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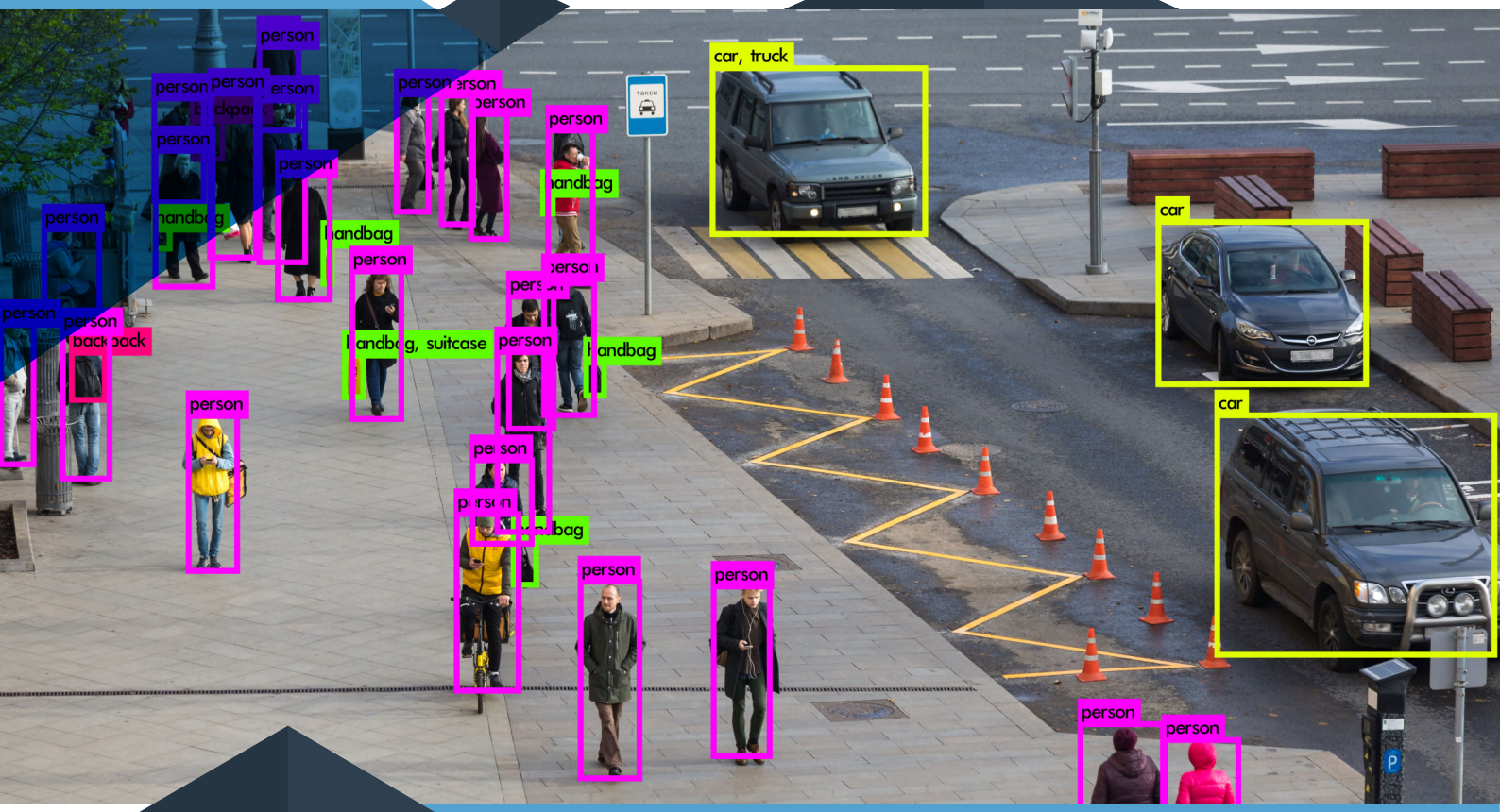

PRODUCT

AIVU-SMART MODULES

An integrated and customised video analytics solution for the real-time events detection

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AiVu-Smart Modules is a modular video analytics solution developed by Aitek to process live and recorded image from video-surveillance cameras.

REAL-TIME EVENT DETECTION

Whether transportation infrastructures, urban areas, points of sales, industrial sites or other are involved, security personnel require reliable solutions capable of detecting any threat in real time. This is why video analytics have become an essential tool for guaranteeing immediate responses in case of events representing possible dangers to people, goods and infrastructures.

