Literature Review 1

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Primary Paper

3D Model Dynamic Cutting Technology Based on Game Engine by *WenFeng Hu* School of Computer Science Communication University of China Beijing. *Shuang Zhao, Yu Ren* School of Computer Science Communication University of China Beijing.

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Secondary Paper

Interactive mesh-cutting techniques and a new method for implementing generalized interactive mesh cutting using virtual tools by Cynthia D. Bruyns*, Steven Senger, Anil Menon, Kevin Montgomery,Simon Wildermuth and Richard Boyle.

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author = {Bruyns, Cynthia D. and Senger, Steven and Menon, Anil and Montgomery, Kevin and Wildermuth, Simon and Boyle, Richard},
title = {A survey of interactive mesh-cutting techniques and a new method for implementing generalized interactive mesh cutting using virtual tools‡},
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}

LITERATURE REVIEW

Author WenFeng Hu along with Zhao S. and Ren Yu in "*3D model dynamic cutting technology based on game engine*" proposes a dynamic 3D model cutting algorithm of authenticity and efficiency. It explores the underpinnings of model cutting in computer graphics and provides the data that substantiates the concept. The paper examine the shortcomings of the contemporary algorithms i.e the integrity of unambiguous specification to solve a class of problems lacks texture replenishment algorithm for cutting section,thereby leading to a unrealistic and inflexible practicality. The IEEE Conference article focuses on the how to improve the algorithm of polygon cutting in order to satisfy the real-time requirements for cutting objects in educational games.This paper proposes a new technology which can cut one model into two parts in real time and applies texture to the cutting section.The cutting process can be converted to judge whether the line and the triangle intersect, that is judge whether the line and the line segment intersect. Author Zhao S. presents several methods , namely, straight line intersection method, projection of intersection prejudgment method and area of intersection prejudgment method to follow the stated. These methods, nevertheless, are used with an assumption of two dimensional plane triangle with vertex P cutting the line at two respective points I1 and I2.

Moreover , According to D. Bruyns , Senger ,Menon A. ,Montgomery K ,in "*Interactive mesh cutting techniques*" ,mesh-cutting methods can be distinguished by how their solutions address the following major issues: definition of the cut path, primitive removal andre-meshing, number of new primitives created, when re-meshing is performed, and representation of the cutting tool. The respective sections of the paper organizes the existing cutting techniques and discuss their distinctions according to how they address the above major issues. Contribution of countable researches have developed schemes for interactive mesh cutting with the goals of reducing the number of new primitives created, creating new primitives with good aspect ratios, avoiding a disconnected mesh structure between primitives in the cut path, and representing the path traversed by the tool as accurately as possible. The goal of this paper is to explain how, by using a very simple framework, one can build a generalized cutting scheme. The method allows for any arbitrary cut to be made within a virtual object, and can simulate cutting surface, layered surface or tetrahedral objects using a virtual scalpel, scissors, or loop cautery tool. This method has been implemented in a real-time, haptic-rate surgical simulation system allowing arbitrary cuts to be made on high-resolution patient-specific models.

The above two papers primarily concludes that cutting is a common manipulation encountered in simulations such as surgical training, clothing design and CAD/CAM manufacturing. The latter literature contains numerous methods for cutting both surface and volumetric meshes while the former is contingent on the foundation of the latter. The cutting of 3D model is mainly based on the cutting of 2D plane, as, Bruyns vividly elucidate the flow of interactive cutting algorithm based on surface rendering, it has the following contents:
-Define cut path.
-Chip deletion and mesh reconstruction.
-Create new fragments.
-perform mesh reconstruction.
-Simulation of cutting tool.
The paper mainly studies the cutting algorithm based on triangle mesh model, and this innovative cutting algorithm of 3D model improves the basic process according to the actual situation and augment some details.

3D model dynamic cutting technology based on game engine presents a dynamic cutting technology thus improving the authenticity. Furthermore, the texture supplement algorithm of this technology increases the real-time of cutting operation. This further is practically put forth as a proven theory by the game demo. The algorithm is implemented for Unity3D platform where the object model is a triangular mesh and is stored in a point list combined with a surface list.The players control perspective by using keyboard and mouse, choose the cutting tool such as axes and saws. Then the cutting angle and position is chosen arbitrarily to provide different results and cutting animation. Thereafter, the corresponding texture for cross section is filled. This feature greatly increases the authenticity and realtime of the cutting operation. In addition, further research aims to implement , extend and strengthen the contents of the game with somatosensory devices like Kinect to perform the cutting operations. Authors, therefore conclude the acceptance of the undisputed three dimensional technology with the core foundation of two dimensional modules.