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

\[ Q_3 = Q_1 + Q_2 \]

• `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
- \texttt{decimate()} in deci.cc
Submission

• Deadline: **Wednesday, March 25, 2015 11:59pm**

• Upload a `.zip` compressed file named “Exercise5-YourName.zip” to Blackboard, same as before

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

- email (include “CSCI_599” in title):
  olszewski.kyle@gmail.com, peilun.hsieh@usc.edu

- Highly recommended to post your questions on Blackboard
Thanks!

http://cs599.hao-li.com