Adaptable Setup For Performance Driven Facial Animation

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1 Motivation

The process for creating believable facial animation is time consuming and tedious. We have developed a tool-set, which dramatically reduces the time spent generating a high-quality facial animation setup with natural, nonlinear skin deformations. The innovation in our approach consists of the unusual employment of facial motion capture data and its adaptation.

2 Motion Capture

Rather than capturing a specific performance we use capture-data for generating a sophisticated facial animation setup which may then be used to animate entirely new synthetic performances. As a basis for the facial setup an actor is motion captured performing a full set of facial movements conforming to Paul Ekman's Facial Action Coding System (FACS). The tracked feature points contain nonlinear animation curves which in combination precisely describe the motion in all regions of the face during each Action Unit performance. The motion capture data is cleaned, normalized and separated from the global head movement.

3 Deformation & Automated Setup Creation

The same set of tracked feature points is distributed as deformers to the corresponding positions on the 3D Model. Each point deforms its surrounding region. Manual weighting of the deformation influences to the feature points is required to obtain optimal results (skinning). The Automated Setup Process connects the motion capture data to the output of specific animation controls (sliders) in the animation setup. The animation slider value is restricted to a range from 0-100 and serves as input for the motion capture data time value. Any value entered for an Action Unit animation control intensity corresponds to precise data for all facial feature points involved. Facial feature points that are not involved in an Action Unit do not contain any data (e.g. the forehead while smiling).

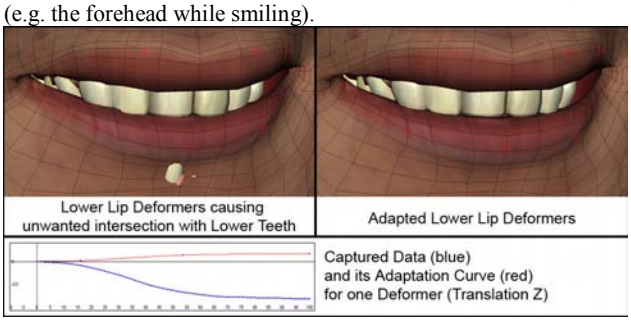

Figure 1. Data Adaptation for Facial Deformers.

4 Data Adaptation

To compensate for the different physiognomies and proportions of the performer and the virtual actor, the data needs to be adapted. This data is entered as an additional curve in order to offset the existing motion capture data.

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Any position in the value range from 0-100 can be precisely adapted by additional keys. The values of the adaptation curves are added to the existing motion capture data. Figure 1 shows the unadapted deformers of the lower lip, while an open smile causes an unwanted intersection with the lower teeth. The captured data remains in its dynamic purity while the adaptation curve is used to adjust the facial performance to the virtual actor.

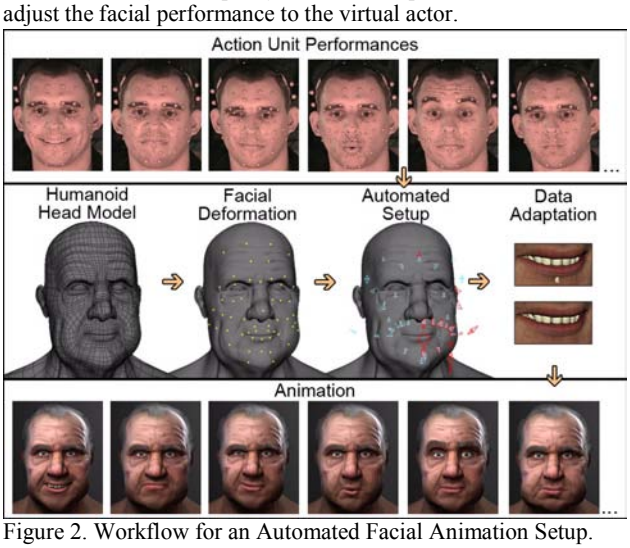

Figure 2. Workflow for an Automated Facial Animation Setup.

5 Animation

The animation artist will be provided with a setup of 65 slider controls (23 symmetrical and 42 asymmetrical controls) enabling him to generate almost any anatomically possible facial expression. This fits into the established workflow of Blendshape/Morph Target animation and requires no special training. In addition to the existing expressions each facial feature point can contain extra offset animation data. Corrective Blendshapes may be used to optimize and further individualize the resulting Action Unit appearances.

6 Conclusion

We have developed an animation system that automates the most challenging tasks in setting up convincing facial animation: the creation of facial actions in articulate form and motion during all intensities. The Action Unit motions look believable and interact predictably in combination with each other. Even the appearances of the Action Units when triggered at full intensity are promisingly accurate. The solution is geometry independent and works with any humanoid character. Recent tests also confirmed that this method works for highly stylized face models. The results of this work will be provided for public use in form of a Maya toolset.

References

EKMAN, P., FRIESEN, W. 1977. *Facial Action Coding System*. Consulting Psychologist Press.

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