Exercise 5. Mesh Decimation

Zeng Huang

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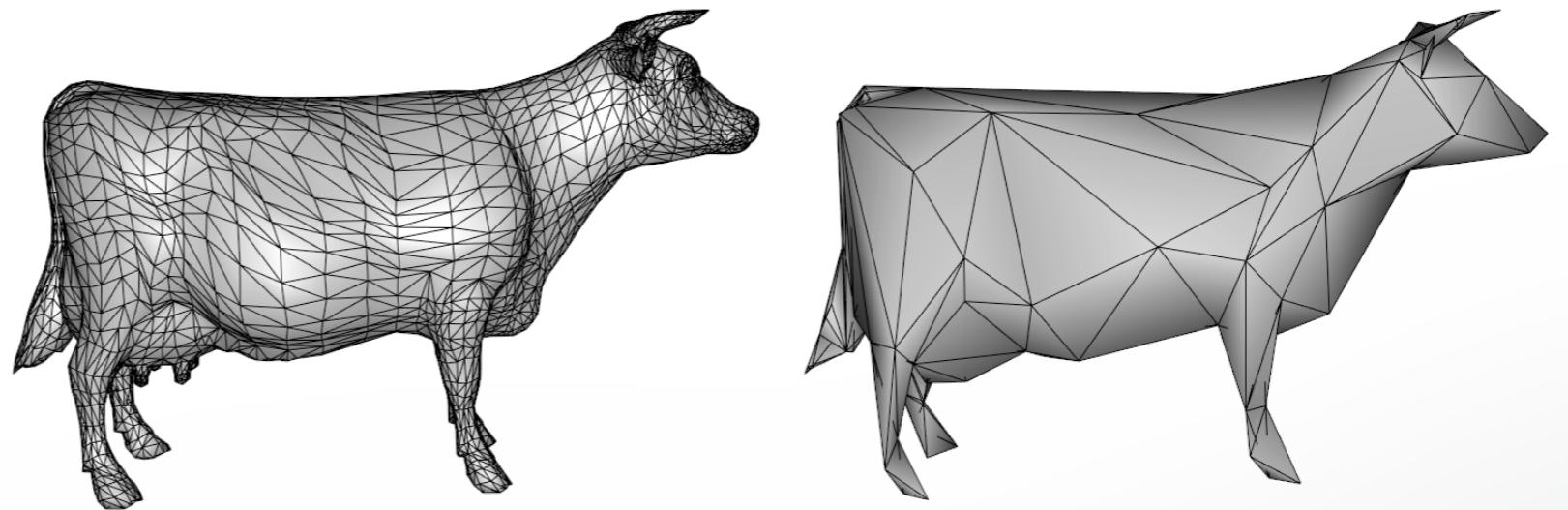
Mesh Decimation

