VIDEO CONTENT ANALYSIS
@ BOSCH IP CAMERAS WITH FW 6.30
OVERVIEW & RENAMING
Video Content Analysis @ Bosch IP cameras with FW 6.30

Naming & Renaming

► Analysis vs Analytics:
► Analysis: A careful study of something to learn about its parts, what they do, and how they are related
► Analytics: A method to analyze

► Video Content Analysis (VCA) as collective term

► Renaming:
► Intelligent Video Analysis (IVA) → Intelligent Video Analytics (no abbreviation)
► IVA Task Skript Language → VCA Task Script Language
  (available for Intelligent Video Analytics, Essential Video Analytics, MOTION+)

► New introduction: Essential Video Analytics (no abbreviation)
### Video Content Analysis @ Bosch IP cameras with FW 6.30

#### Overview

<table>
<thead>
<tr>
<th>Feature</th>
<th>1000-3000</th>
<th>4000-6000</th>
<th>7000-9000</th>
<th>Description</th>
</tr>
</thead>
</table>
| Tamper detection               | x         | x         | x         | • Detect if camera is obscured or moved  
• Evaluate overall lighting level (too dark / bright)  
• Detect removed or placed objects in dedicated areas (reference image check) |
| MOTION+                        | x         | x         | x         | • Change detection to trigger recording                                    |
| Essential Video Analytics (CPP7 only) | x         |           | x*        | • Intrusion detection for smaller, controlled environments  
• Counting / queuing applications                                           |
| Intelligent Video Analytics    |           |           |           | • Mission critical perimeter protection  
• Outdoor environments with harsh weather conditions  
• Long detection ranges  
• Ship tracking  
• Exhibit protection  
• Counting / queuing applications                                           |
| Intelligent Tracking (MIC/AUTODOME/MP cameras only) |           |           |           | • AUTODOME / MIC automatically zoom to & follow a selected object  
• Megapixel cameras: Virtual PTZ camera, cutout stream follows selected object in the camera field of view |

* Intelligent Video Analytics includes the full Essential Video Analytics feature set
TAMPER DETECTION FW 6.30
FEATURES AND UPDATES
TAMPER DETECTION

Overview

► Applications:
  ► Detect camera blinding
  ► Detect camera being moved away from of its view
  ► Detect the loss of sufficient overall illumination
  ► Detect idle / removed objects, e.g. objects in front of an emergency exit

► Limitations:
  ► Not available on thermal cameras

► Algorithms
  ► UPDATED: Scene too dark / scene too bright
  ► REMOVED: Scene too noisy
  ► Global change
  ► Reference image check
TAMPER DETECTION
Scene too dark / too bright

- Application: Detect the loss of sufficient overall illumination

- Formerly: Determined via average brightness of generated images. Cameras nowadays generate very good and bright images even from low-light environments, therefore this did not work properly anymore.

- FW 6.30: Determined via environment brightness on sensor. Threshold adaptable by user.

- For camera blinding detection always use reference check instead
INTELLIGENT VIDEO ANALYTICS

VS

ESSENTIAL VIDEO ANALYTICS
ESSENTIAL VIDEO ANALYTICS

Overview

Available on: all upcoming IP 4000 – 6000 series cameras

Typical applications: small and medium businesses, large retail stores, commercial buildings and warehouses

- (Indoor) intrusion detection
- Enforcing health and safety regulations:
  - Enforcing no-parking zones
  - Detect blocked emergency exits
- Business analytics:
  - Queuing
  - People counting
  - Crowd density information
INTELLIGENT VIDEO ANALYTICS

Overview

Available on: All upcoming IP 7000 – 9000 cameras, DINION IP starlight 8000 MP, DINION IP ultra 8000 MP, FLEXIDOME IP panoramic 7000 MP

Tailored for mission critical applications. Delivering extremely reliable video analytics even under most adverse circumstances.

