MDS CONTROL

MULTI DIMENSIONAL SPACE CONTROL

by neulos visiotech

Following the biological model…

we develop absolutely innovative video analytics software applications using a proprietary Artificial Vision Engine (MDS Control) based on the simulation of artificial neural networks.

…we created a new technology…

aimed at supporting the decision-making process (in Command and Control systems), at analyzing the scene and at monitoring the environment.

Through the analysis of the dynamics of the scene the System understands the alterations, it recognizes their meaning and provides adequate responses based on pre-programmed conditions.

This adaptability is made possible by the implementation of a proprietary programming language through which the System is instructed about the criteria on which to base the analysis of the scene.

…that solves old problems

MDS Control, unlike many traditional systems, provides real-time responses regarding the desired events, generating structured data from unstructured information.

The capability of recognizing the events, without false alarms, makes MDS Control an extraordinary tool in crime prevention, in the control of sensible areas, in the identification of abnormal behaviors, in the smart management of the road network and of the traffic code, and in supporting security in every industry.

The ever growing demand for security has, in fact, only – considerably – increased the areas under camera surveillance, creating an overcrowding of video surveillance systems unable to offer automatic solutions to real problems.

Even the so-called "Smart Systems" are usable only for a few generic functionalities and in controlled environments.

This is why even today, against a great demand for security, automated video analytics systems are under-utilised, because considered unreliable.

Rome Office

Our offering:

- Analysis of the functionalities

- Customized projects

- Programming of the scene

- Technical support

- SW maintenance

- Events management

- 24/7 Control Room

System Architecture

The MDS Control artificial vision neural engine is queryable in different ways in order to obtain information.

The fundamental components of a Neulos' application are similar, in some ways, to those of a traditional client/server application. A typical client/server application is composed by a client that implements the user interface, with some processing and communication functions, and by a server that provides a range of services like managing and accessing data in a database.

In Neulos System the interaction between client and server is even more complex, in order to allow the integration of neural computation components.

The goal is to make a Neulos application independent from the characteristics of the particular application and from the hardware and software platform on which it is run.
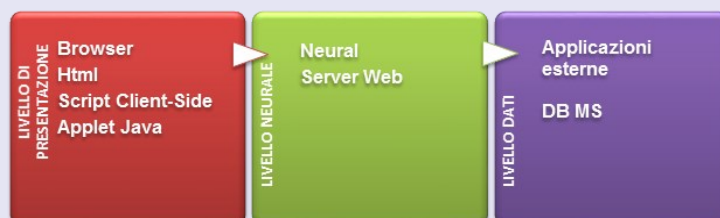
A Neulos application will likely be developed on three logical-functional layers:

- **Presentation layer**
  represents the user interface of the application and is tasked on acquiring data and visualising results;

- **Neural layer**
  it deals with neural data processing, based on the required demands, namely the set of rules on which data is considered meaningful and its relations consistent; the computations of the intermediate layer generate the results requested by the user;

- **Data layer**
  represents the range of services offered by applications independent from Neulos, such as a database manager, an email messaging system, Java Message Service, etc.

Analysis Platform

The hardware dedicated to the neural analysis of the video stream is the XntboX and it can be: an integrated PC, a dedicated PC, or a virtual machine inside a server; a single XntboX can manage one or many sensors (optical or otherwise);

The HW platform can be configured in several different ways:

Integrated Hardware

Dedicated Hardware
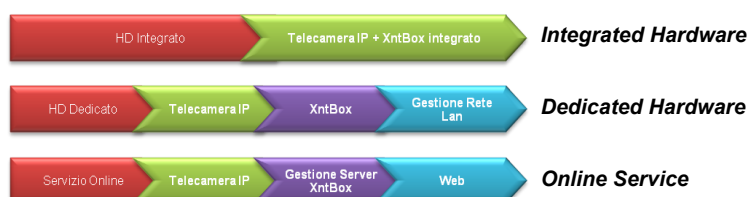
Online Service

Using the Online Service, data generated by the system can be managed by the Value Added Services Center (VAS).

