Sensor Networks and Recognition of Human Activities

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Abstract:

Video cameras are becoming increasingly ubiquitous and pervasive in everyday environments, corresponding to the societal demands to ensure public safety. Sensor networks composed of hundreds of CCTV cameras are being installed in public places including subway stations and airports. The objective of the smart surveillance research is to develop an intelligent system that automatically detects and analyzes suspicious and abnormal human activities, by dynamically interacting with the networks of cameras.

In this talk, we discuss our recent works which are motivated to develop the smart surveillance systems. We present representation and recognition methodologies for the semantic analysis of complex human activities such as 'a person stealing a bag from another' and 'a group assaulting a person'. We discuss our context-free grammar (CFG) syntax to represent highly complicated activities with hierarchical structures, including human-human interactions, human-object interactions, and group activities. We focus on a probabilistic algorithm to recognize the represented human activities, which is able to cope with low-level components providing video inputs such as camera networks.

We also present our research on a surveillance system with multiple Pan-Tilt-Zoom (PTZ) cameras. We utilize multiple PTZ cameras to dynamically change visual information gathered, such as having multiple cameras to focus on a particularly suspicious person to obtain images from different viewpoints. Zooming is used to get higher resolution images of the subject of interest. We describe the methodology for the communication among cameras to have them focus on the same subject of interest. The reconstruction of 3-D trajectories of the targets from multiple cameras and suspicious activity recognition according to trajectories are also included.

Future directions of research and possible outcomes of the research will be discussed.