- Perimeter protection: airports, critical infrastructure, government buildings, jails, industry, border patrol
- Harbour, canal & coast surveillance
- Traffic monitoring: enforce no-parking zones, wrong-way detection, monitor road side for broken cars, traffic counts
- Protection valuable assets (museum): alarm on touch or removal
- People counting, occupancy, queue & crowd detection
INTELLIGENT & ESSENTIAL VIDEO ANALYTICS

Comparison

Intelligent Video Analytics

Camera chip

IVA hardware accelerator

Detection distance

“Extremes”

Essential Video Analytics

Camera chip
INTELLIGENT & ESSENTIAL VIDEO ANALYTICS

Detection distance depends on

- Size of the camera sensor
- Lens
  - Focal length
  - Distortion effects
- Resolution the analytics uses
- Camera setup
  - Height
  - Angle to ground
- Size of the object to be detected
- Scene
  - Contrast
  - Occlusions
  - Background motion

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  - Contrast
  - Occlusion
  - Background motion
ESSENTIAL VIDEO ANALYTICS
Detection distance example

Camera: FLEXIDOME IP starlight 6000 VR
Example focal length: 9mm
HFOV: 36,8°
VFOV: 20,7°
Camera resolution: 1920x1080 pixel (16:9)

Essential video analytics resolution: 320x180 pixel

Target object: Upright person with 0,5x1,6 m
Max analytics detection range: 15 - 80 m (65 m total)

<table>
<thead>
<tr>
<th>DORI</th>
<th>PPM</th>
<th>Dist. (m)</th>
<th>Width (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection</td>
<td>25</td>
<td>64,9</td>
<td>43,2</td>
</tr>
<tr>
<td>Observation</td>
<td>63</td>
<td>25,8</td>
<td>17,1</td>
</tr>
<tr>
<td>Recognition</td>
<td>125</td>
<td>13,0</td>
<td>8,6</td>
</tr>
<tr>
<td>Identification</td>
<td>250</td>
<td>6,5</td>
<td>4,3</td>
</tr>
</tbody>
</table>
INTELLIGENT VIDEO ANALYTICS

Detection distance example

Camera: FLEXIDOME IP starlight 7000 VR

Example focal length: 9mm
HFOV: 36,8°
VFOV: 20,7°

Camera resolution: 1920x1080 pixel (16:9)

Intelligent video analytics resolution: 640x360 pixel

Target object: Upright person with 0,5x1,6 m

Max analytics detection range: 15 - 160 m (145 m total)

<table>
<thead>
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<td>4,3</td>
</tr>
</tbody>
</table>
## INTELLIGENT & ESSENTIAL VIDEO ANALYTICS

<table>
<thead>
<tr>
<th>Feature list</th>
<th>Essential Video Analytics</th>
<th>Intelligent Video Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any object</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Object in field</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Line crossing</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Enter / leave field</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Loitering</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Follow route</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Idle / removed object</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Counting</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Occupancy</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Crowd density estimation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Condition change</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Similarity search</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flow / counter flow</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Calibration, Geolocation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Masking</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Alarm Rules

### Feature list

- Duration
- Size
- Aspect ratio
- Speed
- Direction
- Color
- Object class
- Standard (2D) tracking
- 3D tracking
- 3D people tracking
- Ship tracking
- Museum mode
- Face detection
- Scene-specific Object Detection*

*Only in combination with Bosch Cloud-based Services

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INTELLIGENT VIDEO ANALYTICS 6.30

ESSENTIAL VIDEO ANALYTICS 6.30

NEW FEATURES
INTELLIGENT VIDEO ANALYTICS 6.30 CPP6/7
Extreme weather conditions

- Shaking cameras (e.g. strong wind, high poles) (since FW 6.20)
  - Shaking of up to 1/5 of the image height can be compensated
  - Always active
- Heavy rain & snow (since FW 6.10)
  - Always active
- Wind in vegetation and snowstorm (since FW 6.10)
  - Activate “Noise suppression: Strong”
- Fountains & calm lakes (since FW 6.10)
  - Activate “Noise suppression: Strong”
- Heavy waves, especially around ships (since FW 6.10)
  - Activate tracking mode “Ship tracking”

Tech notes available!
INTELLIGENT VIDEO ANALYTICS 6.30 CPP6/7
Double detection distance

- Application: See twice as far with a single camera

- For robustness, this is available only if
  - CPP6/7
  - Tracking modes: 3D tracking, 3D people tracking
  - Noise suppression: OFF, MEDIUM
  - Object type: Moving, started, stopped

- Corridor mode introduced with FW 6.30: Swap vertical / horizontal resolution

- Objects with at least 20 square pixel internal resolution can be detected reliably, e.g. 3x8 pixel for a person

<table>
<thead>
<tr>
<th>CPP</th>
<th>Aspect Ratio</th>
<th>Internal Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>CPP6/7</td>
<td>320</td>
<td>320</td>
</tr>
<tr>
<td></td>
<td>4:3</td>
<td>320</td>
</tr>
<tr>
<td></td>
<td>16:9</td>
<td>320</td>
</tr>
<tr>
<td>CPP4</td>
<td>5:4</td>
<td>255</td>
</tr>
<tr>
<td></td>
<td>4:3</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>16:9</td>
<td>320</td>
</tr>
</tbody>
</table>

