An Implementation of Halfedge Data Structure in Catmull-Clark Subdivision for 2-Manifold Single-sided Surface

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1 Introduction

2 Halfedge Data Structure

An object in 3D Euclid space can be represented by a mesh of polygons. A mesh contains three basic types of geometry element: vertex, edge, and face. The adjacency structure stores the topological information (adjacency and connectivity) of the mesh. The author chose halfedge data structure as the adjacency structure in this project to realize Catmull-Clark subdivision.

2.1 Vertex, Halfedge, and Face

The definitions and assumptions of vertex, halfedge and face is shown in table 1. An example o

	Definition	Assumption
Vertex	A 3-dimensional point	Vertices can overlap when they have the same position
Halfedge	An edge that starts from one vertex and end at another vertex	A halfedge connects exactly two non-overlapping vertices and it has a direction
Face	A polygon that contains a loop of vertices and halfedges	A face has at least three non-overlapping vertices so it makes a polygon

Table 1: Definition and assumption of vertex, halfedge, and face