Exercise 5. Mesh Decimation

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• Vertex clustering

• Iterative decimation
  • Initialize error quadrics [Garland, Heckbert 97]
  • Construct priority queue
  • Edge collapse
Error Quadrics

• Sum of squared distances to planes

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

\[ \text{dist}(\mathbf{q}, \mathbf{p})^2 = (\mathbf{q}^T \mathbf{p})^2 = \mathbf{p}^T (\mathbf{qq}^T) \mathbf{p} =: \mathbf{p}^T \mathbf{Q}_q \mathbf{p} \]

• After collapsing edge, simply add the corresponding quadrics

\[ \mathbf{Q}_3 = \mathbf{Q}_1 + \mathbf{Q}_2 \]

• \textit{init()} in deci.cc
• 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
  - `isCollapseLegal()` 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 04, 2017 11:59pm**

• Upload a .zip compressed file named “Exercise5-YourName.zip” to
  • Blackboard

• Include a “read.txt” file describing how you solve each exercise and the encountered problems
Contact

- Office Hours: Friday 13:00 - 14:00 PHE 108
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Thanks!

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