Public Abstract

First Name:Yu-Chia
Middle Name:
Last Name:Chung
Adviser's First Name:Zhihai
Adviser's Last Name:He
Co-Adviser's First Name:
Co-Adviser's Last Name:

Graduation Term:FS 2010
Department:Electrical Engineering
Degree:PhD

Title:**AUTOMATED VIDEO PROCESSING AND SCENE UNDERSTANDING FOR INTELLIGENT VIDEO SURVEILLANCE**

Recent advances in key technologies have enabled the deployment of surveillance video cameras on various platforms, including stationary security cameras for infrastructure protection and public safety, UAV (unmanned aerial vehicles) cameras for persistent surveillance of battlefield, and cameras on mobile agents, such as vehicles, robots, and soldiers for site survey. There is an urgent need to develop advanced computational methods and tools for automated video processing and scene understanding to support various applications.

In this dissertation, we develop advanced video processing and computer vision methods for automated video processing and scene understanding. We concentrate our efforts on the following four tightly coupled tasks:

(1) *Aerial video registration and moving object detection.* We develop a fast and reliable global camera motion estimation and video registration for aerial video surveillance.

(2) *3-D change detection from moving cameras.* We study the problem of detecting changes from multi-source videos which are captured by different moving cameras with unknown parameters at different times. Based on multi-scale local binary pattern description of super-pixels and middle-level image patch labeling, we construct a hierarchy of image patch descriptors and detect changes in the video scene using multi-scale information fusion.

(3) *Cross-view building matching and retrieval from aerial surveillance videos.* Identifying and matching buildings between camera views is useful for scene understanding, battlefield surveillance, geo-location and geo-tagging of videos and photos. Our central idea is to construct a semantically rich sketch-based representation for buildings which is invariant under large scale and perspective changes.

(4) *Collaborative video compression for UAV surveillance network.* We study the problem of a network of small UAVs with limited computational and communication resources to perform collaborative video surveillance of the target environment. Based on distributed video coding, we develop a collaborative video compression scheme for a UAV surveillance network.

Our extensive experimental results demonstrate that the proposed methods and tools for automated video processing and scene understanding are efficient and promising for surveillance applications.