

# G22.3033-008: Geometric Modeling — Homework 5

## Selection Tools and Interface for Editing

Handout: Wednesday, 3/24/10 — Due date: Wednesday, 4/07/10

In this assignment you will extend your mesh viewer with some face/edge/vertex selection tools that will serve for mesh editing in your final assignment. Implement the following:

1. Boolean selection of faces and vertices using a rectangle, a free-form lasso and single click selection tools. Element selection (faces or vertices) as well as the selection tool (rectangle, lasso or single click) should be selectable from the UI (e.g. with radio buttons). Boolean selection operations should include *union* and *subtraction* (these modes are entered, when, for instance, some key modifiers are pressed, such as Ctrl or Alt keys).
2. The application must be able to extend/shrink the selected set of faces or vertices by repeated dilation/erosion.
3. The selected set should be rendered in a distinct style. Selected vertices should be rendered using small spheres or circles. If a single element (face, edge or vertex) is selected, display the element's index in the UI.
4. Allow making multiple selections, so that you can select a region of interest (ROI) on the mesh, and a handle inside that region.
5. Allow handle manipulation: translation, rotation and uniform scaling of the selected handle region (come up with some convenient interface for that). To test your handle manipulation, implement a trivial mesh editing approach: the transformation applied to the handle should be propagated to the rest of the ROI using normalized edge distance (such that the further a vertex is from the handle, the less transformation it gets, and vertices on the boundary of the ROI do not get displaced at all).
6. Bonus (15%) Implement Laplacian mesh smoothing to the selected set of vertices by applying iterated local vertex relocation operations (i.e., by moving the center vertex along the graph- or cotangent Laplacian vector by some scalar fraction  $s \in [0, 1]$ ). Alternatively, implement implicit fairing (this will require solving a linear system).

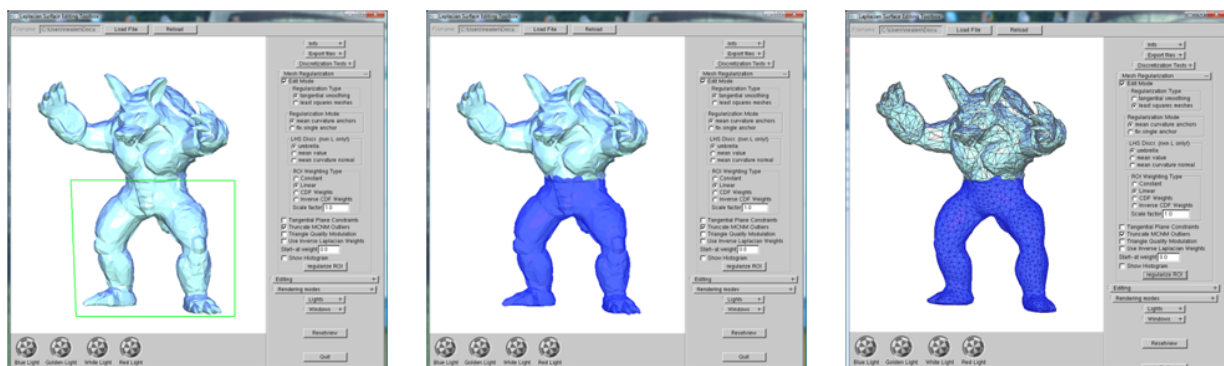


Figure 1: Selection GUI + Local Smoothing