

*Ivana Mikic's Ph.D. Thesis Defense  
Thursday, January 24, at 12:15 p.m.  
SERF Building, Room 150, UCSD*

## **Human Body Model Acquisition and Tracking using Multi-Camera Voxel Data**

### **ABSTRACT**

In this dissertation, a system for automatic acquisition of the human body model and tracking of its parameters using input from multiple synchronized video streams was developed. The video frames are segmented and the 3D voxel reconstructions of the human body shape in each frame are computed from the foreground silhouettes. These reconstructions are then input to the model acquisition and tracking algorithms.

The human body model consists of ellipsoids and cylinders and is described using the twists framework resulting in a non-redundant set of model parameters. Model acquisition starts with a simple body part localization procedure based on template fitting and growing, which uses prior knowledge of average body part shapes and dimensions. The initial model is then refined using a Bayesian network that imposes human body proportions onto the body part size estimates. The tracker is an extended Kalman filter that estimates model parameters based on the measurements made on the labeled voxel data. A voxel labeling procedure that handles large frame-to-frame displacements was designed resulting in the very robust tracking performance.

Extensive evaluation shows that the developed system performs very reliably on sequences that include different types of motion such as walking, sitting, dancing, running and jumping and people of very different body sizes, from a nine year old girl to a tall adult male.