CHARACTER ANIMATION – REALISM AND NUANCES

USC UNIVERSITY OF SOUTHERN CALIFORNIA | IMSC Integrated Media Systems Center

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Multiresolution hair modeling and rendering produces realistic complex hairstyles, a first in computer graphics. The Adaptive Wisp Tree algorithm, which provides a multiresolution representation of moving hair, is one component of an effort to develop an approach to efficiently animating complex hair styles.

A statistical texture synthesis algorithm is adapted to produce natural eye movement, capturing the correlation between gaze changes and eye blinks found in real data.

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BRIEF DESCRIPTION OF DEMONSTRATION

Computer graphic renditions of humans are usually easy to spot – the hair is missing or does not move, the eyes are staring straight ahead, the motion is too smooth to be real. In this research we begin to address several of these more subtle issues. Natural mouth coarticulation effects are "learned" by mining motion capture data. Eye movement and correlated eye blink signals are synthesized using a data-driven approach. Our previous work in sophisticated hair modeling and rendering is expanded, and initial results in hair animation are shown.

DISTINGUISHING CHARACTERISTICS RELATIVE TO STATE-OF-THE-ART

Recent data-driven lip synchronization approaches produce coarticulation by re-using contiguous frames from an original video. Such "implicit" coarticulation can only be used with the face in the original video, however. We learn an "explicit" coarticulation model that can be applied to any face model. Synthesizing realistic eye movement and blink signals is essentially a one-dimensional texture synthesis problem. We apply the successful non-parametric sampling family of texture synthesis methods, producing natural, realistic eye movement from real data.

UNDERLYING TECHNOLOGIES

- Adaptive Wisp Tree algorithm
- Machine learning techniques
- Dynamic programming
- Non-parametric sampling

APPLICATIONS

Applications include avatars and agents, computer animation for entertainment and other purposes, and game characters. Attention to some of the more subtle details of avatar animation (in particular motion algorithms based on real human data) may reduce the robotic feeling of many current avatars and allow a broader range of applications.

RECENT HIGHLIGHTS, LEVEL OF DEVELOPMENT, UPCOMING MILESTONES

During the past year we developed the Adaptive Wisp Tree, a data structure and algorithm for representing hair as it clusters and separates due to physical dynamics. The research on lip coarticulation and eye motion models "mined" from motion data was also started during this period.

LIST OF PUBLICATIONS, REFERENCES, URLs

- T-Y. Kim and U. Neumann, Interactive Multiresolution Hair Modeling and Editing, *ACM SIGGRAPH 2002* (special issue of *ACM Transactions on Graphics* (TOG), v.21 n.3, July 2002).
- E. Plante, M-P. Cani, T.Y.Kim, and U. Neumann, Adaptive Wisp Tree – a multiresolution control structure for simulating dynamic clustering in hair motion. *IMSC internal report*, 2003.
- Z. Deng, J. Lewis, and U. Neumann, Practical Eye Movement Model using Texture Synthesis, *ACM SIGGRAPH 2003 Technical sketch*, to appear.
- Z. Deng, J. Lewis, and U. Neumann, Motion Capture Mining for Speech Co-Articulation, *submitted for publication*, 2003.

http://graphics.usc.edu/~zdeng

http://www.usc.edu/dept/CGIT (CGIT lab web pages)

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