The VAS acts as a concentrator and it is tasked with receiving and managing the information sent by the processing devices (XntboX).
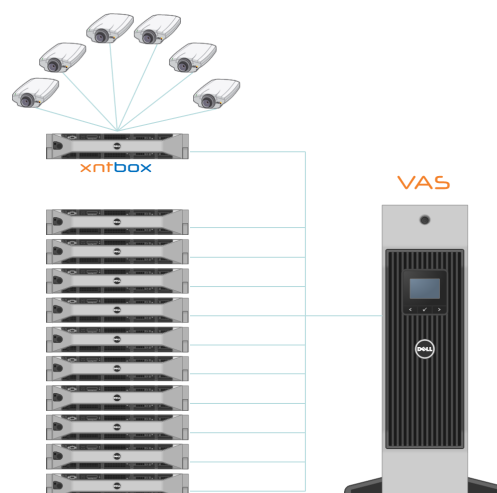
MDS CONTROL

MDS Control is based on the capability of simulating the operation of a short-term memory in which it is formed, and continuously updated, a virtual image resulting from all the experiences the neural System is having of the environment.

Said memory, used to generate a virtual image of the environmental staticity, allows the System to perform the analysis of the scene dynamics, to understand every alteration and to recognise their meaning in order to provide adequate responses, simulating what happens in the biological model.

Some of the functions that MDS Control is capable of analysing:

◊ **Possibility of defining multiple areas of analysis in the field of view**

◊ **Identification of transit and/or occlusion on predetermined areas**

◊ **Tracking and classification of moving targets**

◊ **Shape learning and recognition**

◊ **Color analysis**

◊ **Direction**

◊ **Speed**

◊ **Transits counting**

◊ **Added/removed objects**

◊ **Timer associated with events**

◊ **Logical relations between events (and & or)**

◊ **Reporting missing events**

Response functions of the System:

◊ **Sending the event string to a remote client**

◊ **Storing in a database data generated by every single event (color, direction, coordinates (x- y position relative to the field of view)), etc.**

◊ **Sending the event to preprogrammed email addresses**

◊ **Integration with PTZ cameras and automatic panning, tilting and zooming based on System-generated events**

◊ **Integration with automation interfaces for inputting and outputting information using external sensors and devices**

◊ **Statistical analysis and real-time reporting of System-generated information**

◊ **Associating events with a 24/7 recording**

◊ **Calendar: programming operating days/hours of the System**

Web Interface
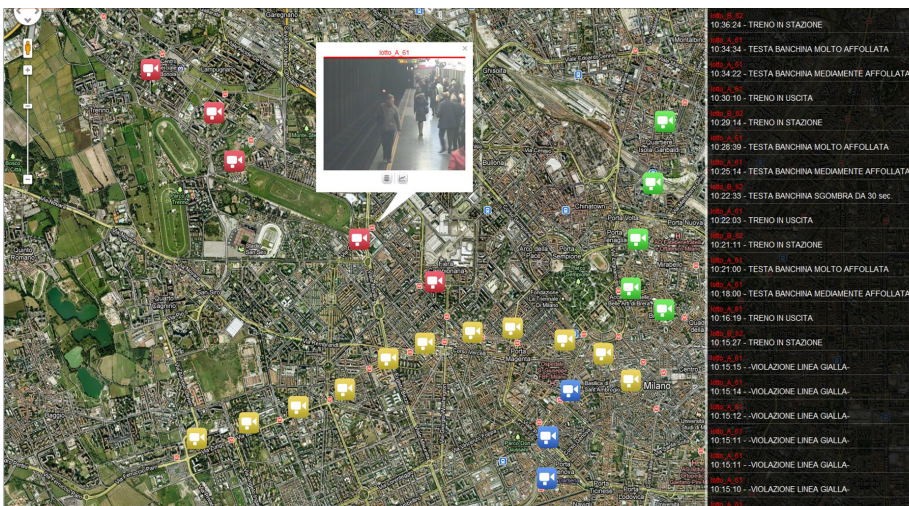
The events provided by cameras and sensors are analysed by the System and georeferenced in a web user interface, accessible through the Internet.