The AiVu-Smart Modules suite integrates existing CCTV systems for the real-time detection of a wide range of events focusing on people, vehicles and static objects. Our software modules are also designed to apply post-event analytics to recordings and to provide useful data for statistical and business intelligence analysis..

The employed image processing algorithms automatically generate notifications whenever events of interest occur, configured based on the needs of the surveillance system manager. The detection is highly reliable and accurate and any redundant or false alarms are automatically filtered out.

AiVu-Smart Modules solutions are scalable and adaptable, allowing users to add new features simply by installing additional licenses when needed.

- **Perimetral protection and intrusion detection**
- **Tracking of people/objects/vehicles**
- **Over-crowding detection**
- **Wrong way detection**
- **Vehicle queue/speed drop detection and vehicle speed estimation**
- **Object interdistance estimation**
- **Counting of people/objects/vehicles**
- **Size-based object classification**
- **Abandoned object / spilled load detection**
- **Automatic smoke and fire detection**

CONFIGURATION INTERFACE

Easy and quick video analytics configuration

The front end is a web-based interface, supported by mainstream browsers and therefore easily accessible from workstations equipped with different OSs (Windows, Linux), which allows to draw virtual sensors (“rules”) on an image or parts of it.

The number and type of sensors on the cameras are easy to modify. Multiple sensors can be configured on a single camera to simultaneously detect different events without affecting processing performance.

Setting up video analytics on a video camera is extremely simple: one just has to select the rule corresponding to the event to be detected and to define the image area to which the analytics must be applied by drawing the virtual sensor using the mouse.

Furthermore, default values and/or suggested ranges are available for all parameters and thresholds, allowing even video processing novices to perform analytics configuration with no need for complex measurements or evaluations.

If a video camera points to a different location, video analytics can be restored simply by adjusting the position of the virtual sensors on the image.

Post-event analytics on recordings

The video analytics software modules can also be applied to recordings, allowing to quickly and automatically reconstruct events of interest, without having to examine hours of recordings.

Events can be quickly detected just by drawing the virtual sensors on the images: post-event analytics are performed at the highest possible speed, allowing to process hours of recordings in a few minutes!

Real-time alarm notification

All notifications generated by sensors, with the corresponding images, can be automatically sent to a control center provided with Aitek’s AiVu-VMS video management portal or to third-party supervisory systems, using the AiVu format or Onvif specifications.

The control center automatically receives alarm notifications from video cameras any time unpredicted events occur, allowing the security personnel to view the recordings associated with the event and trigger the appropriate response procedures.

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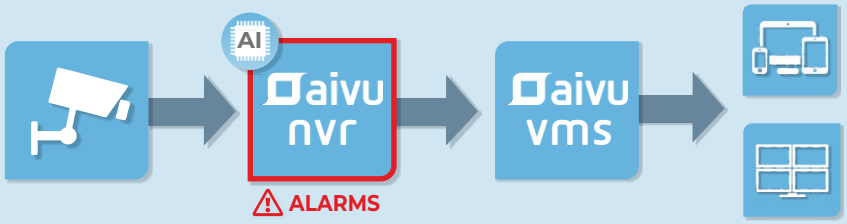
AIVU-SMART MODULES ARCHITECTURE

Server-based implementation

The video analytics modules run on the device hosting the video recording software without requiring any specific hardware. Image acquisition, processing and sending are performed by the device independently of the type and model of connected video cameras.

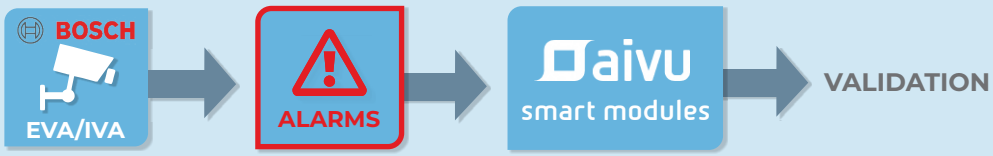


On-the-edge video analytics

BOSCH

The algorithms of the AiVu-Smart Modules suite can be applied directly on the EVA / IVA (Essential Video Analytics / Intelligent Video Analytics) metadata generated by Bosch cameras, with no need to process video streams to detect objects in the frame and generate the alarms.

