USER GUIDE

Revision November 2009

© Synesis LLC
220043, Belarus
Minsk, Nezavisimosti 95,
Bld 12 suite 316
tel/fax +375 (17) 281-77-85
http://www.synesis.by

© Synesis LLC
119019, Russian Federation
Moscow, Gogolevsky boulevard,
2/18/1, bld 1.
tel +7 (495) 660-77-47
http://www.synesis.ru

Contents

Introduction 3
Installation 3
System requirements 3
Installation pre-requisites 3
Installation process 3
Using application 4
Main window 4
Main menu 4
Choosing video source 5
Video file 5
Local video camera 5
Configuring and controlling video analytics 6
Video playback 6
Camera calibration 6
Video analytics configuration 10

Introduction

VIDEO ANALYTICS EVALUATION KIT includes an x86 implementation for perimeter security and graphical user interface to control. An analytical algorithms are identical to TI DSP implementation.

Application can analyze video stream either directly from attached video camera or from pre-recorded video file, perform algorithm calibration and camera calibration.

Installation

System requirements

x86 family processor with SSE-2 instruction set support. These instructions are supported by all Intel processors starting from P-IV and all AMD processors starting from Athlon 64.

OS: Windows Server 2003; Windows Server 2008; Windows Vista; Windows XP.

Installation pre-requisites

Installer is created with Windows Installer 3.1. If your system does not have it, installer would prompt it for download during installation process.

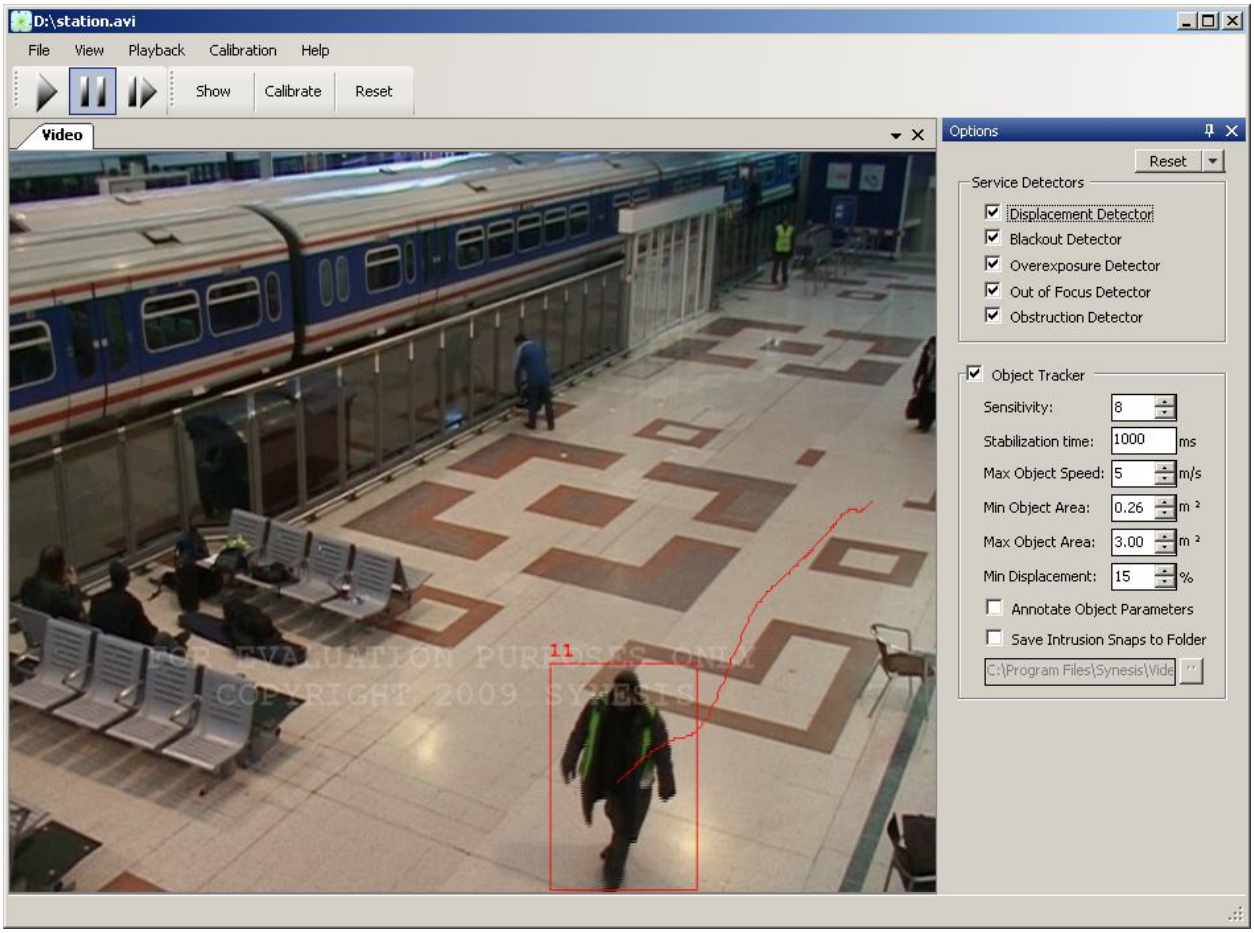
An application requires Microsoft .NET and requires .NET Framework 3.5. If framework is not installed it would be prompted for download.

