Visual-based 3D Human Posture Recognition

Camera input, 3D visual-hull and recognized posture

INTEGRATED MEDIA SYSTEMS CENTER
A National Science Foundation
Engineering Research Center at the
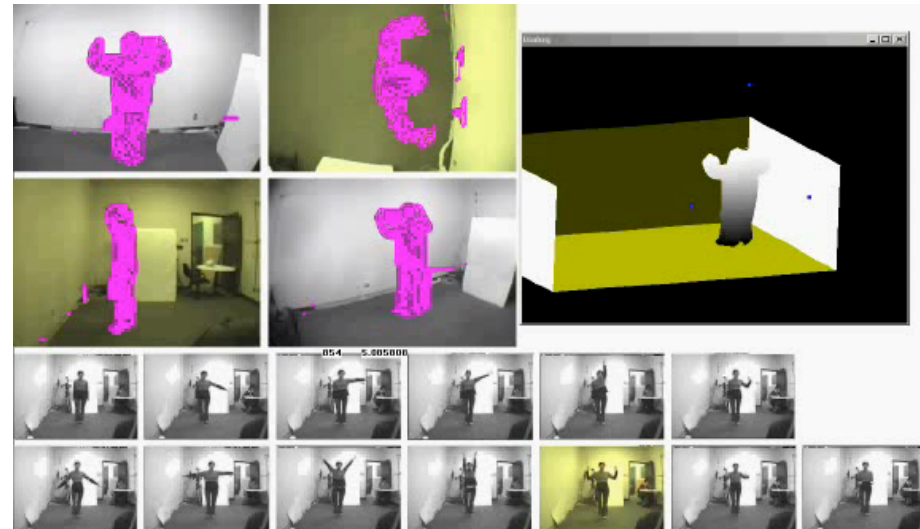UNIVERSITY OF SOUTHERN CALIFORNIA

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BRIEF DESCRIPTION OF DEMONSTRATION

A real time 3D human body reconstruction is performed using two to four synchronized cameras. Silhouettes of the detected regions are extracted and registered allowing a 3D reconstruction of the human body using Generalized Cylinders. When four cameras are used simultaneously, we derive from the detected silhouettes the visual-hull of the human body shape. A global shape descriptor is computed from the polygonal representation of the visual-hull allowing the recognition of 13 human body postures across a variety of people. We use a machine learning approach (support vector machine) for training the system to recognize various body postures from the perceived visual-hull.

UNIQUE OR DISTINGUISHING CHARACTERISTICS RELATIVE TO STATE-OF-THE-ART

Posture recognition from a 3D visual-hull

Global 3D shape description: efficient description of surfaces allowing a fast measure of their similarity

Support Vector Machine for training and identifying body postures

Body posture recognition independent from the user body orientation

Body posture recognition across people

APPLICATIONS	RECENT HIGHLIGHTS, LEVEL OF DEVELOPMENT, UPCOMING MILESTONES
Vision-based Perceptual User Interfaces, Attentive User Interfaces Computer Aided Training Virtual Prototyping Human Motion Capture	Automatic recognition of body postures across people of various body proportions Future: Real-time performances, Increasing the repertoire of body postures, Gesture recognition

UNDERLYING TECHNOLOGIES

Detection of moving objects in a scene using background modeling
Shape from silhouettes
3D Visual-hull computation
3D shape description
Support Vector MachineParticle filtering for tracking articulated body model

LIST OF PUBLICATIONS, REFERENCES, URLs

I. Cohen, G. Medioni and H. Gu. Inference of 3D human body posture from multiple cameras for vision-based user interfaces, 5th World Multi-Conference on Systemics, Cybernetics and Informatics, 2001, Orlando Florida
I. Cohen, Mun Wai Lee. 3D. Body Reconstruction for Immersive Interaction, Workshop on articulated motion and deformable objects, Palma de Mallorca, November 2002.
I. Cohen, Mun Wai Lee, Hongxia Li. "Human Body Posture Inference for Immersive Interaction", ACM, International Workshop on Immersive Telepresence , ACM Multimedia 2002, Juan Les Pins, France. 6 December, 2002.

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