- Vertex clustering

- **Iterative decimation**

  - **Initialize error quadrics [Garland, Heckbert 97]**

  - **Construct priority queue**

  - **Edge collapse**

Error Quadrics

- Sum of squared distances to planes

$$\mathbf{p} = (x, y, z, 1)^T, \quad \mathbf{q} = (a, b, c, d)^T$$

$$\text{dist}(\mathbf{q}, \mathbf{p})^2 = (\mathbf{q}^T \mathbf{p})^2 = \mathbf{p}^T \left(\mathbf{q}\mathbf{q}^T \right) \mathbf{p} =: \mathbf{p}^T \mathbf{Q_q} \mathbf{p}$$
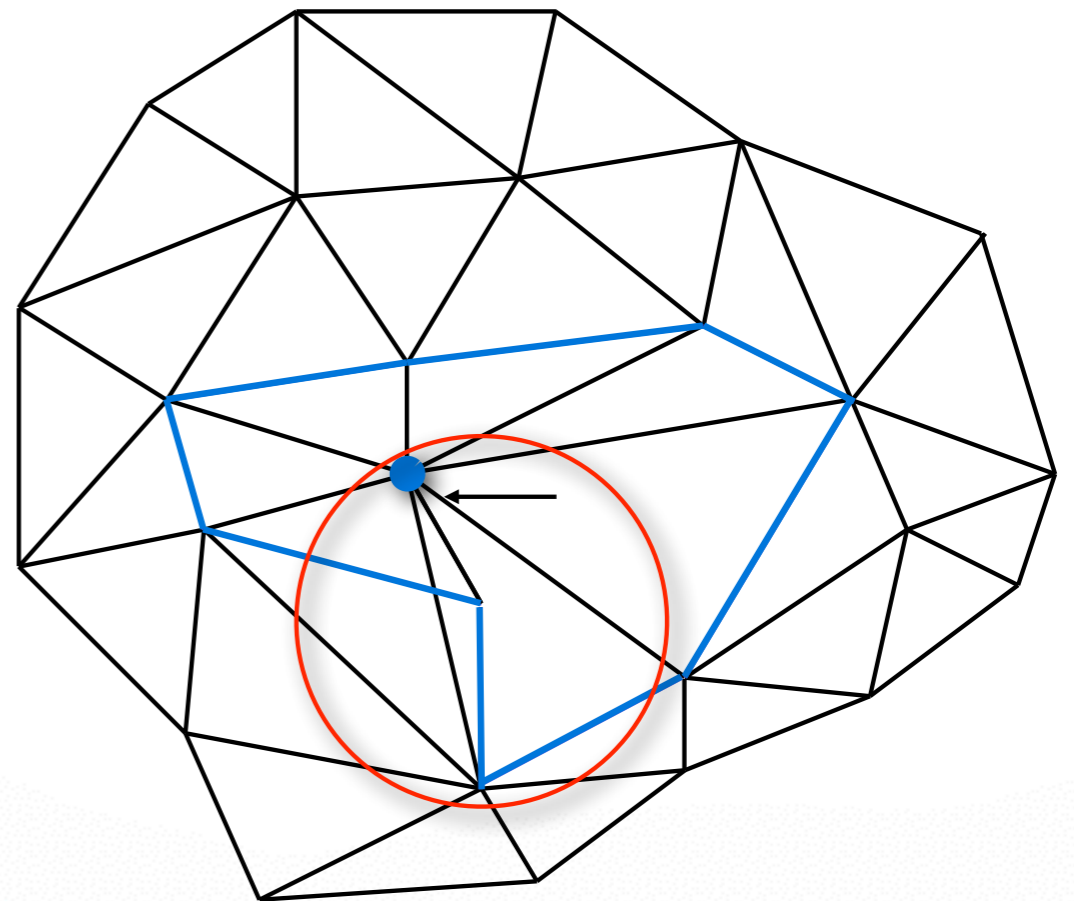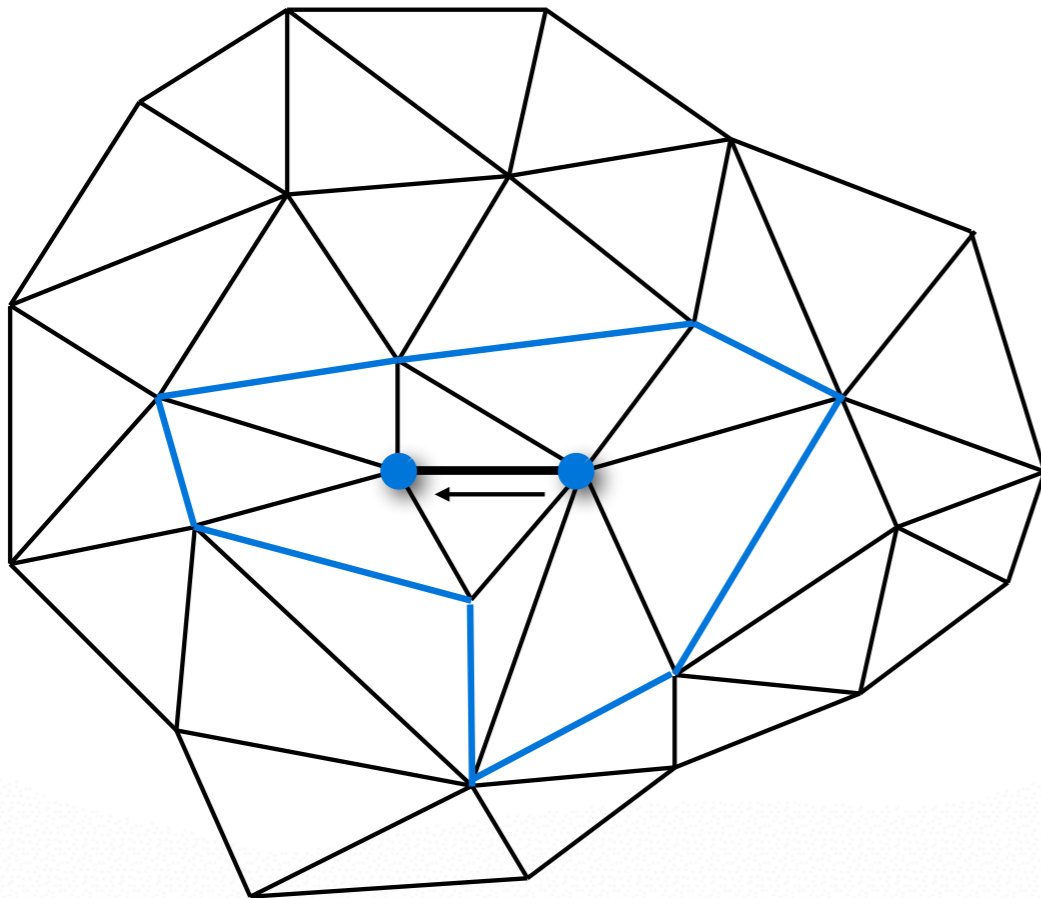
- After collapsing edge, simply add the corresponding

