

# Zoom on Evidence with ACE Surveillance™

*"Despite the population's growing awareness of the need to use surveillance systems for better security in private and business settings, such systems still have not become commonplace. This is about to be changed with the systems like ACE Surveillance..."*

### Problems with existing DVR-based surveillance systems

- **Problem 1. Storage consumption problem:** not enough space to save video data (esp. recorded over long period of time).
- **Problem 2. Data manageability problem.** - not enough time to go through all saved data searching for the evidence.

*"Having too much stored data may sometimes be just as bad as not having any data at all, because if the amount of data is so large that it cannot be managed within a reasonable amount of time and efforts, it is useless."*

Existing "motion-detection" techniques do not help, as they capture pixel-change rather than actual motion of objects, and pixel-change occurs too often, esp. outdoors.

#### Example: Monitoring without ACE



*A dedicated officer has to look at the monitors at all times. If he is away or momentarily looked elsewhere, an event may pass unnoticed.*

**ACE-Surveillance provides an efficient and low-cost solution to these problems.**

**Definition: Critical Evidence Snapshot (CES)** - a video snapshot that provides information that is both useful and new.

**Definition: ACE Surveillance** – an automated surveillance system that deals with extraction and manipulation of Annotated Critical Evidence snapshots.

- CES-es are automatically detected and saved in optimal resolution: low-res for all events, high-res for objects only.
- **No useful video information is lost.** All useful is stored and shown in an easy to browse and manage way.
- Each CES is provided with text and graphical annotation such as: object location, shape, velocity, colour, that enables instantaneous data comprehension and enhances manageability of archival data.
- **Summarizes** observed activities (which would normally be stored as lengthy and difficult to analyze video clips) in an intuitive and succinct manner using ACE snapshots, reliable in both indoor and outdoor environments.
- Allows one to perform long-term monitoring with off-the-shelf cameras and limited-space hard-drive desktop computer. Works well in outdoor environments.

#### ACE Surveillance software:

1. **ACE-Surveillance:** captures and annotates CES-es.
2. **ACE-Browser:** enables Zoom-On-The-Evidence™ browsing of captured CES-es.

**Critical feature # 1:** ACE Surveillance is object-detection-based, rather than motion-detection-based and is therefore tolerant to pixel changes caused by environment and noise.

**Critical feature #2:** ACE Surveillance replaces video files with a sequence of graphically annotated snapshots, where the annotations are designed in such a way as to provide an intuitive and natural substitution for the missing video data.

### NRC Pilot project: Enhancing security within NRC premises using ACE Surveillance.

- runs non-stop 24/7 with existing equipment: commercial CCTV surveillance systems and commissioner's desktop computer.
- makes sound alarm when new activity is detected
- shows the last captured event, annotated and time-stamped
- keeps archived evidence for the entire year
- enables remote viewing of current and archived evidence.

#### Example: Monitoring with ACE



*In real-time mode: watch closely when alarm sounds.*

*If you were away: check the last captured CES and, if any is captured, then play-back captured events in ACE Browser*

*In archival mode: "zoom on the evidence" – zoom on a day, on hour, then on event - point and click (for high res as needed)*



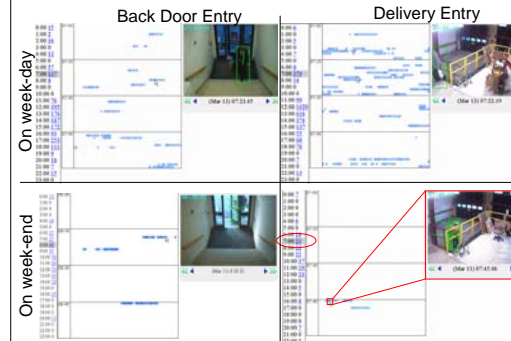
**ACE-Browser allows quick detection of abnormal events**

### Good for home or business monitoring, with:

- CCTV security cameras,
- wireless cams,
- USB webcams



ACE summarizations for home use with low-cost computer and wireless webcam:



**ACE-Surveillance download:** <http://ace.iit.nrc.ca/download.html>  
**ACE-Browser demo (login/pwd: guest/ace-demo):** <http://ace.vrs.iit.nrc.ca/ces/ACE-Browser.php?station=demo>

Refs:

D. O. Gorodnichy, M. A. Ali, E. Dubrofsky, and K. Woodbeck. **Zoom on the evidence with ACE Surveillance.** In Intern. workshop on Video Processing and Recognition (VideoRec'07), Canadian Conf. on Computer and Robot Vision, Montreal, Canada, May 28-30, 2007.

D. Gorodnichy. **ACE Surveillance: The next generation surveillance for long-term monitoring and activity summarization.** In Intern. workshop on Video Processing for Security (VP4S-06), Canadian Conf. on Computer and Robot Vision, Quebec City, Canada. June 7-9, 2006.

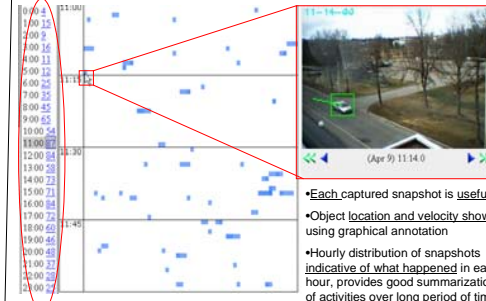
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### Comparison of summarization results (on the same 24-hour outdoor monitoring assignment)

#### Status-quo "motion-detection" capture



#### ACE Capture



•Each captured snapshot is useful.  
 •Object location and velocity shown using graphical annotation  
 •Hourly distribution of snapshots is indicative of what happened in each hour, provides good summarization of activities over long period of time.