

Data-Driven Facial Modeling and Animation

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Research Goal

- This project explores facial models and animation made directly from captured data to address the goals of realism and automation.
 - Learn an “explicit” speech animation model from capture data; it can be applied to any face model.
 - A statistical texture synthesis algorithm is used to produce natural eye motion and dynamic facial expressions.
 - Explore audio-visual expressive speech processing and novel audio-visual fusion techniques for future Human-Computer Interaction (HCI).

Role in IMSC

- Part of the general IMSC effort towards expressive human interaction in virtual and augmented reality environments.
- Realistic human facial modeling and animation addresses a major bottleneck for current facial animation applications.
- Audio-visual expressive speech processing and audio-visual fusion are key components of next-generation integrated human-computer interface.
- The interactive talking avatar is a key component of IMSC Communication Vision Project.

Research Approach

- Facial motion data of human subjects, with markers on their faces, are captured by a motion capture system.
- A general machine-learning pipeline is used to learn the motion model from capture data.
- A divide-and-conquer strategy is used to organize different modules of a talking face.



Accomplishments

Publications

- Z. Deng, M. Bulut, U. Neumann, S. Narayanan, Automatic Dynamic Expression Synthesis for Speech Animation, In *Proc. of IEEE Computer Animation and Social Agents 2004*, Geneva, Switzerland, 2004.
- Z. Deng, J.P. Lewis, U. Neumann, Automated Eye Motion using Texture Synthesis, *IEEE Computer Graphics and Applications*, to appear.
- Z. Deng, J.P. Lewis, U. Neumann, Practical Eye Movement Model using Texture Synthesis, In *Proc. of ACM SIGGRAPH 2003 Sketches and Applications*, San Diego, 2003.
- Z. Deng, J.P. Lewis, U. Neumann, P. Fox, Synthesizing Speech Animation using Motion Capture Mining, submitted for publications.



Uniqueness & Related Work

- “Data-driven” modeling is currently popular in computer graphics research, and it has been applied to speech modeling as well as other areas such as human body animation. Our work is distinguished in several ways:
 - We are the first group applying data-driven modeling to eye motion, speech animation, expression synthesis, head motion, and others.
 - We are pioneering audio-visual expressive speech processing and audio-visual fusion for next-generation human-computer interaction.

5-Year Plan

- 2004-2006, Integration with facial expression and other projects to produce an expressive avatar prototype.
- 2006-2008, prototype of real-time talking avatars can be widely used in many areas, such as IMSC communication vision project.