

Technical Note

FW 6.30 Idle / Removed Objects



BOSCH
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This technical note describes idle and removed object detection.

Applications:

- Detect parked cars in no-parking zones
- Detect blocked emergency exits
- Detect the removal of museum exhibits
- Detect suspiciously left packages in high-security areas
- Detect idle bags in walk-through areas

Limitations:

- Not available on thermal cameras
- Does not work in crowds
- No abandoned baggage detection
- No differentiation between baggage and persons sitting or lying down
- Does not work in front of moving background like wind in trees or water
- Does not work during illumination changes or camera brightness adaptations



Abandoned baggage myths and facts:

“Abandoned baggage”: A bag that has been carried by a person and has been placed on the ground (“idle”). Afterwards, the person left the bag and the surrounding area (“abandoned”). Application target areas are often crowded train station platforms or equally crowded airport waiting areas.

THIS IS NOT POSSIBLE AT ALL:

- The bags are often fully occluded by the crowd of people and thus not visible anymore. Something that is not visible cannot be detected.
- The people are waiting, standing or sitting, and not moving any more than the bags do. Current idle object detection technology cannot differentiate whether a person or a bag is currently idle. Thus it will alarm on any waiting person as well, with a huge amount of false alerts.
- Separating and tracking people in crowds is not possible with current technologies, thus the owner of an idle bag cannot be determined, and neither can be determined whether the owner left the premises and the idle bag is therefore really abandoned.
- People wait at train station platforms and airports for hours at a time, much longer than any abandoned baggage should be alarmed on.
- If people arrive in groups, like a family traveling, often someone is asked to look after baggage while the other leaves to buy something. Thus even while the correct owner left, the baggage is not abandoned at all, but well cared for.
- The probability that a bomb is placed in a trash bin or hidden somewhere else is very high. No idle object detector will be able to find them then.
- Even if an abandoned bag is detected, the time for a potential bomb to explode is too short to do anything about it.

Abandoned Baggage task:

1. Find the bag!



2. Who is the owner?



3. Where is the owner now?

**NOT POSSIBLE WITH
VIDEO ANALYTICS**

Two different solutions for idle / removed object detection:

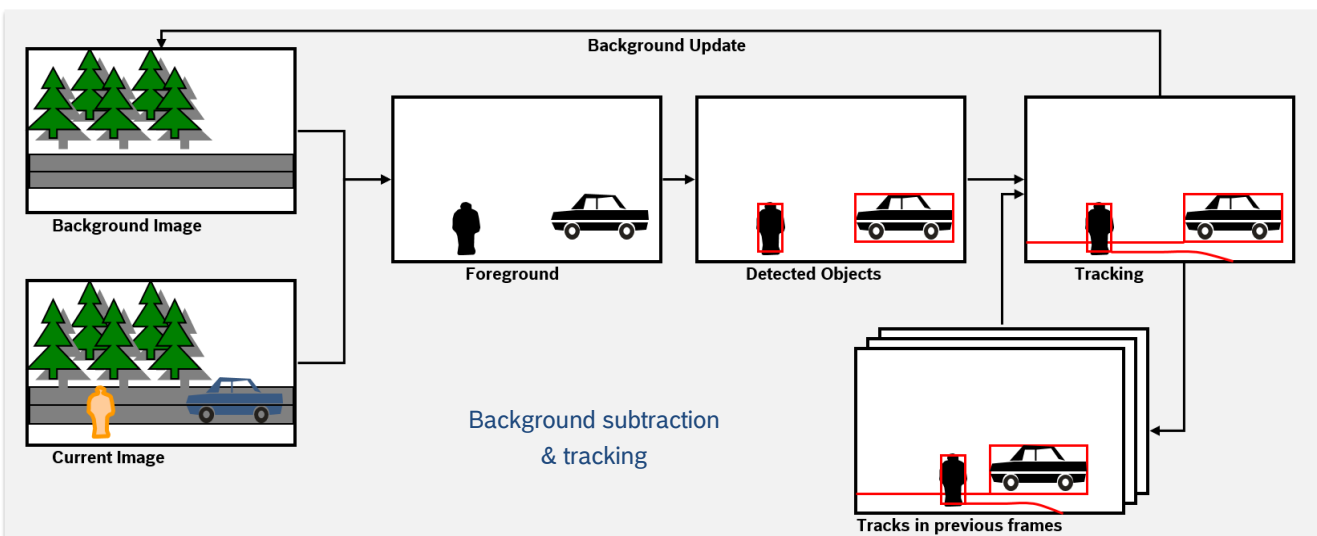
- Static background and stable illumination: Use reference image check from tamper detection. See the tech note on tamper detection for full details and configuration.
- Changing illumination or background: Use idle / removed object detection tasks.

