Interactive Rigging

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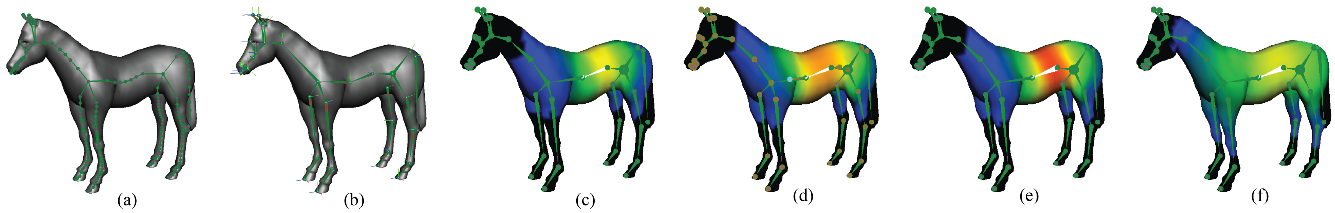

Figure 1: *A skeleton is extracted first from the given mesh (a). During this process corresponding region of each joint is obtained (c), after removing extraneous nodes using DP algorithm, a hierarchical joint structure and orientation information is determined (b). Finally, the system computes the initial skin weights for the mesh (d). Interactive Skinning weights manipulation tools are provided such as Editing Influence Range (d), Scaling Influence Magnitude (e), and Editing Influence Smoothness (f).*

1 Introduction

Skeleton-driven animation is a widespread technique, which is frequently used in film and video game productions to animate 3D characters. The process of preparing characters for skeletal animation is referred to as character rigging. Commercial applications such as Maya or 3DS Max provide many tool that support this process, including the 'joint tool' and the 'paint skin weights tool'. Most of these tools are difficult to use for novice users. Even for professional artists, it requires many hours of intensive effort.

We approach the rigging process from a semi-automatic point of view, integrating the skeleton creation process with the skinning of the mesh into an interactive rig editing system. We also maintain an important degree of control over the final result of the rig, especially in its ability to refine the skinning results. Our method begins by providing an automatically generated, fully skinned rig as a starting point for interactive editing. In this framework, the skeleton structure and the skin weights can be interactively edited with the provided manipulation tools while receiving immediate visual feedback of the current state of the rig.

2 Base Rig

In order to obtain a fully skinned base rig, a skeleton is extracted first from the given mesh using the skeleton extraction technique [Au et al. 2008]. Redundant nodes are removed using Douglas-Peucker algorithm. Then a hierarchical joint structure is defined by traversing the nodes in a depth-first manner starting from the user specified root. Next, joint orientation information is determined by assigning the primary axis of a local joint to the direction pointing to its child joint and secondary axis to the bending direction of the joint. Lastly, skin weights are computed using the heat diffusion technique [Baran and Popović 2007].

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3 Interactive Editing

Once the base rig is created, the user is presented with several tools to modify and to adapt the rig to his/her needs. We provide two different types of manipulations of the rig. The user can manipulate the skeleton to refine the position and orientation of the joints or to modify the skeleton structure by inserting and deleting joints. The user can also edit the character skinning and receive immediate visual feedback on the modifications with a color gradient visualization of the skin weights of a selected bone. We provide intuitive skin weight handles to delimit the influence and area of influence of the bones over the mesh, and also provide means of controlling the scale and smoothness of weights.

To afford plausible interactivity, we re-compute the skin weights locally by exploiting the information about the corresponding regions obtained in skeleton extraction process. This local re-computation is important, as global re-computation scarcely achieves real-time performance depending on input mesh resolutions.

4 Conclusions and Future Work

We proposed a new method that allows very intuitive and efficient character rigging. Our system can handle any mesh that is compatible with the skeleton extraction process. Rigging of one character required nearly up to 20 minutes by a novice user. Our local re-computation of weights technique achieves 3-40 times the performance gain compared to the global weight computation. For high-resolution meshes, i.e., those of more than 100k, our local computing scheme may fail to achieve real-time computation. We plan to incorporate a GPU-based implementation in the future to increase the degree of interactivity with a wider range of meshes.

References

AU, O. K.-C., TAI, C.-L., CHU, H.-K., COHEN-OR, D., AND LEE, T.-Y. 2008. Skeleton extraction by mesh contraction. In *ACM Transactions on Graphics (TOG)*, vol. 27, ACM, 44.

BARAN, I., AND POPOVIĆ, J. 2007. Automatic rigging and animation of 3d characters. In *ACM Transactions on Graphics (TOG)*, vol. 26, ACM, 72.