Perceiving Interactive Sketching Through Facial Expressions

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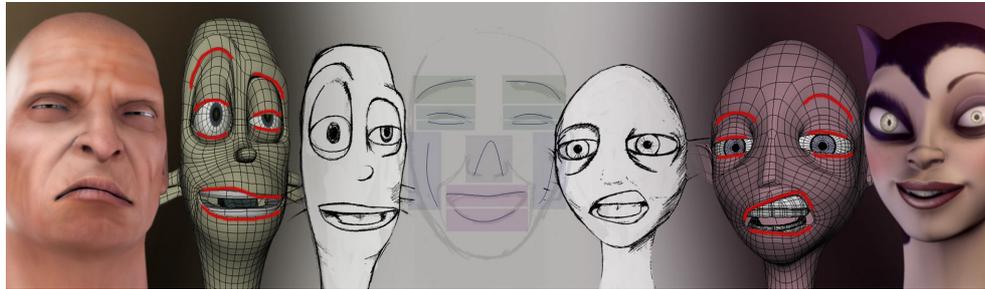
1 Introduction

Facial Animation is the key element to convey emotions in virtual characters. One of the major challenges in interactive systems (e.g. games, virtual worlds) and off-line systems (mainly used in films) is to ensure that the characters are highly expressive to reinforce the spectators' 'suspension of disbelief'. It is necessary to create believable facial expressions to guarantee a correct perception of the emotions [Ekman and Friesen 1971]. Creating appealing and convincing facial animations is a laborious and time-consuming process that only expert digital artists are capable of doing. Usually animators work with rigged 3D models. A rig is analogous to the strings that control a puppet. This process still involves heavy manual work as the artist needs to manipulate the controls individually. Requiring them many hours or weeks to create believable results.

In order to investigate whether manipulating a 3D model without understanding the rig structure enhances the facial animation process, we developed a *facial sketching system* for artistic purposes embedded in the modeling package Maya. A more in depth description is presented in [Miranda et al. 2012]. Here, we present a comprehensive study to evaluate the user's response to the system.

2 Facial Sketching Overview

Our system allows two different interaction models to create facial expressions: one *2D Sketching Interface*, which allows the user to draw strokes on a fixed 2D canvas, and another *3D Sketching Interface* which allows the user to draw strokes directly on the 3D mesh. Despite of the configuration, the canvas is a bounded space, which serves as a simple animation control system where the model deformation is sketched on. First, the user selects the interaction model to be used. Then draws free-form strokes on the canvas or on the mesh and the system automatically creates the deformation on the correspondent region of the 3D model. A *stroke* is represented by a curve and a *region* is represented by a set of rig elements. The user can indefinitely refine the strokes and save poses at anytime, which can then be used as keyframes for animation. See a video of our system at `http://www.portointeractivecenter.org/sketch/validation`.

3 Facial Posing Experiment

The experiment was designed in order to evaluate the effectiveness of our facial sketching system. We test its usability by measuring the *user's effort* (number of clicks, curves created, modified and deleted) and its *performance* by computing the time the user took to create a pose. We compared our *facial sketching control system* to

traditional rigging techniques, where the user manipulates directly the individual controls of the rig.

Experiment Design: We tested and validated the system with groups of different profiles: One group of *30 expert participants* which regularly use 3D animation packages (group of graduate students from an animation school and professional artists) and another group of *30 non-expert participants* with average 3D animation skills (group of undergraduate students from an animation school). The experiment was divided in 6 sessions. Each session was composed by 3 tests (one test for each interaction model): one test using the 2D sketching interface; another using the 3D sketching interface and still another using the traditional technique, i.e. by directly manipulating the rig. We gave the participants three examples of facial expressions and asked them to recreate each expression using the respective interaction model, starting from a neutral expression. There was no time limit to conclude the tasks and the only rule was that the user needed to create the expressions with the respective interaction model. After completing the tests for the three interaction models and before any debriefing or discussion took place, we asked the participants to fill in a usability questionnaire.

4 Results and Conclusion

During our experiments we evaluated the usefulness of our facial sketching system. We found that the sketching interaction method is simple to master and useful to create facial deformations, producing fast results. The timing results vary depending on the expertise level of the participants. Our 2D sketching interface revealed to be as fast as the traditional approach with expert users, but faster with non-experts. The 3D interface was slower than the traditional technique with the experts users, but presents the same timing results with non-experts. We consider these results positive, due to their years of training in Maya and compared to their unfamiliarity to our sketching interaction models. Another interesting finding of this experiment is that the sketching interaction paradigm seems to require a shorter learning curve when compared to the traditional technique.

References

EKMAN, P., AND FRIESEN, W. 1971. Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology*, 17(2), 124–129.

MIRANDA, J. C., ALVAREZ, X., ORVALHO, J. a., GUTIERREZ, D., AUGUSTO SOUSA, A., AND ORVALHO, V. 2012. Sketch express: A sketching interface for facial animation. *Computers & Graphics* (Mar.).