Bachelor Thesis
Efficient Implementation of Edge Collapse and Vertex Split

University of Zurich[UZH]

Introduction

In computer graphics, models are often times stored as triangular meshes. Simplifying these meshes into versions with way less triangles, but a similar shape (as shown in Figure 1, Figure 3, or the titleimage) is a long studied topic.

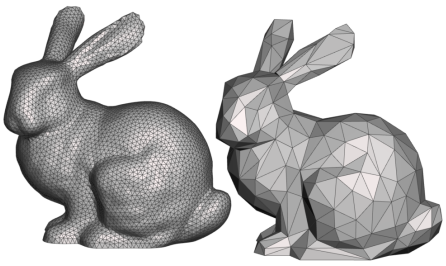

Figure 1: The Stanford Bunny in high resolution and a simplified version

Edge collapsing can be summarized as follows:

1. Select an edge
2. Join the two adjacent vertices into one
3. Repeat, until the stopping criterion is hit

This general concept repeats throughout all versions of edge collapsing. What differs, is the selection criterion for the edge and where to put the joined vertex relative to the two original ones (a common choice is in the middle). The stopping criterion is typically set to be a desired amount of triangles.

The inverse of this technique is called "vertex split". Here, the starting point is a mesh with relatively few triangles and the goal is to refine the structure. The strategy to do that is similar to the edge collapsing algorithm, except that a vertex is chosen and split, resulting in an edge. The concept of edge collapsing and vertex splitting is visualized in Figure 2.

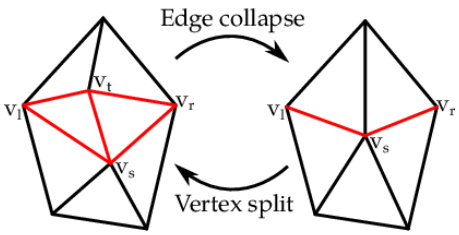

Figure 2: The Concept of Edge Collapse and Vertex Split

Assignments

Your task will be to implement efficient edge collapse and vertex split algorithms, allowing to choose different selection and positioning strategies. These two algorithms are supposed to be the exact inverse of the respective other. The main goal of this work is to have a precise and efficient implementation of an existing algorithm.

Work Type

This work is designed to be a Bachelor Thesis. If you want it to be another type of work, please contact me, so we can figure out possibilities.

Requirements

Basic C++ knowledge is a must. Knowledge about 3D datastructures and algorithms is optional.

Work Load

- 40% Theory
- 60% Implementation

Supervision

- Prof. Dr. Renato Pajarola
- Lars Zawallich

Contact

Write an Email to zawallich@ifi.uzh.ch

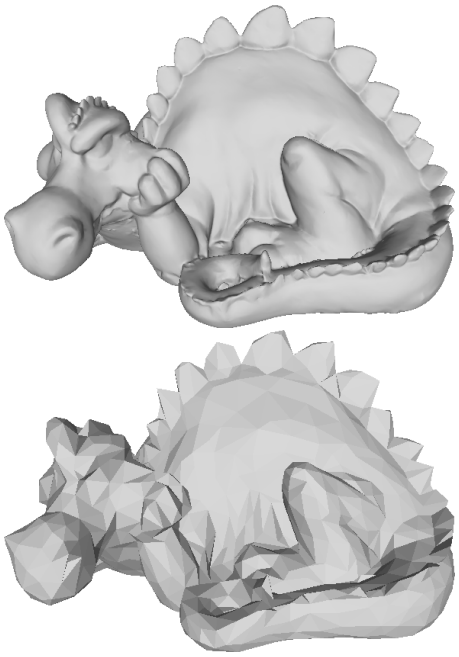

Figure 3: A Dragon in high resolution and a simplified version

VISUALIZATION AND MULTIMEDIA LAB

Professor Dr. Renato Pajarola
Visualization and Multimedia Lab
Department of Informatics
University of Zurich