Installation process

Run ***setup.exe*** from installation folder and follow instructions.

Using application

Main window



Main menu

- **File**
  - **Open**
    - **Video file…** - to open pre-recorded video file
    - **Video devices** – this menu is shown only if you have at least single video capture device installed in the system which could be used for live video capture and analysis.
    - **Model…** - load model.
  - **Save**
    - **Model…** - save model
    - **Snapshot image…** - export current video frame as PNG image
  - **Exit**
- **View**
  - **Options** – video analytics configuration options
  - **Playback**
  - **Calibration**
  - **Zoom –** sets video zooming in preview windows
    - **50%**
    - **100%**
    - **150%**
    - **200%**
    - **Auto fit**
- **Playback**

    - **Play** – starts video playback
    - **Pause** – pauses video playback
    - **Step** – frame-by-frame video playback
- **Calibration** – camera calibration setup
    - **Show/Hide –** shows / hides calibration instruments overlay
    - **Calibrate** – perform calibration
    - **Reset –** reset calibration settings

Choosing video source

You can use the following video sources:

- Pre-recorded video file
- Locally connected via USB or IEEE1394 attached external camera, TV tuner or embedded webcam.

Video file

In order to open pre-recorded video or image file, choose:

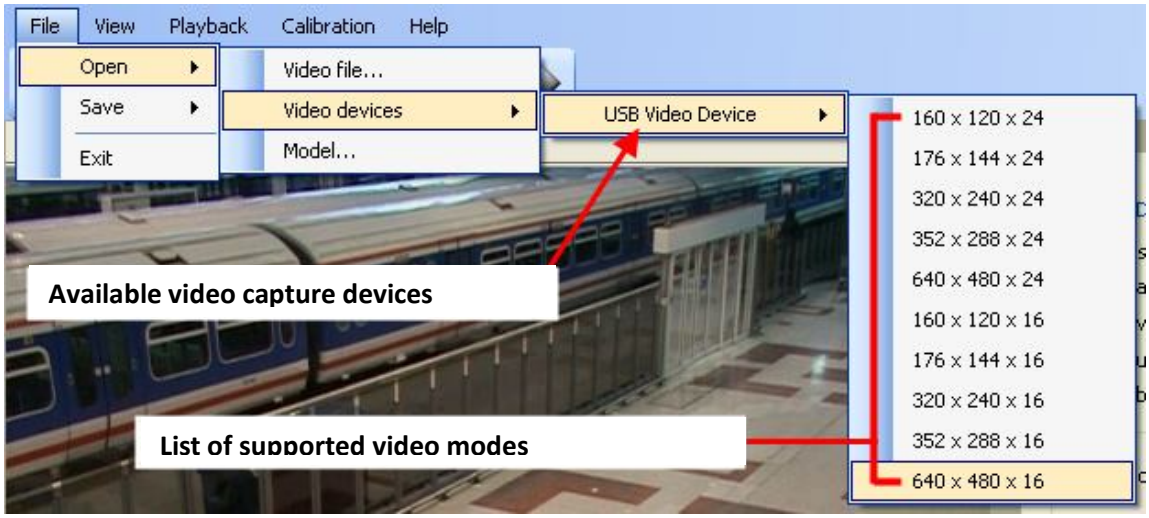
- **File – Open – Video File...**

Note: application uses DirectShow to find a matching decoder for a video file. If you are lacking codecs, try installing ffdshow codec and filter pack.

Local video camera

To use your locally attached video camera:

- choose **File – Open – Video Devices**.
- Menu would show list of available and compatible video devices
- Choose video device
- Once device is selected, supported video modes would be shown. Choose one and video acquisition would start.



Configuring and controlling video analytics

Video playback

Use Playback panel:

- **Playback – Play:** resumes video playback if currently paused
- **Playback – Pause:** pauses video playback
- **Playback – Step:** Once in **Pause** mode, renders next frame from video file or current frame from video capture device.

Camera calibration

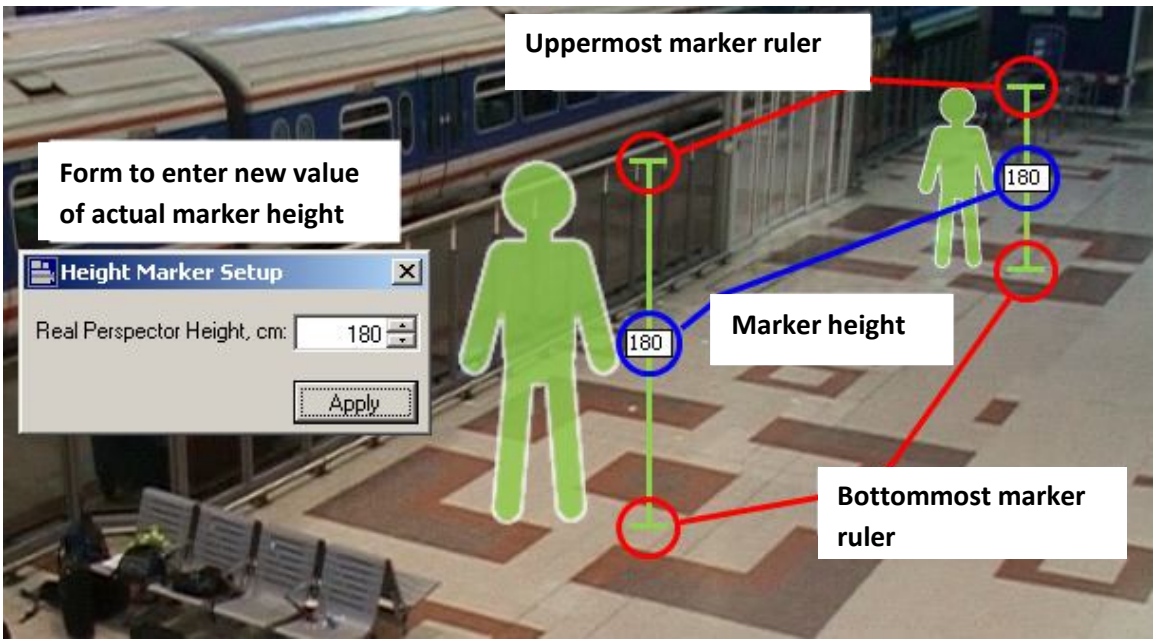
Calibration is required for algorithms to perform size estimation of tracked objects based on their 2D projections perspective adjustments. In order to estimate a scene depth system should have a minimum amount of knowledge about 3D scene it observes. Calibration is performed with help of "Height markers" and "Interest zone" tools. Calibration process consists of three main steps:

- Setting height markers
- Defining interest zone
- Application of these parameters to videoanalytical algorithms.