$$(\mathbf{p}_1, \mathbf{p}_2) \to \mathbf{p}_3$$

quadrics $\quad \mathbf{Q}_3 = \mathbf{Q}_1 + \mathbf{Q}_2$

- `init()` in deci.cc

Priority Queue

- Pick an adjacent halfedge (or target vertex) to collapse for each vertex

  - avoid edge flipping

  - sort by contraction error

Priority Queue

- Avoid normal flipping

  - test if normal is flipped after edge collapse

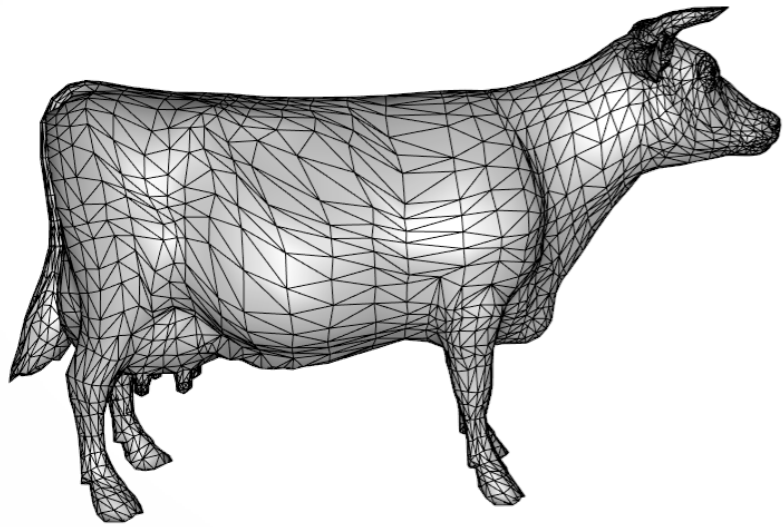 - `is_collapse_legal()` in deci.cc

Priority Queue

- Update priority by the **contraction error** defined by the error quadrics
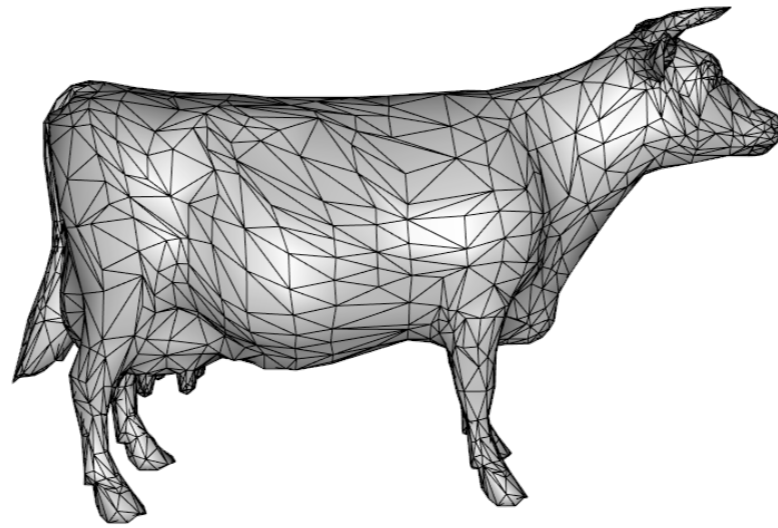
- `priority()` in deci.cc

