OBJ file (main, 20 marks)	100%	After pressing "O"
Read Some Other Type of Files Other Than OBJ (optional, 20 marks)	100%	Reads the specified ASCII STL automatically
~~**Implement `enext()`, `sym()` (20 marks, main)**~~		
Implement `org()`, `dest()` (20 marks, main) .	100%	Function
Implement `fnext()` (80 marks, main)	100%	Automatically computed
Compute the Number of Components (20 marks, optional)	100%	Automatically computed
Implement `orientTriangles()` (20 marks, optional)	100%	After pressing "R"
Compute Vertex Normal Vectors for Smooth Shading (10 marks, optional)	100%	After pressing "G"
Visualize boundary edges (10 marks, optional)	100%	After pressing "B"
Implementing Selection of Triangle by User Marquee (20 marks, optional)	0%	

Final Task

Topics: Mesh Simplification and Subdivision

Mesh Simplification: Iterative decimation based on user defined function ($\frac{curvature \times edge\ length}{(number\ of\ faces\ with\ v)^{1.75}}$) and half-edge approach

Problems encountered:

- Slight topology changes
- Efficiency - around 15 minutes to reduce from 5000 to 2500 faces

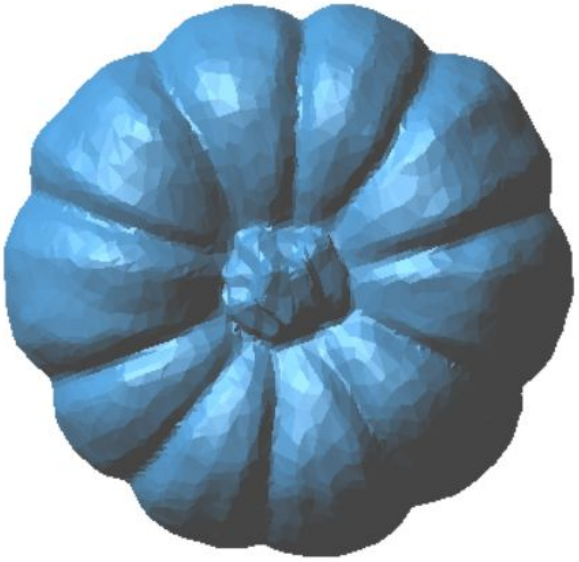
Future work:

- Quadratic Error Metric as a criterion for choosing edges to collapse
- Optimization
- Link check
- Animation based on the refinements