Height markers

Height markers are presented as human element shaped markers with adjacent actual height marker. The following operations are available:

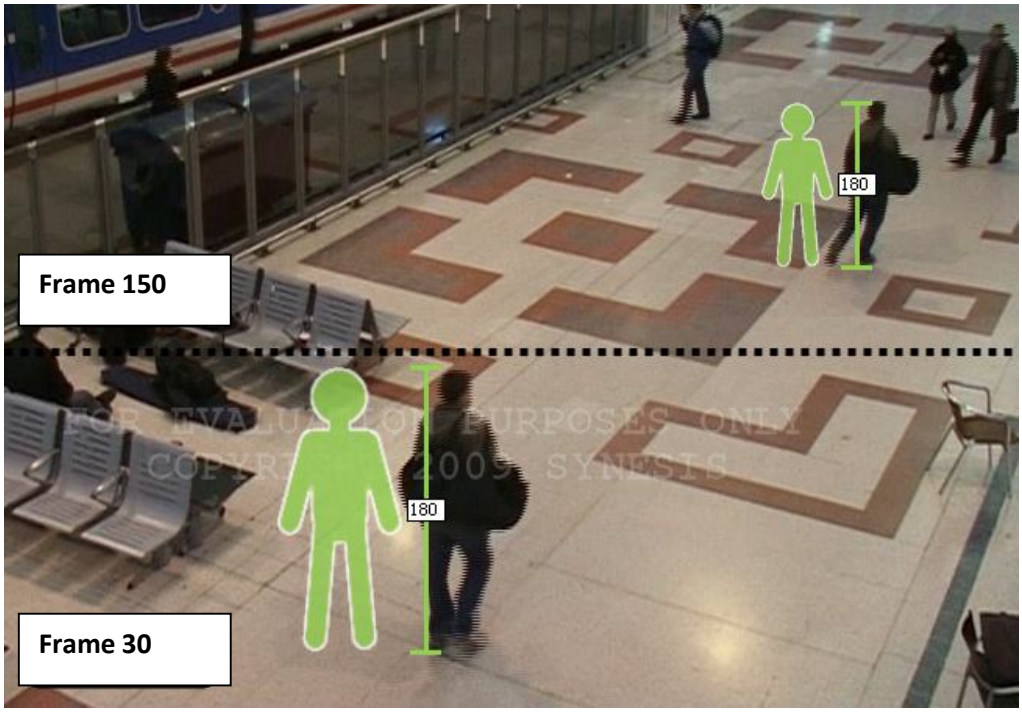
- Moving marker within the image zone. Tap and drag on the marker to move it.
- Changing marker display size. Point with mouse to uppermost or bottommost marker points, click left mouse button and vertically move until required new size is set.
- Changing actual marker size as if it would be a real object in the camera observed zone. By default marker height is set to 180 cm. To change the actual marker size double-click on the market and enter a new height in cm in the popup window.



Calibration using height markers is optimal when calibrating using live video playback, when you have moving objects in front of the camera (i.e. human or car) or lengthy static object with known linear dimensions (i.e. fence). In order to perform marker calibration with the help of moving objects perform following steps:

- Start video playback; choose as a base object - i.e. matching moving human. Move any of the markers into initial object position and adjust visible marker size to match visible object size. Use Pause for more accurate adjustment.