A different approach allows to employ the metadata to acquire the alarms generated by Bosch Inteox cameras. Alarms can be validated using neural networks, with a further increase in performance and reliability of video analytics. In this way, the alarms are managed by Aivu-NVR devices as if they were generated by Aivu systems.



On-the-edge video analytics

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The Aivu-Smart Modules algorithms can be easily installed on board Azena-compliant cameras and devices. Thanks to this integration, the images are captured in *.raw* format: a low-level processing detects objects, then and the Aivu-Smart Modules algorithms perform a high-level processing to generate alarms .

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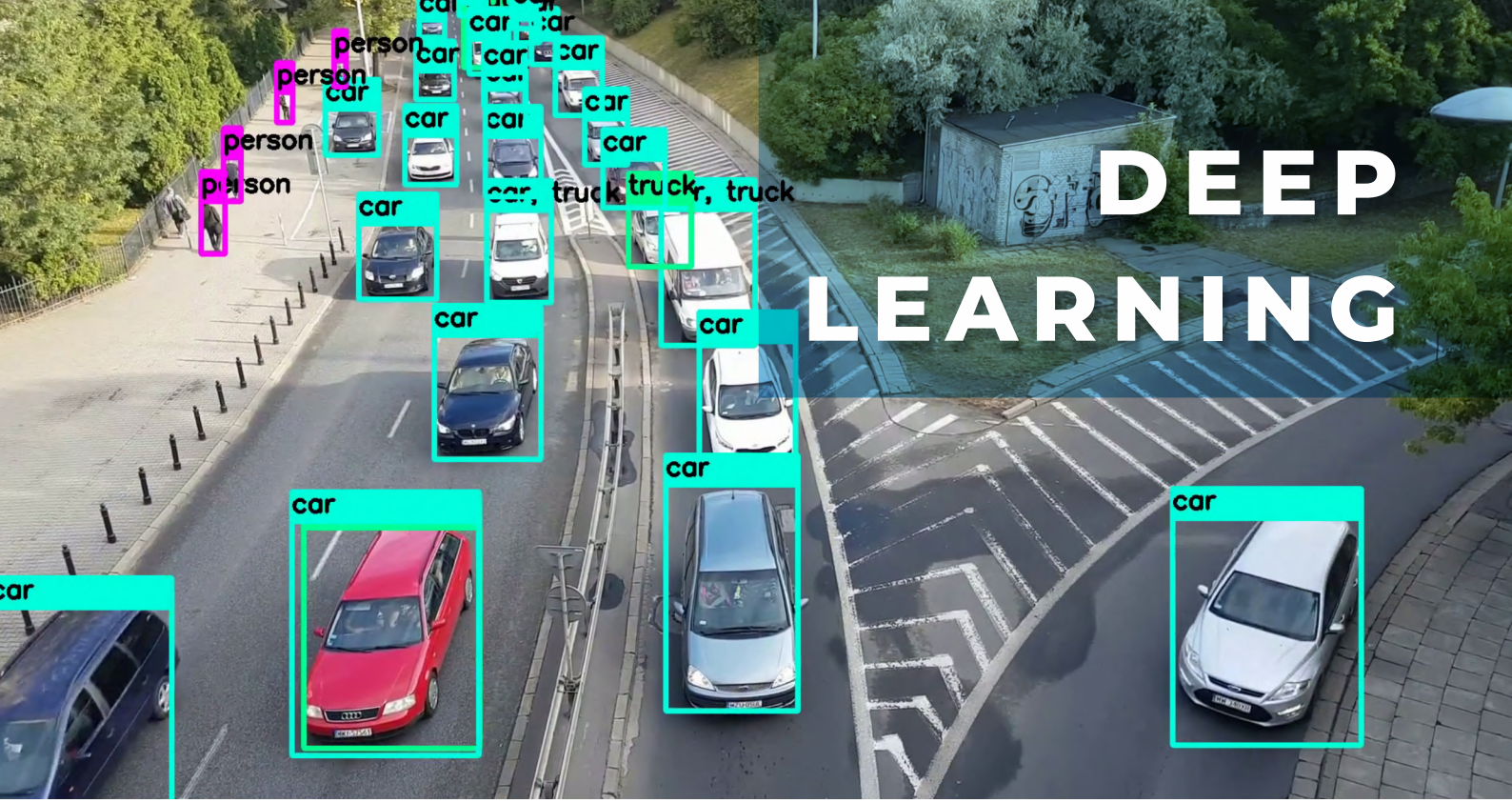


Advanced functionalities, highest reliability

The analytics algorithms of the AiVu-Smart Modules platform can employ standard background subtraction techniques as well as the latest deep learning technology.