Different kinds of idle / removed objects

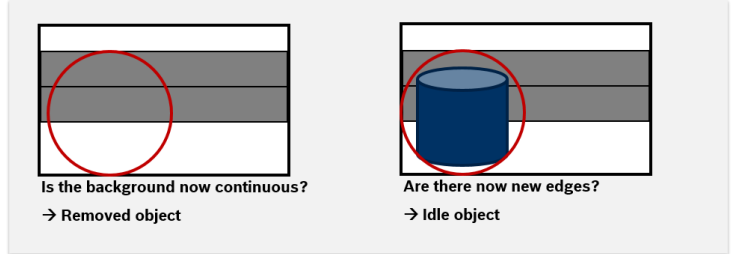
	Idle / Removed	Type	Examples	Explanation
Stopped object	Idle	Self-moving tracked object	Person, car	This is an object that has been moving by itself and now stopped.
Started object	Removed	Self-moving tracked object	Person, car	This is an object that was idle for so long it was considered part of the background, and now started moving all by itself.
Placed object	Idle	Carried static object	Bag, Package	This is an object that was carried by another object and has now been left behind.
Taken object	Removed	Carried static object	Bag, Painting	This is an object that was taken and carried away by another object.
Instantaneously self-appearing object	Idle	Background maintenance	Shadow, branch,	This is typically a difference in current image and learned background caused by illumination changes, moving shadows, wind in vegetation or opening / closing doors, and has no relevance. These idle objects are completely suppressed since FW 6.10.
Instantaneously self-disappearing object	Removed	Background maintenance	Shadow, branch	This is typically a difference in current image and learned background caused by illumination changes, moving shadows, wind in vegetation or opening / closing doors, and has no relevance. These removed objects are completely suppressed since FW 6.10.

Technology

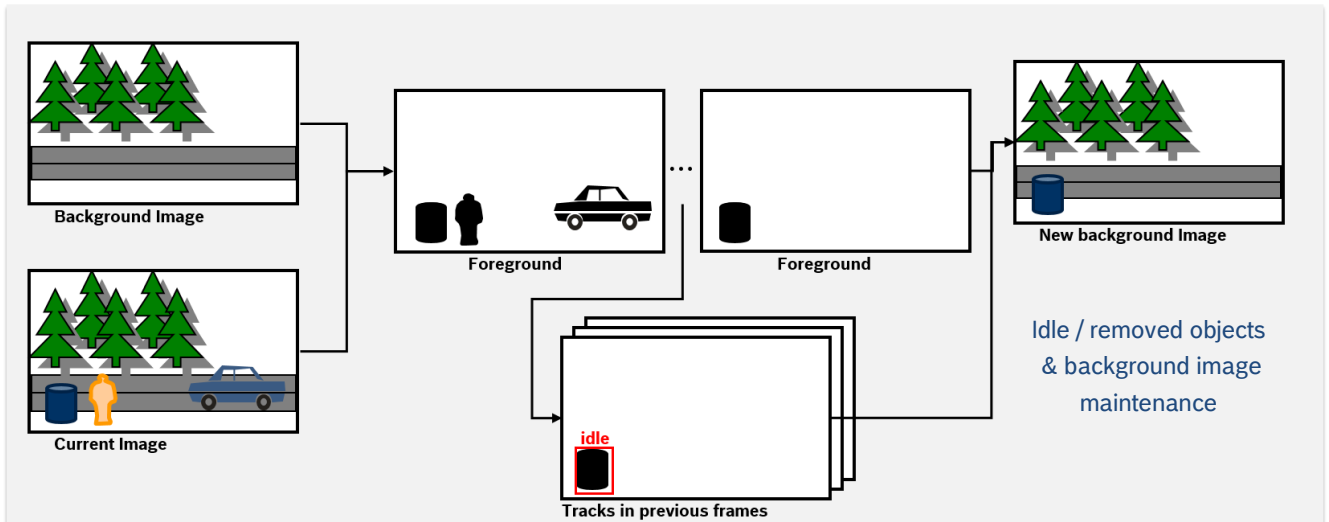
Idle and removed object detection is always based on the comparison of a current image to a background representation, which can be a single static background like with the reference image check from the tamper detection, or a learned background image as with Intelligent or Essential Video Analytics. Thus it also has all of the limitations from background subtraction algorithms like not being able to separate close objects as they only appear as a single foreground blob and being confused by illumination changes and motion in the background as those are changes to the background, too. For best performance, use Intelligent Video Analytics on CPP6 or higher, as this has the most advanced object reasoning using other features like optical flow, trajectory analysis and object shape analysis, as well as the best background maintenance and idle object detection based not only on one background image but a statistical representation over time.