Security operators will be able to immediately access the live feed. An effective and flexible tool capable of supporting any decision regarding the event.
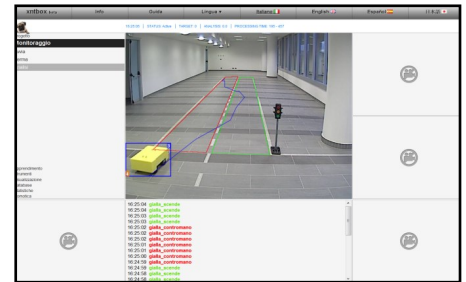
MDS Control Analysis Functions

TRACKING AND CLASSIFYING MOVING TARGETS

Each dynamic target (viewed by the scene camera) is tracked and classified in relation to the morphologic characteristics.


DIRECTION TRACKING

The System captures, in the field of view, information about the direction that the moving targets follow from the moment they enter the scene to their relative exit. This information can be used to include the dynamic in a predefined event. E.g.: overtaking on the right of a vehicle.

COLOR ANALYSIS

The System is capable of quantifying the percentage of the chromatic components of each object and of using this information to distinguish/ recognise/ classify a target according to the colors of which it is composed.
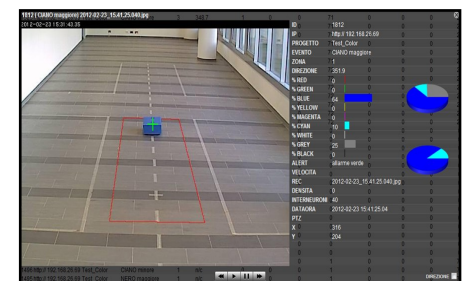
SPEED DETECTION

The System is capable of detecting with extreme accuracy the speed of each moving target and of using this information to include the dynamic in a predefined event.


SHAPE LEARNING AND RECOGNITION

Shape recognition is one of the main limits of traditional artificial vision systems. MDS Control learns to recognise and classify objects through a simple and straightforward supervised learning process.

DIMENSION FILTERS

The System is capable of detecting the dimensions of each target and of using this information to better discriminate the events.
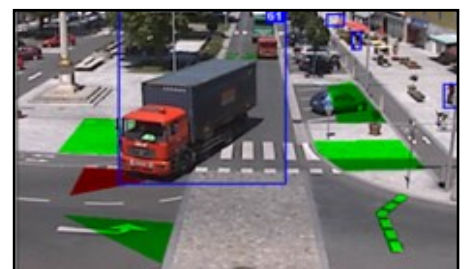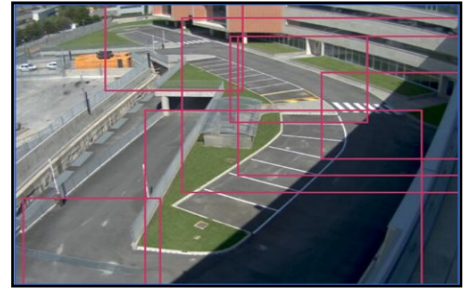
MDS Control Analysis Functions

DEFINING SEVERAL AREAS OF ANALYSIS IN THE FIELD OF VIEW

It is possible to select countless "areas" of analysis in the scene on which to define and refer to the events requested.

DETECTING TRANSIT AND/OR OCCLUSION ON PRESELETECED AREAS

MDS Control is capable of distinguishing the transit of a target inside an area from the generic prospective occlusion of the same area, using a single camera, without the need of any other sensor.

EVENT COUNTING

The reoccurrence of the same event can be counted and this information can be used in a predefined event. E.g.: counting people entering a room and alerting when the number reaches the predetermined threshold.

TIMER ASSOCIATED WITH EVENTS

It is possible to associate to each event a time function that establishes in which hours that event must be active.
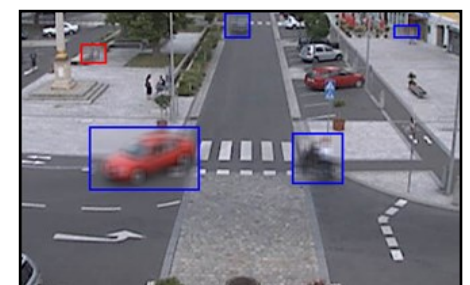

REPORTING A MISSING EVENT

It is possible to define an event related to the failure of happening of a situation. E.g.: a vehicle that doesn't enter its parking spot during the established hours, the lights of a room that don't turn on after 8 pm, etc.

PRIVACY

The targets detected by the System in the scene can be automatically obfuscated for privacy reasons.