Tech notes available!
Scene-specific Object Detection via Bosch Cloud-based Services

Video Detector Training Suite
Give a few examples of what you want and feedback on true / false detections

Scene-specific Object Detection
Camera generates metadata

Cloud-based Evaluation
Object detected in field or not?
INTELLIGENT VIDEO ANALYTICS 6.30 CPP6/7
Readded & Improved Museum Mode

- Application: Don’t touch e.g. exhibits

- How to configure:
  - Ensure camera view parallel to exhibit borders e.g. top-down view, or parallel to wall
  - Set alarm area to desired no-touch-zone
  - Mask all non-alarm areas
  - Set tracking mode to “Museum mode”
  - Opt: Adjust sensitivity & noise suppression

- Crowdedness outside alarm area is irrelevant 😊
- Calibration is not required nor used at all 😊

Tech note available!
INTELLIGENT VIDEO ANALYTICS 6.30 CPP6/7
Slightly Improved Flow (since FW 6.20)

► Application:
   ► Wrong way detection even in crowds
   ► Detect if conveyor belt blocked / stopped

► Improved range of detected motion velocities
INTELLIGENT & ESSENTIAL VIDEO ANALYTICS 6.30
Occupancy Alarm & Counter

► Application:
  ► Occupancy statistics
  ► Queue length alarm

► How to configure:
  ► Optimal: Use top-down view
  ► Set tracking mode to “3D people tracking”
  ► Set new tasks “Occupancy”, configure field, enter minimal occupancy number for an alarm

Tech note available!
UX: Easily teaching the camera about perspective

- No calibration needed for short-range intrusion detection in controlled environments & some other applications

- Calibration needed for
  - Real size (m²) & speed (km/h)
  - 3D tracking
  - 3D people tracking
  - Object classes
  - Geolocation
  - Double detection distance (available only with Intelligent Video Analytics)

Tech note available!
INTELLIGENT & ESSENTIAL VIDEO ANALYTICS 6.30

UX: Easily teaching the camera about perspective

- Calibration for long-range intrusion detection / people counting often reduced to entering height or marking single person!
- All FLEXIDOME / AUTODOME / MIC: Focal length from inbuilt lens & zoom position
- AUTODOME / MIC: Tilt angle known from scene, roll angle zero
- CPP7 DINION / FLEXIDOME: Tilt / roll angle known from internal sensor
- Manual override for angles possible
- Value update on opening VCA configuration

Tech note available!
Draw lines / fields / routes on ground (alarm on footpoint)
All other options remain available. An upgrade to FW 6.30 will not change existing tasks.

Visualization: Trajectories drawn on ground
(Formerly: Object center)

Draw polygonal lines (up to 15 segments).
Drawing is done by clicking for each node, and finishing with a double click.
INTELLIGENT & ESSENTIAL VIDEO ANALYTICS 6.30
UX: Diverse

▶ Simplified counter task: Line crossing only, removal of virtual room from GUI.
   Counting on enter field as well as virtual room still available via task script language. An upgrade to FW 6.30 will not change any existing counter tasks.

▶ Pause / freeze video during configuration

▶ Removed most apply buttons in the configuration as unnecessary
   Saving can be done via Configuration Manager or device webpage as usual.
   Only exception: Calibration

▶ Double row of tab headers for easier access
INTELLIGENT & ESSENTIAL VIDEO ANALYTICS 6.30
UX: Diverse

- Alarm object overlay for all alarm snapshots
- WebPage MJPG Stream
- Remote: http://192.168.0.1/snap.jpg?VCAOverlay=1
- Alarm Email (upcoming with FW 6.32)
INTELLIGENT TRACKING UPDATES
Intelligent Tracking

NEW: Also on FLEXIDOME IP panoramic 7000

- AUTODOME / MIC: automatically zoom to & follow a selected object
- Megapixel cameras: “Virtual PTZ camera”, cutout stream follows selected object
- Start via
  - Auto: Any Intelligent Video Analytics alarm object
  - Click: User clicks on any object tracked by Intelligent Video Analytics
- Available on
  - PTZ: Every stream
  - FLEXIDOME IP panoramic 7000: Video E-PTZ
  - Non-panoramic megapixel cameras: Stream 2