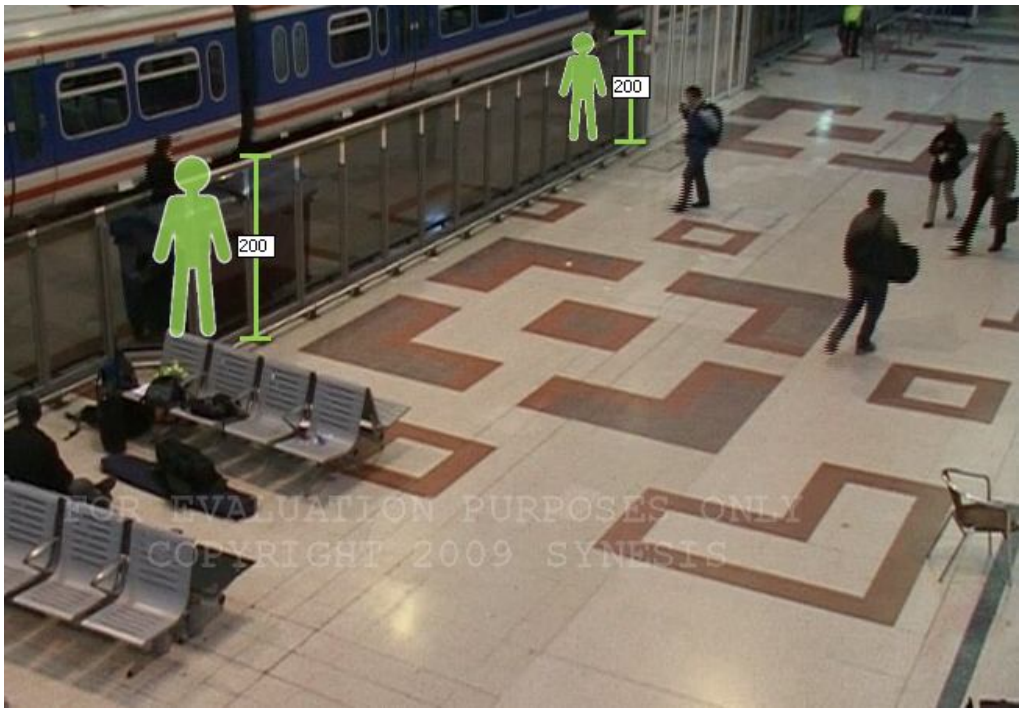
- Resume playback and wait until object would move to certain distance. The longer the distance object traverses, the more accurate calibration. Move second height marker into current object position and adjust its visible height to match currently perceived object height.



- Adjust object height actual numbers (180cm by default).
- Complete calibration by applying changes (**Calibration – Calibrate**)

Note:

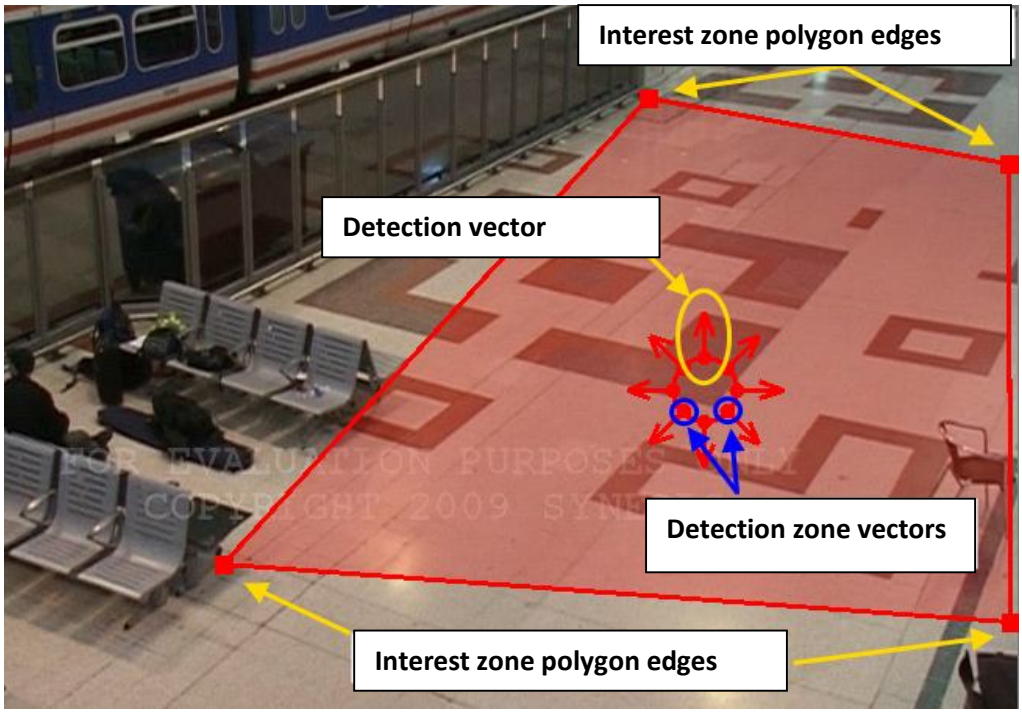
- Static lengthy objects perpendicular to object movement plane and having equal size, also could be used to perform calibration as shown on picture below.



