

CSE530: Assignment Three

Modeling and Rendering of Subdivision Objects

The goal of this program assignment is to model and render subdivision surfaces. In particular, we focus on

- Catmull-Clark surfaces, and
- Surfaces of Butterfly scheme.

The basic graphics features of your software should include:

- Read the geometric data of any initial control polyhedron from a file;
- Allow users to interactively specify the level of subdivision process and display the wireframe and smoothly shaded model of this subdivision surface at this user-defined level;
- Display initial control points and control polyhedron of the subdivision surface;
- Allow users to interactively select arbitrary control point and move it to any desired position using mouse; and
- After all geometric manipulations are finished, save the updated data of control polyhedron into a file.

Please feel free to add any necessary features in order to make your system interface user-friendly.

To verify the above features of your system, you should demonstrate that your system correctly model and render (at least) the following three examples:

1. Catmull-Clark surface defined by a tetrahedral mesh with holes;
2. Catmull-Clark surface defined by a coarsely polygonized torus; and
3. The surface of Butterfly scheme defined by a control polyhedron in Figure 1 below.

Note that, the geometric data of (1) and (2) can be found in SIGGRAPH'93 conference proceedings. Please refer to

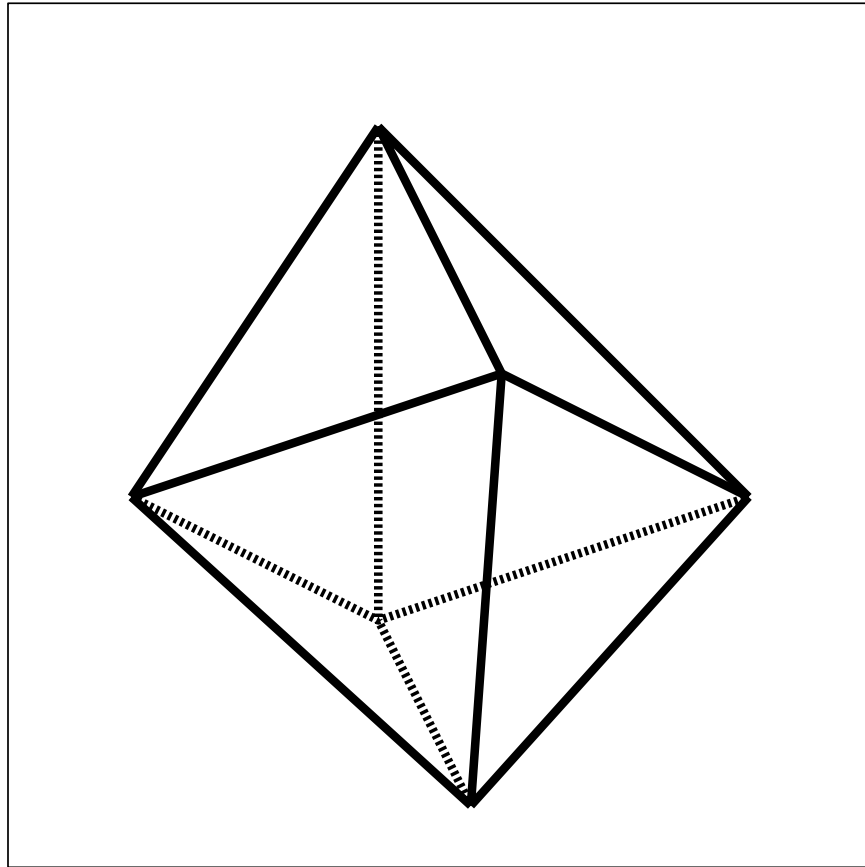


Figure 1: Control polyhedron for Butterfly scheme

- “Efficient, fair interpolation using Catmull-Clark surfaces” M. Halstead, M. Kass and T. DeRose, pages 35–44.

In particular, the control polyhedrons for (1) and (2) are displayed in the upper left corner of Figure 3 and Figure 4 on page 44, respectively. I strongly suggest that you complete the part for Catmull-Clark subdivision before you start to work on Butterfly scheme! Please note that, to understand how the variation of w affects the geometric shape of Butterfly scheme, please refer to

- “A butterfly subdivision scheme for surface interpolation with tension control,” N. Dyn, D. Levin, and J. A. Gregory, ACM Transactions on Graphics, 9(2), 160-169, April, 1990.

Please pay special attention to the discussion on pages 163-164. You can refer to the lecture notes for the technical details and algorithms for subdivision modeling and rendering. If you have any questions, please feel free to consult with the instructor. The above publications are available in our library. Before you start to write any programs, you should carefully read my notes and the paper and understand them.