MDS Control Analysis Functions

TRAFFIC CODE

The System is capable of controlling in real-time the information relative to the flow of traffic with particular attention to road conditions, visibility and traffic code violations.


LOGICAL RELATIONS BETWEEN EVENTS (AND, OR, NOT)

It is possible to program the System to highlight the logical relations between events according to the and, or, not operators. E.g.: simultaneous transit in two or more areas.
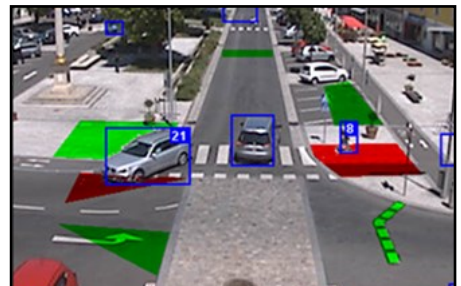

ADDED/REMOVED OBJECTS

Reporting the addition/subtraction of objects in predefined areas or on the entire field of view. To each object that will become statical will be associated a timer (event start) until their changing of position and/or their exiting the field of view: in this case the System will return a subtraction event.
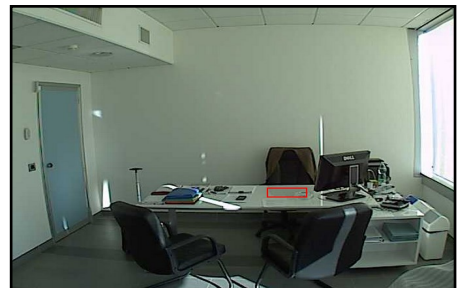
BEHAVIORAL ANALYSIS

The System is capable of defining a range of dynamic rules that, contextualised in the scene, can report a suspect behavior. E.g.: a person that stays too much time in a place, or that runs to fast, or that enters forbidden areas, etc.
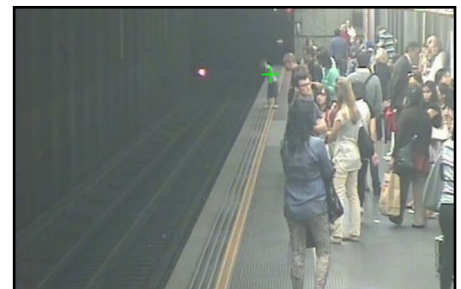

CONTROLLING VIRTUAL PASSAGES AND PATHS

It is possible to decode events on non-physical passages and paths in order to create virtual models drawn on the scene.

FUSION OF VIDEO STREAMS PROVIDED BY DIFFE-RENT CAMERAS

With this function it is possible to use several video streams, provided by contiguous cameras, in order to create a single field of view on which to perform the automatic analysis of the scene.

A few fields of application

neulos
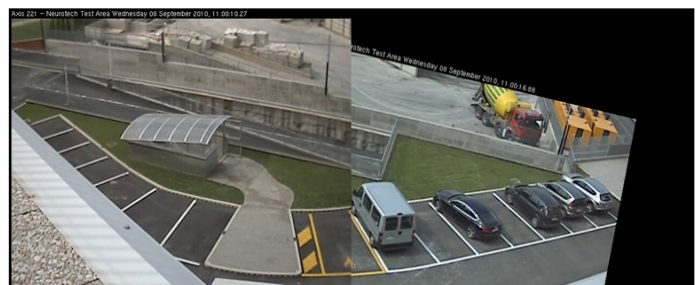
CRIME PREVENTION IN URBAN AND SUBURBAN AREAS

- ♦ Abnormal behavior detection
- ♦ Vandalism prevention
- ♦ Thefts and robberies prevention
- ♦ Sensible areas protection

CRITICAL INFRASTRUCTURES PROTECTION

PUBLIC / PRIVATE BUILDINGS AND PRODUCTIVE INDUSTRIAL / COMMERCIAL AREAS

- ♦ Real-time detection of any intrusion or violation of protected areas by unauthorised people or vehicles
- ♦ Perimeter protection
- ♦ Access control and classification on driveway and pedestrian gates
- ♦ Control and verification of improper usage of gates/turnstiles (bypassing, queuing, two-people transit)
- ♦ Added/removed objects

