COMPUTER VISION DISTINGUISHED SPEAKER SERIES

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Modeling and Reconstruction of Deformable Object Shapes from Video

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The structure from motion (SFM) problem for rigid shapes has been extensively studied, and working systems have begun to appear for modeling scenes such as city streets from a sequence of images. There are, however, many non-rigid deformable objects, such as faces, whose shape and motion we would like to obtain from video. In general, the image measurements of such objects contain two factors that are coupled: non-rigid deformations (such as facial expressive motion) and rigid motion (such as head motion).

The task of non-rigid SFM is to decouple or factorize the two component factors and then to obtain the model of shape deformation. With the Bregler-like assumption that the shape deformation can be modeled as a linear combination of (unknown) shape bases, we have developed a new non-rigid SFM algorithm. Its important advantage is that it is a closed-form solution without the ambiguity that previous similar algorithms have suffered. The process of developing the new solution sheds the light on the fundamental difference from and relation to the rigid SFM problem.

The algorithm has been applied to extracting the 3D morphable model of expressive human faces from a monocular image sequence. Then, combining the highly efficient fitting of the 2D active appearance model (AAM) and the explicit 3D parameterization of the 3D morphable model, we have achieved the capability of tracking a face in video, recovering facial landmark positions, the 3D face shapes, the 3D head poses, and the facial appearance in real-time (~60fps).

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Student Union, Key West Room 218CD
http://www.cs.ucf.edu/~vision

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BIOGRAPHY

Takeo Kanade is the U. A. and Helen Whitaker University Professor of Computer Science and Robotics at Carnegie Mellon University. He received his Doctoral degree in Electrical Engineering from Kyoto University, Japan, in 1974. After holding a faculty position in the Department of Information Science, Kyoto University, he joined Carnegie Mellon University in 1980, where he was the Director of the Robotics Institute from 1992 to 2001.

Dr. Kanade works in multiple areas of robotics: computer vision, multi-media, manipulators, autonomous mobile robots, and sensors. He has written more than 250 technical papers and reports in these areas, and holds more than 15 patents. He has been the principal investigator of more than a dozen major vision and robotics projects at Carnegie Mellon.

Dr. Kanade has been elected to the National Academy of Engineering (1997) and the American Academy of Arts and Sciences (2004). He is a Fellow of the IEEE, a Fellow of the ACM, a Founding Fellow of American Association of Artificial Intelligence (AAAI), and the former and founding editor of International Journal of Computer Vision.