Defining Interest zone

Interest zone is where object detection and tracking would be performed. Defining interest zone is important when camera has to observe a scene where some regions need be "protected" while other areas are out of interest. Additionally, one can define movement directions – i.e. to detect only objects crossing interest zone from right to left and ignore objects moving in reverse direction.

An "Interest zone" tool is used to define detection zone with integrated directions marker. Interest zone is defined as a polygon with adjustable edges. Directions marker is a circle placed in a center of interest zone with eight direction tracking vectors. The following parameters could be adjusted by the user:



- Editing interest zone markers. Point and left-mouse press on the edge, drag to new position, release mouse button.
- Change detector sensitivity by direction by adjusting each of eight direction vectors. By default, all vectors are set to equal (maximum) sensitivity. When set to minimal sensitivity, vector is not displayed and only dot on a circle is shown. Click and drag on each vector to adjust object tracker sensitivity in desired direction.
- Turn object detector on/off in a desired direction by mouse double-click on relevant vector.

Defining interest zone is performed in these three steps:

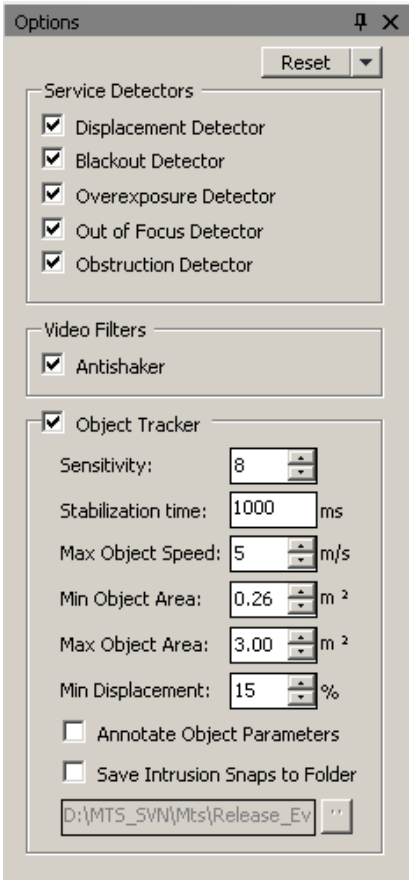
- Define interest zone by adjusting polygon edges positions using "interest zone" interactive tool.
- Adjust detector sensitivity vectors. Leave default settings If all directions are equally important.
- Apply changes (**Calibration – Calibrate**)

Notes:

- Once calibration is completed, you may hide graphical overlay using **Calibration –Show/Hide** menu**.** A calibration is preserved.
- In order to reset to defaults interest zone and detector sensitivity vectors, use (**Calibration - Reset**) menu.

Video analytics configuration

Use (**View – Option**) menu item to show video analytics algorithm options.



Service detectors parameters

Service detectors in action could be observed here: http://synesis.ru/en/networkvideo/video/service-detectors

- **Displacement Detector** – turns sudden camera displacement on/off. Such a detector is used to detect physical manipulations with the camera leading to change in observed scene. In case camera displacement detector is activated, once camera observed scene is rapidly changed video is overlaid with “DISPLACEMENT” notification.

