CENG 589—Digital Geometry Processing

**ASSIGNMENT II**   April 5, 2024
Instructor: Y. Sahillioğlu   2 Weeks

Enclosing Mesh Simplification (start early!) {100 points}

Your task is to simplify/decimate the input watertight mesh M such that the lower-resolution output fully encloses M. Implement the classic decimation pipeline where legal edges extracted from a priority queue P are collapsed sequentially. P is keyed based on edge length, curvature (see my slide 60), or $(d1+d2)/2$ where $d1/2$ is the distance from the edge midpoint to the local tangent plane of edge endpoint$1/2$. Either during collapses or after completing all the collapses, inflate the new point in its normal direction as long as it stays inside M. Use Generalized Winding Numbers Eq. 5 for the inside/outside test[1]. Decimate M with 3 keys and 2 inflation decisions above, until it has 50%, 20%, 10%, or 5% of the original face count.
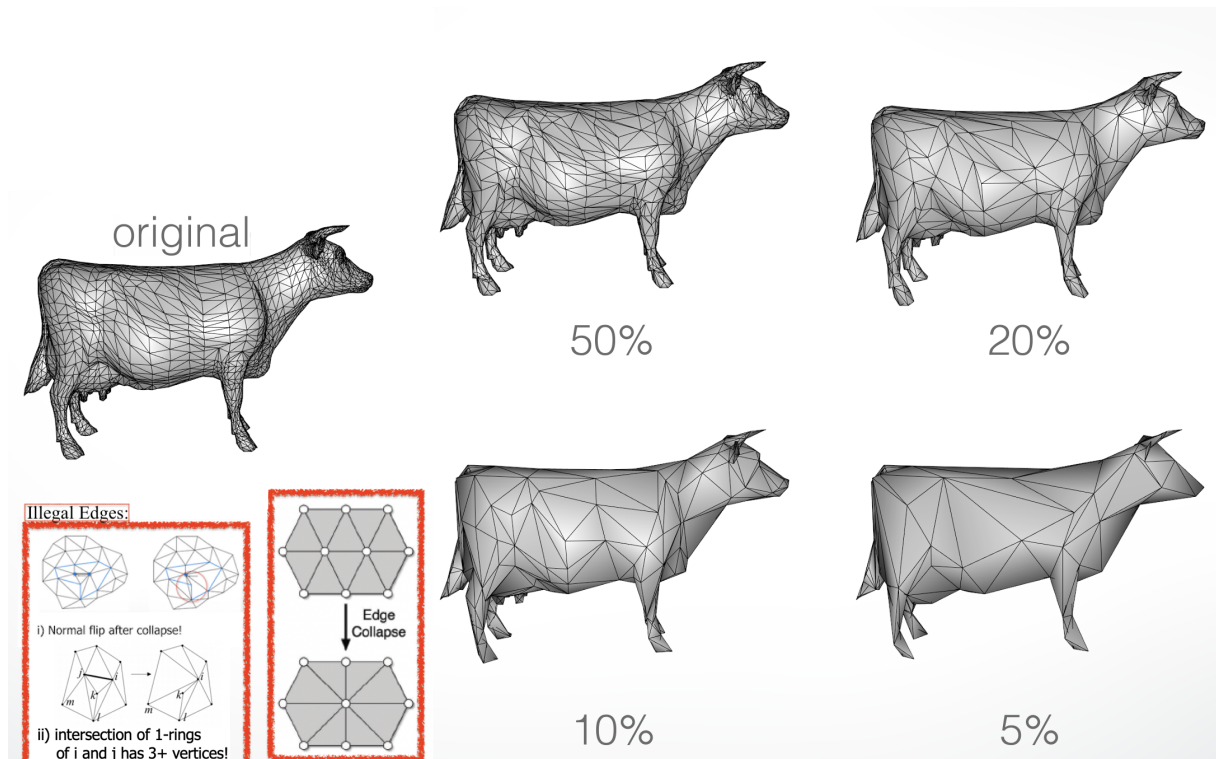
Submission This assignment constitutes 20% of your final grade. Good luck. Test with the meshes in https://segeval.cs.princeton.edu and send to ys@ceng.metu.edu.tr your code, executable, and a report containing screenshots as well as your interesting observations.

References you may want to check first:
Nested Cages, 2015.
Simplification Envelopes, 1996.
Decimation of Triangle Meshes, 1992.

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[1]You may use my implementation as a reference: `https://user.ceng.metu.edu.tr/~ys/winding-ys.cpp`