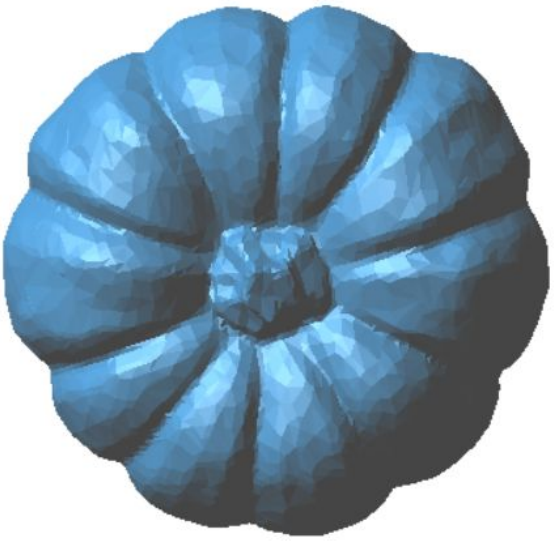
Faces: Around 5000

Faces:2500

Faces:1000



Pumpkin: 10,000 triangles

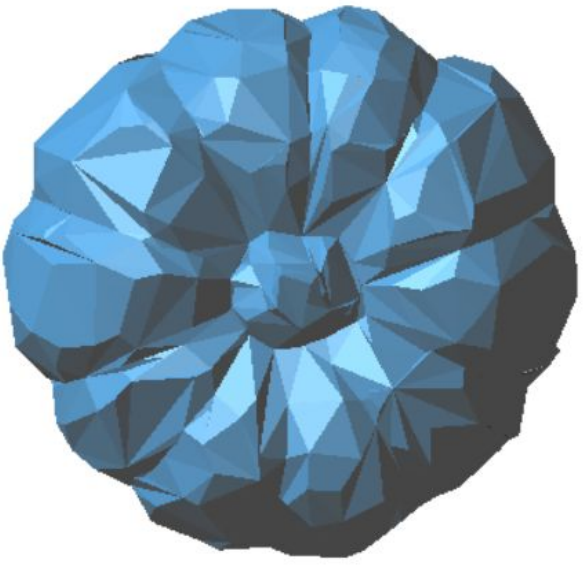


Pumpkin:8,000 triangles

Pumpkin: 6,000 triangles

Pumpkin: 4,000 triangles

Pumpkin: 2,000 triangles



Pumpkin: 1,000 triangles

Teddy: 100%

Teddy: 50%

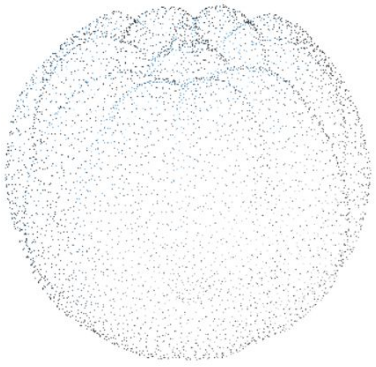
Teddy:25%

Subdivision: Loop subdivision

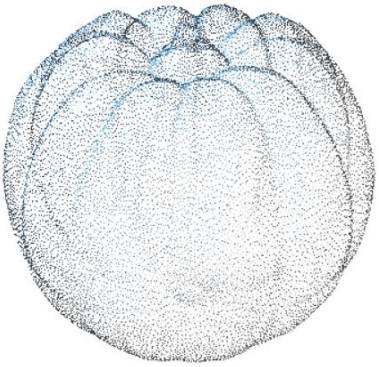
Iteration: 0
Vertices: ~2500

Iteration: 1
Vertices:~10000

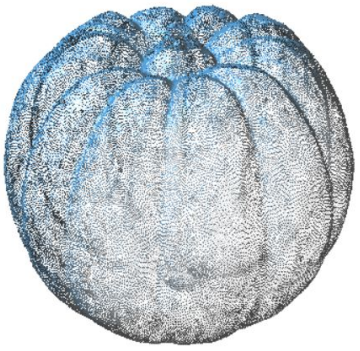
Iteration: 2
Vertices:~40,000



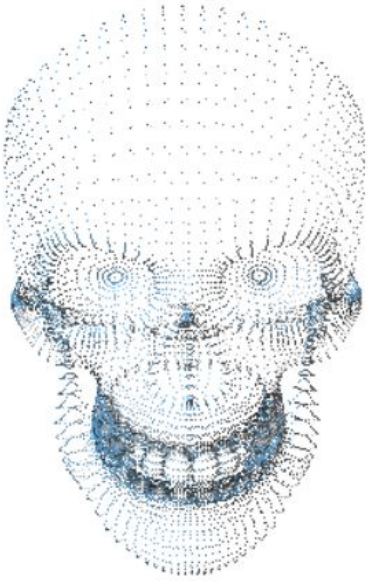
Pumpkin: 5,000 Vertices



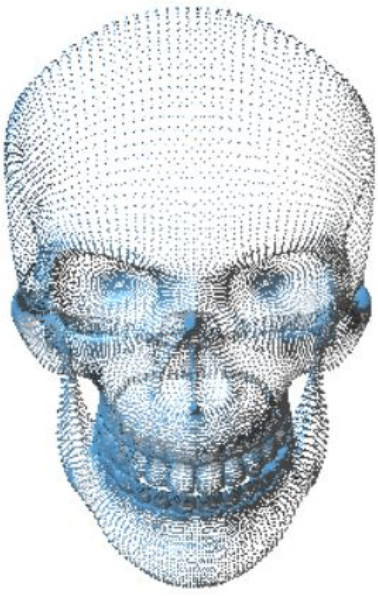
Pumpkin: 20,000 Vertices



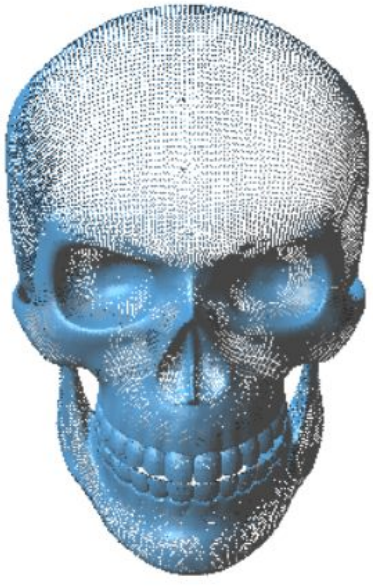
Pumpkin: 80,000 Vertices



Skull: Around 15,000 Vertices



Skull: Around 55,000 Vertices



Skull: Around 220,000 Vertices

Ideas for improvement:

- Finding a metric to check vertex's sharpness or crease vertices and approximating them

Future work:

- Introducing partial subdivision based on the curvature of faces (if curvature between faces>=threshold) or user selection (user marquee)
- Add different subdivision algorithms (Butterfly; Barycentric)