Background subtraction is based on creating an artificial “background” image (for example, an empty square in case of vehicle and pedestrian detection), using images acquired from the monitored scene, representing an “average” of the processed frames. Object detection is performed by “subtracting” current images from the background and it allows to evaluate the detected objects and interpret their behavior based on the configured video analytics algorithms: moving objects, detection of their direction, counting, etc.

A new generation of analytics aims at making the most of image data and providing useful information by exploiting the potential offered by deep learning, the artificial intelligence technology allowing to develop algorithms which learn directly from past experience with no specific tie to predefined mathematical models.

Extreme reliability, limitless possibilities

Deep learning is based on training highly sophisticated neural networks to achieve the highest reliability in processing images and video streams.

The performance of neural networks improves as they are fed more examples from which to learn, allowing the algorithm to dynamically adapt to new conditions. In case of changes to the application scenario or of incorrect detections, a network can be retrained to correct any inaccuracy.

Deep learning provides numerous advantages. Using neural networks provides robustness to rapid variations in the monitored scene such as changes in weather, lighting or video camera orientation.

Furthermore, algorithms can process in real time every single image with no need to employ a reference model of the scene and can detect with extreme reliability even partially overlapping or occluded objects or objects which have long been abandoned.

STRENGTHS

- Aitek expertise in data analysis for neural network design
- Development of complex video analytics solutions with no need to develop complex algorithms
- Detection of individual objects even when overlapped or partially occluded
- Classification of objects comparable in shape and size (for example, bicycles/motorcycles)
- Detection of motionless objects in the monitored scene (long-term tracking)

SOFTWARE MODULES

AiVu - Smart Modules - COUNT

This rule counts all objects detected in the virtual sensor drawn on the image. It is ideal for counting vehicles travelling along a road lane or people/vehicles at access gates.

AiVu - Smart Modules - CROWD

This rule detects overcrowding within a configured area by setting minimum crowd occupancy and maximum stationing time. It is ideal for the surveillance of squares, public spaces, railway platforms and stations, entry and exit gates, waiting areas, ticket offices, etc.

AiVu - Smart Modules - DANGER

This module detects the presence of people, vehicles and objects in a sensitive area, generating an alarm after a configurable time threshold. It is ideal for monitoring operational areas, warehouses and depots and for detecting potentially dangerous situations in railway scenarios such as objects on the rails, yellow line crossing, etc.

AiVu - Smart Modules - DEBRIS

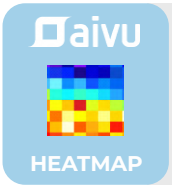
This module developed specifically for roadway scenarios detects motionless objects in a sensitive area which can be classified as cargo lost by vehicles in transit.

AiVu - Smart Modules - CALIBRATION

This module provides camera calibration which allows to transform image coordinates into real-world coordinates (and vice versa) and compute distances, speeds, etc. The calibration can be applied to fixed cameras, in which case the resulting calibration is only valid for a specific camera, or to PTZ cameras.

AiVu - Smart Modules - DIRECTION

This module detects objects moving along a reference direction, defined during module configuration. An alarm notification is generated any time an object crosses the monitored area moving along the configured direction. It can optionally ignore pedestrian. Ideal for detecting wrong-way vehicles or people crossing unidirectional gates in forbidden ways.



AiVu - Smart Modules - HEATMAP

This module generates a heatmap of objects transits in the monitored scene, i.e. it provides a graphical representation, using pseudo colors, of areas most frequently occupied by objects. Ideal for the analysis of vehicle flows along roadways or for point of sale in-store analytics.

AiVu - Smart Modules - INTERDISTANCE

This module computes a set of statistics on objects crossing the monitored scene: absolute count, hourly count (transits per hour), distance between objects.

AiVu - Smart Modules - INTRUSION

This module generates an alarm when an object (for example a vehicle or a person) is detected in the virtual sensor drawn on the image for longer than a configurable time threshold. It is ideal for perimeter protection and detecting trespassing over gates and fences in industrial sites, port terminals, warehouses and depots, military sites, etc.

