

Video Surveillance and Transportation Imaging Applications

**Robert Paul Loce
Eli Saber**
Editors

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Introduction

VSTIA I

The Video Surveillance and Transportation Imaging Applications (VSTIA) conference was new to the Electronic Imaging symposium in 2013. The conference aimed to bring together world class researchers and practitioners who develop and deploy imaging and video technologies to enable novel solutions for problems in surveillance, security and transportation. Roughly 40 papers were submitted and discussion at the conference was very lively. The conference is off to a great start in a field that is experiencing explosive growth and promises to have significant long term impact on society.

Technical Field

With the advent of low-cost/high-performance video sensors, imaging platforms, and computational equipment, it has become increasingly possible to process video streams in real-time on affordable cloud computational servers, desktop systems, and various hand held mobile devices. Major applications of these technologies span the spectrum from surveillance, transportation, remote sensing, social media, sports, retail, and biomedical to name a few. Only recently has the potential for these technologies begun to be realized in various commercial, government and consumer based applications. For instance, automated video understanding can enhance surveillance/monitoring systems beyond what is possible for human operators alone. These systems are being developed to maintain long-term surveillance on large numbers of video streams for various applications with minimal or no manual intervention. In addition, automated systems can coordinate multiple cameras and provide "synopsis" views of activities that can be used to predict/analyze potential events pre or post mortem. On the other hand, transportation systems, the life blood of our economic and social lives, are far from their ideal state. Vehicle accidents are the number one cause of death in the US for ages 4 to 34, and expected to surpass disease as a cause of death for all ages worldwide by 2020. By some estimates, half the fuel consumed in San Francisco is consumed while searching for a parking space. Vehicular congestion is a leading cause of lost productivity and the fuel efficiency considerations have traditionally received very limited attention in the design of present day systems.

Over the past two decades, various video analytics algorithms have been proposed for autonomous understanding of events for a variety of surveillance and transportation type applications. While most of the earlier solutions started from raw data and followed with the interpretation at increasing levels of semantic complexity, more recent techniques attempt to bridge the gap between signal-level and semantic level processing. Technological solutions to

problems in these areas have the potential for very significant societal impacts on many fronts from airport/stadium/building/city security to patient/elderly care. There is an emerging global effort to develop effective surveillance systems to monitor various facilities and smarter transportation networks to improve fuel efficiency, safety, and reduce emissions and congestions in various metropolitan areas throughout the world.

Topics for VISTIA include, but are not limited to:

Law enforcement

- license plate and vehicle identification
- speed detection from stationary or mobile platforms
- seat belt enforcement
- expired registration detection
- stop/light sign enforcement
- shoplifting

Efficiency

- video-based parking spot detection for billing or navigation
- traffic congestion detection
- assisted driving/parking
- transit time estimation

Environmental

- reduction of emissions
- gasoline and chemical spill detection

Infrastructure monitoring and optimization

- traffic flow measurements
- road and bridge inspection
- snow plow and bus cameras
- vehicle classification
- vehicle conditions (overheated brakes, underinflated tires)

Surveillance

- sampling and selection techniques
- video segmentation and tracking algorithms
- event detection algorithms
- subspace methods for video analytics
- cooperative and context based tracking
- fusion of multiple sensors and various modalities
- Bayesian models for tracking and activity monitoring

Imaging for motor vehicles and autonomous devices

- driver alertness estimation
- road condition sensing (water, ice, dry, potholes, etc)
- road hazard detection
- object/animal/human detection
- tailgating detection
- mobile imaging platforms

Applications of the above in:

- transport (urban/highway pedestrian/motor/mixed traffic, pedestrian traffic, terminal\port)
- retail (loss prevention, customer recognition, behavior recognition, process optimization, customer counting)
- physical security (high-density venues: concert halls, stadiums, airports, train stations, etc., and low-density venues: nuclear power plants, military installations, etc.)
- environmental monitoring (animals, forest fires, avalanches, etc.)
- smart spaces and ambient intelligence (interactive environments, etc.)
- hospitals and elder care

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