A New 3-D Mesh Simplification Algorithm

Wu Xianfeng[1] Ye Jianhui[2]

Abstract

To simplify the 3D color head mesh ,it is more important to keep the boundary and quality of the head's sense organs including eyes, eyebrows, nose and mouth. In this paper, we present a novel mesh simplification algorithm based on region segmentation. The algorithm can be divided into two stages: segmentation and simplification. After the automatic segmentation of 3D color head mesh into different head parts, vertices are classed into region-boundary vertices and region-inner vertices. Using iterative edge collapse and region-weighted error metric, the algorithm generates continuous levels of detail (LOD). Results of several experiments are shown, demonstrating the validity and efficiency of our method.

Keywords: *mesh simplification, level of detail, image segmentation, multi-resolution model*

1 Introduction

With the development of computer technology, the complexity of the objects involved in modern virtual reality simulations and computer animations increases every day. Texture and lighting information is also necessary to produce more realistic rendering. On the other hand, the computation and storage requirements for such applications far exceed the capacity of modern graphics hardware system.

There are many approaches to acquire 3D models in a virtual world. Laser scanning, which uses active optical triangulation technique, is one of the most common methods for acquiring range data. Its speed and accuracy has increased dramatically in recent years with the development of geometrically stable imaging sensors such as CCD's and high-precision mechanical parts. We have developed a new kind of 3D laser color scanning system that produces color dataset of 3D models as well as range data. The triangle's number of a typical human head's 3d data is half million.

Because such large meshes are difficult to store, transmit, and render, many techniques have been developed for geometrically simplifying them [1]. However the majority of them are intended for accurate free-noise mesh, and the models are always geometric objects, not high-resolution human face model.

[1] Image Processing & Intelligent Control Key Laboratory of China, Institute of Pattern Recognition & Artificial Intelligence, Huazhong University of Science & Technology, Wuhan , 430074, China
Email: Summit.wu@263.net

[2] Image Processing & Intelligent Control Key Laboratory of China, IPR&AI, Huazhong University of Science & Technology, Wuhan , 430074, China
Email: echoyf@263.net