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SOFTWARE MODULES

AiVu - Smart Modules - POSITION

This rule detects vehicles and/or people in forbidden areas, emergency lanes, etc. An alarm signal is generated each time people or vehicles are detected within a configured sensor area (with no time threshold). This module is best suited to the surveillance of non-entry or restricted areas, such as parking-lots, worksites, depots, warehouses, industrial sites, etc.

AiVu - Smart Modules - QUEUE

An alarm notification is generated when the monitored area (for example a road lane) is occupied by vehicles over a set threshold percentage. Ideal for monitoring traffic flows and detecting queues and accidents.

AiVu - Smart Modules - SMOKE

This module employs a neural network to detect smoke and fog, even if not particularly dense, in outdoor or indoor areas (for example in tunnels or industrial sites) to provide early warnings in case of fires.

AiVu - Smart Modules - SOCIAL DISTANCING

Detects people in the monitored area and estimates the real-world distance between them, generating an alarm whenever two or more people are too close to each other for too much time. Distance and time thresholds can be configured to prevent false alarms or ignore short-term events, such as when people do not maintain a proper distance for just a few instants because their paths momentarily cross.

AiVu - Smart Modules - SPEED

This module automatically estimates the speed of vehicles in transit through a virtual sensor. It allows to acquire data about traffic conditions along a road infrastructure (real-time estimation of the speed of each vehicle, minimum and maximum speed values detected by the sensor and average calculation).

AiVu - Smart Modules - STOP

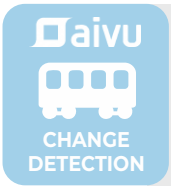
This module generates an alarm signal each time stationary objects or vehicles are detected within a configured sensor area for longer than a defined time threshold. It can optionally ignore pedestrian. It detects vehicles or objects stationing on carriageways and/or inside tunnels, accidents, etc.

AiVu - Smart Modules - TAMPER

This rule detects camera movements, caused for example by tampering or vandalism, which might negatively affect image processing and interfere with video analytics.

AiVu - Smart Modules - COVER

This rule detects camera coverings, caused for example by vandalism, dirty lenses or objects blocking the camera view, which might negatively affect image processing and interfere with video analytics.



AiVu - Smart Modules - CHANGE DETECTION

This module, specifically designed for railway and subway scenarios, detects people and objects inside train carriages and can be employed to verify that carriages are empty before entering the depot. A one-of-a-kind algorithm, it's ideal for driverless systems.

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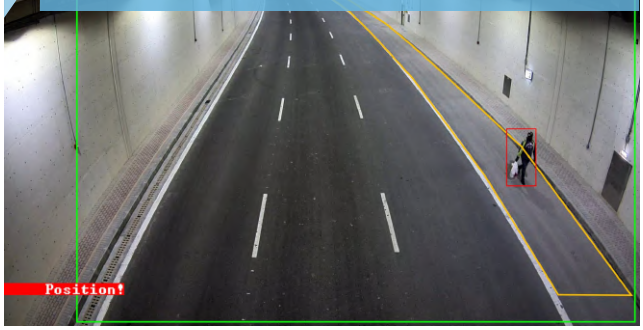
FIELDS OF APPLICATION

ROAD NETWORKS

The human eye is not enough to detect dangerous events and guarantee high standards of traffic and infrastructure security. This is why video analytics provide a set of advanced features allowing roadway operators to manage in real time any critical event and to acquire useful statistics for traffic flow analysis.

> Accident detection
> Detection of people in non-entry or dangerous areas
> Abandoned/removed objects
> Spilled load detection
> Smoke and fire detection
> Detection of stationary vehicles
> Wrong way detection
> Queue / Speed drop detection
> Vechicle speed estimation
> Interdistance detection
> Counting and size classification of vehicles
> Integration into traffic monitoring systems

Detection and tracking of objects in sensitive areas



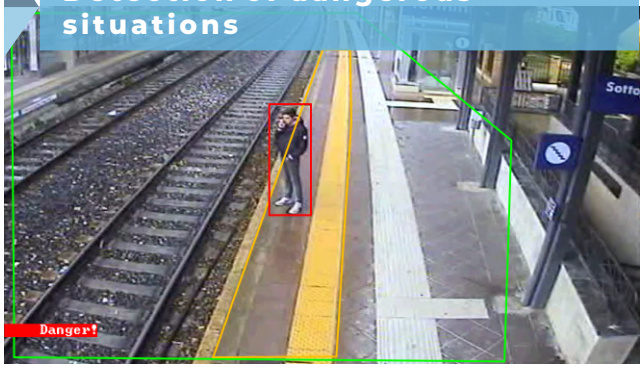
Wrong way detection

RAILWAYS AND SUBWAYS

The wide range of software modules allows the design of highly customized solutions to support the management of distributed video security systems covering an entire railway system and detecting in real time events which may affect the safety and security of vehicles, infrastructures and passengers.

