3D Human Body Tracking

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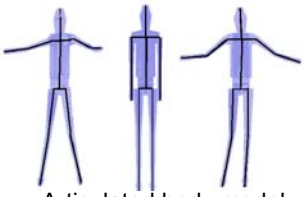
Research Goal

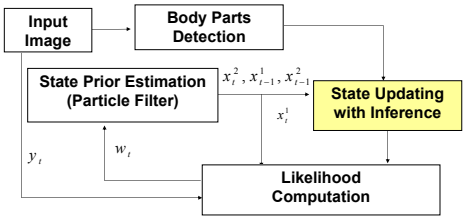
- Recognize body motion and gestures for multimodal interactions
- A markerless, accurate body motion estimation

Research Approach

- Use of an articulated human model for constraining the physical structure of the human body and its movement.
- Particle filter-based tracking:
  - Integrate particle filter with analytical inference techniques: detection of body parts: head, hands and torso.
  - Infer analytically a subset of state parameters:
    - Reducing the degree of freedom
    - Automatic model initialization.
- Estimate unknown static parameters (i.e. height and shape) during tracking, using mixture Gaussians approach.



Articulated body model



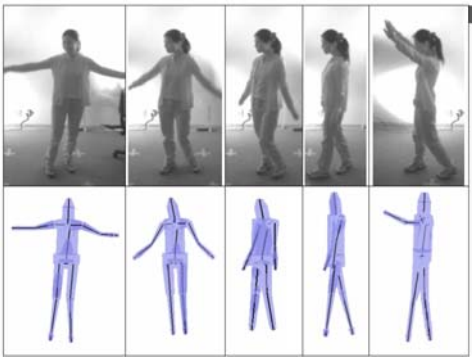
Particle Filtering with Inference

Role in IMSC

- User-state assessment from multimodal data
- Enabling technology for multimodal interactions
  - An alternative non-invasive human motion capture technology.
  - Understanding of human body structure and human movement.

Uniqueness & Related Work

- Recent works focused on improving efficiency using variance analysis, simulated annealing approach, partitioned sampling or hybrid Monte Carlo approach.
- Open problems:
  - large dimensional state space,
  - automatic initialization,
  - robustness of tracking.
- Contributions of this project:
  - Improved tracking efficiency and robustness.
  - Automatic initialization of body pose
  - Automatic estimation of human body shape: fitting the model to user's body proportions.



Tracking result

Accomplishments

Recent Publications

1. Cohen, M. Lee, "3D Body Reconstruction for Immersive Interaction", Second International Workshop on Articulated Motion and Deformable Objects Palma de Mallorca, Spain, 21-23 November, 2002.
2. Mun Wai Lee, Isaac Cohen, Soon Ki Jung, "Particle Filter with Analytical Inference for Human Body Tracking" Workshop on Motion and Video Computing, 2002, pp. 159-165.

5 Year Plan

- Improving the accuracy of the model for complex and ambiguous body motion
- Automatic gesture recognition from the spatio-temporal changes of the articulated model
- Automatic assessment of user state from its body language
- Extends the framework for tracking multiple interacting persons.