Edge Collapse

- Pop the first element from the queue

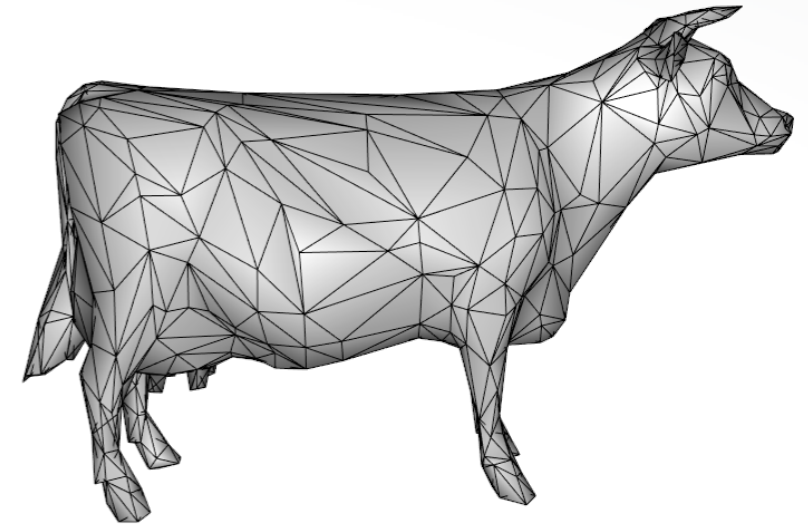- Perform collapse

- Update queue

- `decimate()` in deci.cc
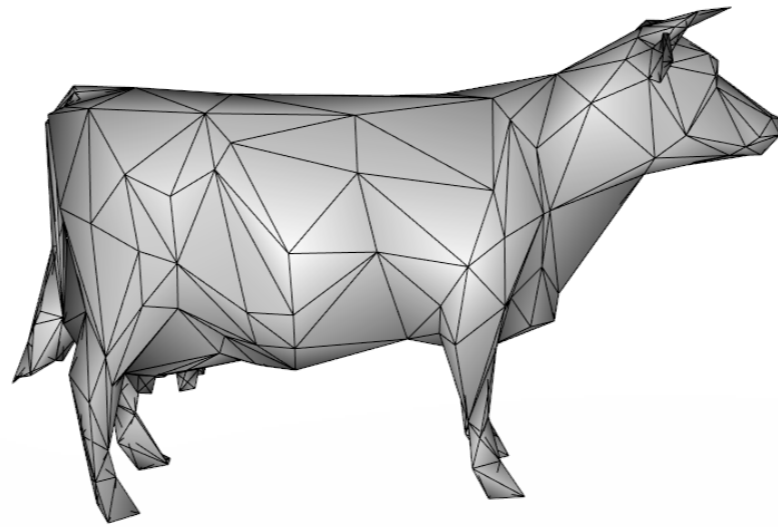
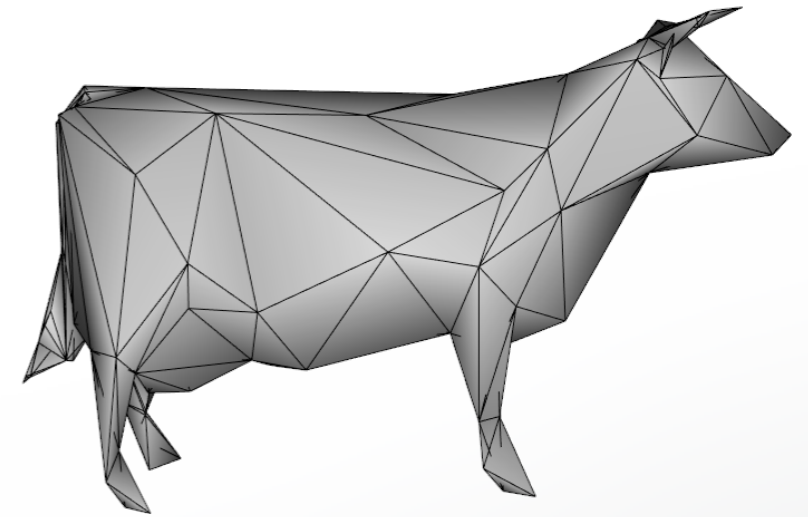# Result

original

50%

20%

10%

5%

Submission

- Deadline: **Apr 2, 2019 12:00pm**

- Upload a .zip compressed file named "Exercise5-YourName.zip" to

  - Blackboard

- Include a "readme.txt" file describing how you solve each exercise and the encountered problems

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Thanks!