> Yellow line crossing detection
> Overcrowding detection
> Intrusion detection
> Smoke and fire detection
> Rail crossing detection
> Abandoned/removed objects
> Spilled load detection
> Empty carriage detection
> Integration into railway traffic supervisory systems

Detection of dangerous situations



Overcrowding detection

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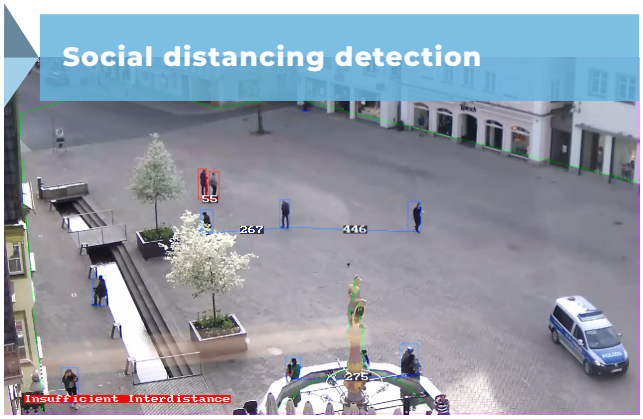
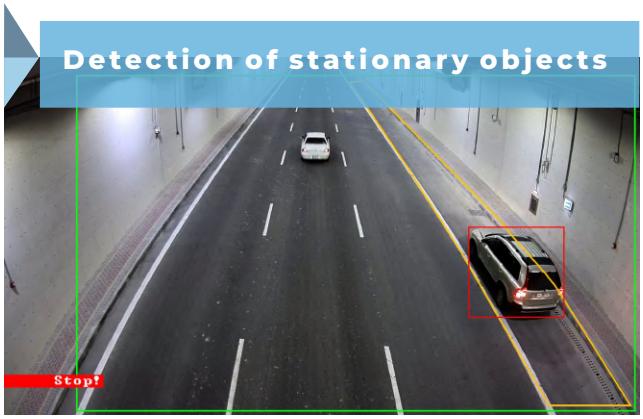
FIELDS OF APPLICATION

PORTS AND DRY PORTS

In a port terminal, detecting in real time events which may affect the safety of people and the security of goods and operational areas is of the utmost importance. To achieve a higher level of security, software modules from the AiVu-Smart Modules suite can be added to video surveillance systems.

> Protection of quays, warehouses and perimeter areas
> Intrusion detection
> Detection of people in non-entry or dangerous areas
> Abandoned/removed objects
> Spilled load detection
> Tracking of vehicles/people
> Counting of vehicles/people
> Smoke and fire detection

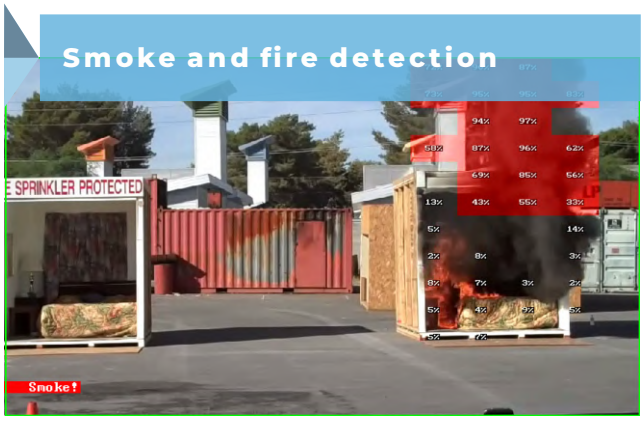




CITY SURVEILLANCE

In urban areas anything can happen, anytime. Being everywhere is impossible. This is why video analytics are essential in detecting automatically and in real time situations or events which may affect the safety of people and the security vehicles of goods and infrastructures.