The difference between an idle and a removed object for the video analytics is basically whether edges were taken away or added into the image. Started and stopped objects are tracked in addition, allowing further evaluations.



For learned background images, idle and removed object detection is essential for background image maintenance.



Note that overall illumination changes or camera brightness adaptations fully disrupt the video analytics, as the difference between background image and current image becomes too large. While Intelligent Video Analytics on CPP6 or higher with FW ≥ 6.10 still continues to track the moving objects, all idle / removed object observations are still disrupted and stopped. All other versions lose the moving objects as well. Therefore while in theory quite long idle / removed time to alarm can be supported, in practice the idle and removed time to alarm should be as short as possible to avoid illumination change disruptions.

Configuration

For the configuration of idle / removed object detection using reference image check please see the tech note on tamper detection. All else is described here.

The basic metadata configuration options of idle / removed object detection are the time to alarm. The same time is also used to determine when to put idle objects into the background image and remove removed objects from the background image. Note that started objects have no configurable time to alarm, as the alarm is sent as soon as the algorithm verified it is a started object. Other configuration options allow to fully enable or disable the metadata generation of idle / removed objects. For Intelligent Video Analytics on CPP6 and higher from FW 6.10 onwards, a separate idle object size for placed and taken objects can be configured. For all other cases, the minimal and maximal object sizes from Metadata Generation -> Tracking applies. Note that Metadata Generation -> VCA masks also suppress any idle or removed objects.

Note that in front of moving background, the started, placed and taken object detection will not work. Intelligent Video Analytics on CPP6 and higher with FW ≥ 6.10 fully suppresses all started, placed and taken objects in front of detected moving background areas when Metadata Generation -> Tracking -> Noise suppression is enabled, including in Metadata Generation -> Tracking -> Ship tracking mode. In all other cases, expect a multitude of false idle and removed alarms in front of moving background.

After configuring the metadata generation, an idle or removed object task has to be configured in the alarm rules. There, the alarm generation can also be restricted to a specified alarm area. As the time to alarm needs to be configured already for the metadata configuration, it is only added for information in the alarm rule wizards.

Settings

Tasks: Metadata Generation Metadata Inspection

Sensitive Area Tracking Idle/Removed Crowd Fields

Idle/Removed Objects

Set parameters for tracked and static objects. Decide if you want metadata to be generated. Press F1 for more information.

Tracked Objects

Debounce time [s]
(only stopped objects)

Generate 'started/stopped' metadata

Static Objects

Generate 'placed/taken' metadata

Debounce time [s]

Object area [m²]
Min. Max.

Reset Apply Cancel

Settings

Tasks: Metadata Generation Metadata Inspection

Filter by Object Type


Define which type of idle object should trigger an alarm. The debounce time is displayed for information.

Select the type of object to filter for:

All idle objects
 Only stopped objects
 Only placed objects

Debounce time settings [s]:

Stopped objects 30
 Placed objects 5



Previous Next Finish Cancel

Settings

Tasks: Metadata Generation Metadata Inspection

Filter by Object Type


Define which type of removed object should trigger an alarm. The debounce time is displayed for information.

Select the type of object to filter for:

All removed objects
 Only started objects
 Only taken objects

Debounce time settings [s]:

Taken objects 5



Previous Next Finish Cancel