Exercise 5. Mesh Decimation
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

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

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

- After collapsing edge, simply add the corresponding quadrics

\[ Q_3 = Q_1 + Q_2 \]

- \textit{init()} in \texttt{deci.cc}
• Pick an adjacent halfedge (or target vertex) to collapse for each vertex
  • avoid edge flipping
  • sort by contraction error
• 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 3, 2018 12:00pm**

• 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: Monday 3:00 - 4:00pm, PHE 108

• email: tianyeli@usc.edu
http://cs621.hao-li.com

Thanks!