Human Interaction Analysis in Video

Seong-Whan Lee

Department of Brain and Cognitive Engineering,
Korea University, Korea
E-mail: swlee@image.korea.ac.kr

Abstract

Understanding and analyzing human activities in video is one of the challenging issues in computer vision. During the past couple of decades, many research groups have addressed this problem and achieved good results mostly for recognizing single person actions. With growing interest in vision-based surveillance systems, many researchers are now devoting their efforts to the analysis of human activities with interactions.

In this lecture, I will introduce a novel method of analyzing human interactions based on the walking trajectories of human subjects, which provide elementary and necessary components for understanding and interpretation of more complex human interactions in visual surveillance tasks. Our principal assumption is that an interaction episode is composed of meaningful small unit interactions, which we call 'sub-interactions.' We model each sub-interaction by a Dynamic Probabilistic Model (DPM). The complete interaction is represented with a network of DPMs by an ordered concatenation of sub-interaction models. The rationale for this approach is that it is much more effective to utilize common components, *i.e.*, sub-interaction models, to describe complex interaction patterns. By assembling these sub-interaction models in a network, possibly with a mixture of different types of DPMs, such as standard HMMs, variants of HMMs, dynamic Bayesian networks, etc., we can design a robust model for the analysis of human interactions. Given the reduced state space of the simple sub-interaction models, we can also reduce the computational complexity. In addition, when a new type of interaction pattern needs modeling, we simply include a few additional sub-interaction models into the network with appropriate links.

In our experiments, the network of DPMs demonstrated high performance of recognition outperforming five competing DPMs widely used in the literature for human interaction/behavior recognition. I will also analyze the structure of a network of DPMs and show its success on both Tsinghua Univ.'s dataset and the public CAVIAR dataset.