DreamWorks Animation Facial Motion and Deformation System

Sven Pohle* Michael Hutchinson† Brent Watkins‡ Dick Walsh§ Stephen Candell¶ Frederick Nilsson‖
Jason Reisig** Dreamwork Animation

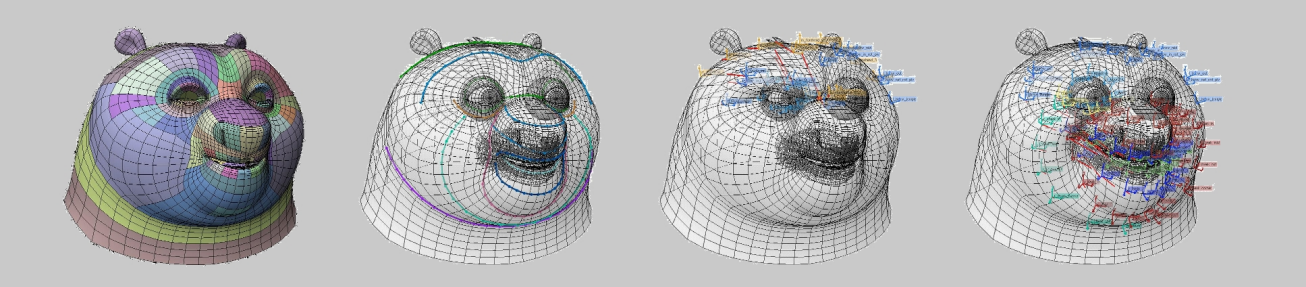

Figure 1: *FeatureLines Motion System*

Abstract

DreamWorks Animation's Premo animation system enables a direct manipulation of controls in real time on the geometry of the character. To support this workflow a new approach for our facial system needed to be developed as a typical shape driven system with macro controls could not take advantage of the new software.

This paper introduces a free-form facial control shaping system, a new in-house motion system approach coupled with a curve based pose interpolation system in a layered deformation rigging system. The resulting rigs are capable of producing a larger amount of facial shapes while offering more control to the animator. A freely designed set of Featurelines defining either main control areas or layers of minor controls is driven by the posing system. A highly layered Deformation System using a new curve based deformer type at its base is then used to transfer the motion into the Face. Several additional layers allow for a very art directable rigging system and provide a necessary level of abstraction for the artist. This system in its various stages has been used on productions using Premo at DreamWorks.

1 Free-Form Animation System

Our approach to the Animation Control System consists mainly out of a large set of individual controls driving specific areas in the Face. This, coupled with a new Animation Software Posing System, allows animators to artistically direct the Face Performance of the Character. Additionally we are able to implement traditional Macro Poses like smile, frown, mad etc to compliment the free-form control set. This approach allows artists to adjust to individual show or character needs.

2 Pose Space Featureline Motion

The Featureline-based motion approach consists of a new in-house procedural motion system, correlated to geometry flow and areas of needed animation control. Motion is applied using a pose based driven system coupled with additional procedural systems. Direction of the motion can be applied in a world space coordinate system or a surface based parametric space to provide art direction of the motion between defined poses. At the core is a posing system which allows for artist-driven direct manipulation shape generation through various layers of the system. Traditionally, poses are interpolated in a sparse data set interpolation, but in our approach we use more well defined curve based interpolation. Similar interpolation-based systems treat the poses as unstructured data, relying on scattered data interpolation methods such as thin-plate splines and gaussian radial basis functions. These are difficult to control and suffer from issues such as overshoot and undershoot. Because of the structure of our data we can break up the complex multi-dimensional pose space into a set of simpler single-dimensional spaces. Once in a single-dimensional domain, we can interpolate the data with simple cubic splines.

3 Layered Deformation System

Our highly layered approach to deformations is driven by a low res layer to which deformations are applied in several layers with coarse to fine control. The Featureline Motion System provides the main means for transfering motion into the deformations. Additional Posing Layers, a shape based lid system in spherical space and additional procedural layers provide us the artist with the necessary control to shape various stages.

4 Production Results

The Features *How to Train your Dragon 2 and HOME* are successfully using this approach. The Free-Form Animation approach provides more artistic control to Animation and reduces the iterations with Rigging. The new artist friendly rigging system has reduced the general time needed to rig a face and has sped up iterations.

Additionally the system has provided a significant higher amount of reuseability between different characters.

References

GONG, M., NILSSON, F., POWELL, A., REISIG, J., WELLS, A., BRYSON, S., PAPP, E., AND DILORENZO, P. 2014. Premo: A natural-interaction animation platform. In *ACM SIGGRAPH 2014 Talks*, ACM, New York, NY, USA, SIGGRAPH '14, 3:1–3:1.

MODESTO, L., AND WALSH, D. 2014. Dreamworks animation's face system, a historical perspective: From antz and shrek to mr peabody & sherman. In *ACM SIGGRAPH 2014 Talks*, ACM, New York, NY, USA, SIGGRAPH '14, 37:1–37:1.

[Modesto and Walsh 2014] [Gong et al. 2014]