

Material Parameter Editing System for Volumetric Simulation Models

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Introduction

“How to adjust material parameters of volumetric character model?”



Physically-based character animation is a trend represent secondary deformation and volume preservation in character animation using volumetric lattices [1] [2]. However, it is difficult for rigging artists to adjust the material parameters of interior deformable parts (such as muscle, flesh, and skin) enclosed in skin meshes. Our system can allow artists to adjust anatomical parameters of volumetric character model effectively using distance propagation method.

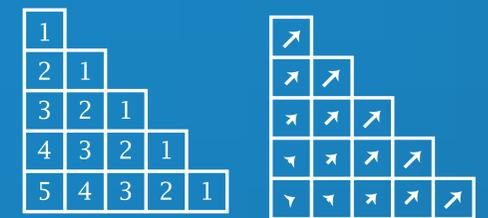
Methodology

Our key idea is based on connecting between interior lattices and UV space. First our system is required skin mesh model and skeleton to user. Next, the skin mesh is voxelized and created lattice structure. From skeleton information, we can register skeleton lattice which is close to skeleton. Then the distance from skeleton lattice to surface lattice defined 6-neighbor relation. We can calculate normal direction based on the distance at each lattice. Each lattice has two information(normal direction and surface distance) . UV space and skin mesh model is corresponded , so skin vertex embedded each lattice is connected to interior lattice vertex. Finally, the material parameter is set between UV space and lattice space.

Our Method

Normal Direction

We define a normal direction considered to the relation of neighbor lattices. The interior normal direction is defined as an average of the six-neighbored normal vector which the surface distance value is less than its own value.



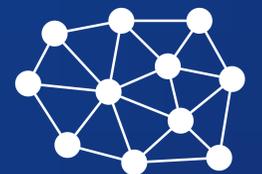
Surface Distance

To calculate surface distance, we use the Manhattan distance from surface lattices to interior lattices. Surface lattices are set the value 1, and the distance of interior lattices increase based on Manhattan distance from surface lattices.

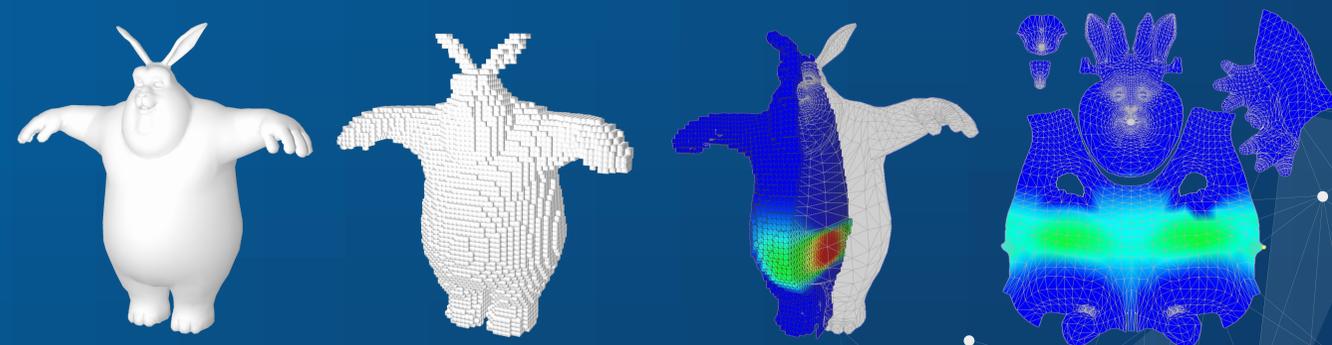


Parameter Propagation

To adjust parameters of interior material, we connect between UV space and volumetric lattice using the method as same as heat propagation method. According to the traditional painting method to set skinning weight, the parameter which is set on skin vertex in UV space propagate into the interior lattice considering the surface distance value and normal direction. We denote a maximum surface distance value d_{max} and material value s_i for each vertex.



Result



Reference

HAHN, F., MARTIN, S., THOMASZEWSKI, B., SUMNER, R., COROS, S., AND GROSS, M. 2012. Rig-space physics. ACM Trans. Graph., 31, 4 (July), 72:1–72:2.