Facial Animation by the Manipulation of a Few Control Points Subject to Muscle Constraints

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1. Introduction

Muscle-based Facial Animation
• One of the best approaches to realizing a realistic, lifelike character.
• However, the optimal control of each muscle to generate facial animation is complicated.

The goal of our work is...
• To synthesize realistic facial animation with a variety of facial expressions by automatically estimating facial muscle parameters through the manipulation of only a few control points on the face.
• To develop a facial expression cloning method that transfers an actor’s muscle parameters to another character.

2. Facial Measurement and Modeling

Constructing Actor’s Facial Model:
• Scanning the subject using a 3D scanner: (Cyberware 3030 RGB)
• Adapting a generic face mesh to the acquired facial data.

Motion capturing:
10 Motion Capture Cameras (VICON MX-40)
The motion of each marker on the actor’s face while he creates various facial expressions is recorded at 120 fps.

3. Facial Muscle Parameter Estimation

Surface Error (SE) Minimization:
The simulated facial model: Uniquely determined by 37 facial muscle parameters.
To find the optimal facial muscle parameters:
Minimize the difference between the surface of the actor’s face and that of the simulated face – Surface Error.
Total of Control Points:
20 motion capture markers.

Separating the Face Area into 4 Sub-Areas:
The facial muscle parameters:
Too numerous to easily solve this problem.
Therefore –
The facial surface is divided into 4 sub-areas.

4. Facial Animation Synthesis Results

Muscle contraction → Animation of actor’s model:
Estimated by minimizing the SE, according to the movement of the 20 motion capture markers.

(a) Actor’s expression. (b) Actor’s facial model with automatically estimated muscle parameters. (c) Facial model of another character with the muscle parameters of (b) applied.

5. Conclusion

We proposed the automatic synthesis of facial expression by manipulating a few control points under facial muscle constraints.
We have been able to synthesize facial expressions easily by adapting generic facial muscle parameters to any characters’ facial model only by fitting a generic model to personal data.

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