> Detection of people in non-entry or dangerous areas
> Abandoned/removed objects
> Spilled load detection
> Smoke and fire detection
> Overcrowdings detection
> Social distancing
> Queue / Speed drop detection
> Accident detection
> Acts of vandalism
> Integration info civil defence IT systems



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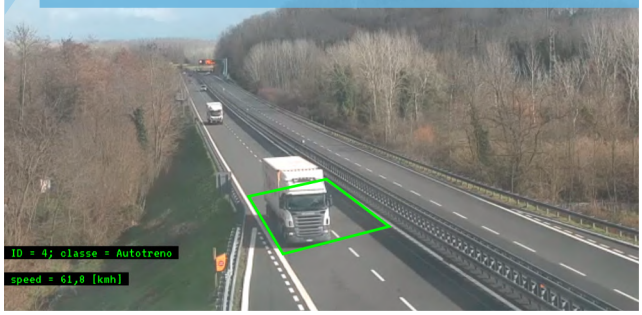
FIELDS OF APPLICATION

RETAIL

Video analytics modules complement video surveillance systems to ensure the highest security in points of sale and shopping malls, in addition to providing business support thanks to the automatic detection of empty shelves, missing products, queues at check-out and the analysis of client flows in different departments.

> Perimetral protection and intrusion detection
> Abandoned/removed objects
> Detection of people in non-entry areas
> Smoke and fire detection
> Overcrowding detection
> Counting of people
> In-store analytics to optimize the PoS management
> Heatmap to analyze customer flows inside the PoS

Vehicle speed estimation



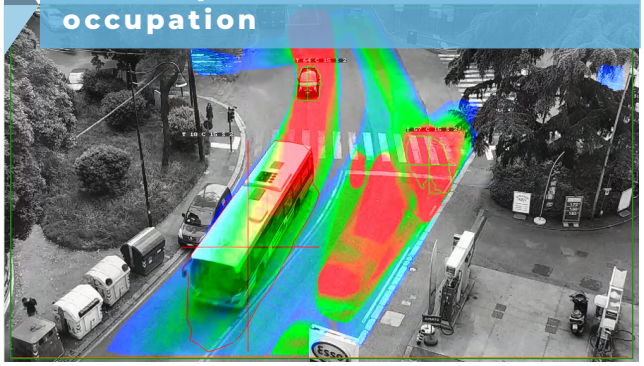
Detection of vechicle queues

INDUSTRIAL SITES

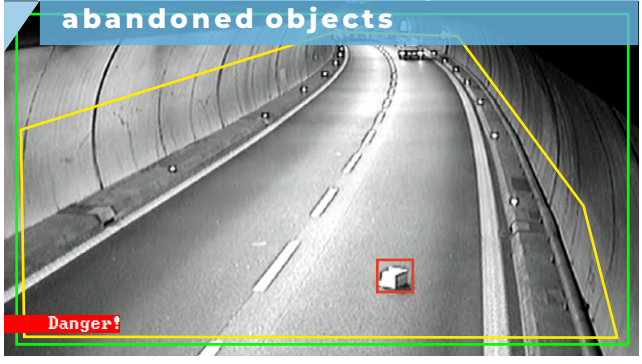
AiVu-Smart Modules guarantee complete, round-the-clock control of any industrial site, no matter how large, hazardous or inaccessible: theft of raw material and goods, accidents, sabotages and other events which may interrupt production and pose a threat to workers' safety can be detected in real time.

> Perimetral protection and intrusion detection
> Detection of people in non-entry or dangerous areas
> Abandoned/removed objects
> Spilled load detection
> Smoke and fire detection
> Tracking of people/vehicles
> Integrazione into supervisory systems

Heatmap: detection of area occupation



Detection of lost cargo / abandoned objects



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AIVU-SMART MODULES FEATURES

- Modular video analytics platform for the design of solutions tailored to the Cusotmers' needs
- Easily expandable with new functionalities
- User-friendly web-based configuration interface that does not require specific know-how
- Real-time detection of critical events and support for proactive decision-making
- Increased operating efficiency and reduced response times in case of emergencies
- Post analysis on recordings to detect events without having to browse hours of video streams
- Automatic forwarding of alarms and relevant recordings to the control centre and to mobile devices
- Simple configuration procedures, allowing even non-video analytics experts to manage the system
- Default values and/or advised interval ranges for each parameter
- Deep learning, data analysis and design of neural networks for even more reliable video analytics
- Integration in third-party systems (i.e. railway traffic control systems, traffic management, SCADA , etc)
- Use of heat maps and counters for computing statistics and business intelligence analysis

A wide range of Aitek's applications for Automatic Incident Detection, railway security and social distancing detection is available in the Azena application store.
https://store.azena.com

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