- **Blackout Detector** – detects situations when camera observed image is too dark to perform any monitoring. This detector is essential to detect situations when camera view is blocked (i.e. by someone’s hand) or there’s not enough light for monitoring (i.e. an infrared projector is broken). A “BLACKOUT” notification is overlaid in the video preview pane.

- **Overexposure Detector** – monitors situations when camera is exposed to strong direct light – i.e. from sun, car lights, etc. If active and such situation occurs, an “OVEREXPOSURE” message is shown over the video.

- **Out of Focus Detector** – used to detect situation when camera image is too blurred and is not applicable for video surveillance. This may happen by intruder manual influence at optics. Once out of focus situation is detected, video is overlaid with “OUT OF FOCUS” message.

- **Obstruction Detector** – used to detect a situation when substantial area in front of the camera is obstructed by some object in direct proximity of camera. “OBSTRUCTION” message is shown on top of video once detector is triggered.

Digital antishaker parameters

Digital antishaker in action could be observed here: http://synesis.ru/en/networkvideo/video/digital-antishaker

- **Antishaker** – option turn on/off antishaker. It is used to detect and compensate camera vibrations of variable frequency and amplitude in any direction in order to improve analytics performance and output video quality.

Object detector and tracker parameters

Object detector and tracker in action could be previewed here:
http://synesis.ru/en/networkvideo/video/motion-detectors

Object Tracker option turns on/off object tracker. Once activated, each object classified as intruder would be tracked and overlaid by additional graphical annotation in form of frame and trajectory from detection point. This detector has following additional settings:

- ***Sensitivity*** – adjusts detector sensitivity in range 0 (minimal sensitivity) to 15 (maximum sensitivity). In order to analyze scenes with high level of noise such as night view or scenes with intensive dynamic textures presence (i.e. tree leaves under wind), it is recommended to raise the sensitivity to higher levels. Scenes with high contrast between background and moving objects, sensitivity need be lowered. For most scenarios, default settings should be used.
- ***Stabilization Time*** – time for the scene learning. This time interval defines amount of microseconds left for detector from activation moment to perform scene analysis and learning. Once defined time period is elapsed detector switches from training mode to regular detection and tracking mode within defined interest zone. A default setting is good for most scenarios. Increasing learning time makes sense for scenes with significant dynamic textures presense such as water, bushes and trees under wind, etc.
- ***Max Object Speed*** – Filters objects based on their speed, to track fast moving objects such as birds and not consider them as intruders. Performance of this filter highly dependant to calibration accuracy (see notes below).
- ***Min Object Area*** – filters object by their size in square meters. This allows to effectively filter out small objects like animals and not classify them as intruders. Performance of this filter is highly dependant on calibration accuracy (see notes below).
- ***Max Object Area*** – filters object by their maximum size in square meters, to effectively filter out large objects like cars or i.e. objects out of movement plane such as insects on the lens. Performance of this filter is dependant on calibration accuracy (see notes below).
- ***Min Displacement*** – filters out objects based on their tracked trajectory as % from overall observed interest zone width. A moving object is identified as intruder if its observed detection trajectory exceeds defined level.
- ***Annotate Object Parameters*** – turns on/off overlay of additional information per tracked object, such as object speed and area. This information is most useful when verifying calibration performed. If after calibration a detected speed and area of object fit their actual parameters then calibration was performed correctly and one can effectively use ***Max Object Speed***, ***Min***

Object Area, ***Max Object Area*** filters with high accuracy. If you observe significant variation from estimated speed and area from object actual parameters, perform calibration with more accuracy.

- ***Save Intrusion Snaps to Folder*** – turns on/off function to automatically save frames with detected intruders to defined file system folder.

Configuration profiles

When performing evaluation of video analytics using varying video sources, you may find useful to create separate configuration profiles per each observation scenario. You can save and later load configuration from **Options** panel into XML file.