RAILWAY AND SUBWAY MANAGEMENT

- ♦ Security of forbidden areas
- ♦ Passengers' safety control
- ♦ Vandalism
- ♦ Added/removed objects
- ♦ People not catching the train within the defined time limits
- ♦ Control of people moving in directions that are not allowed
- ♦ Fires

LANDFILL MANAGEMENT

- ♦ Security and protection of perimeters and areas
- ♦ Activity monitoring of landfills and goods storage sites
- ♦ Controls for illegal dumping activities
- ♦ Fires/smoke monitoring

A few fields of application

URBAN AND SUBURBAN TRAFFIC CONTROL

♦ Traffic information (speed detection, traffic jams, slowdowns/queues, stopped traffic, accidents, etc.)

♦ Traffic code violations (speeding, U-turns, unauthorised manoeuvres, emergency lane violations, etc.)

♦ Visibility detection (rain/fog/snow)

MUSEUM CONTROL

♦ Unauthorised accesses or presences

♦ Works of art protection using virtual perimeters

♦ Vandalism

♦ Added/removed objects

♦ Control of people moving in directions that are not allowed

♦ Fires

STADIUM SECURITY MANAGEMENT

♦ Reporting and control of perimeter bypassing

♦ Reporting of queues at access points

♦ Reporting of overcrowding at gates

♦ Reporting of sector invasions

♦ Fires reporting

♦ Reporting of agitated crowds

PARKING MONITORING AND MANAGEMENT

♦ Automatic parking management

♦ Parking spots occupation times

♦ Vehicle discrimination (size/length)

♦ Correct placement of vehicle in authorised areas

♦ Ticket validation

♦ Car removed from parking without authorisation

A few fields of application

HARBOR MANAGEMENT

♦ Security of forbidden areas

♦ Passengers' safety control

♦ Vandalism

♦ Added/removed objects

♦ Fires

♦ Docking control

♦ Goods/logistics control

♦ Queueing monitoring

AIRPORT MANAGEMENT

♦ Reporting and control of presence on the airstrip and/or of transits in unauthorised areas

♦ Controlling the airstrip to detect extra aircrafts

♦ Passengers' safety control

♦ Vandalism

♦ Added/removed objects

♦ Fires

♦ Baggage check

♦ Logistics

BANKS AND FINANCIAL INSTITUTIONS

♦ Standing in front of the ATM for longer than a defined threshold

♦ Number of people standing in front of the ATM above a defined threshold

♦ Abnormal behaviors (loitering, kneeling, rapid movements, etc.) in front of the ATM

♦ Camera obscuring

♦ Camera repositioning

♦ Man down

♦ Added/removed objects, in particular a miniature camera dedicated to the card reader that is able to identify the application/removal of a component on the reader itself
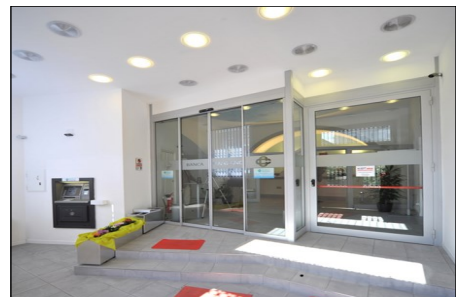
# Functional features of the System

INTEGRATION WITH PTZ CAMERAS (REMOTELY CONTROLLED)

MDS Control correlates information extracted from the video of a camera with one or more PTZ cameras, providing automatic pan, tilt and zoom based on the events generated by the System. Automatically controlling a PTZ camera allows the extraction of details imperceptible with the sole scene camera.
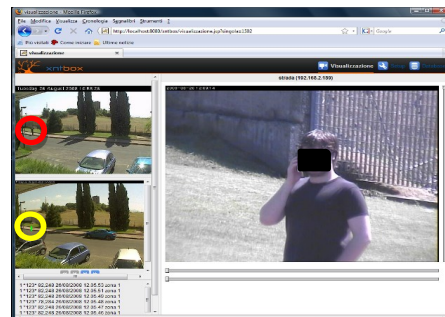

SENDING THE EVENT STRING TO A REMOTE CLIENT

Customization of the "event string" (what the System returns as a description of the event accordingly to the user's request). Sending of the event to a remote location (as "event string" and frame) to the Control Rooms specified by the user.
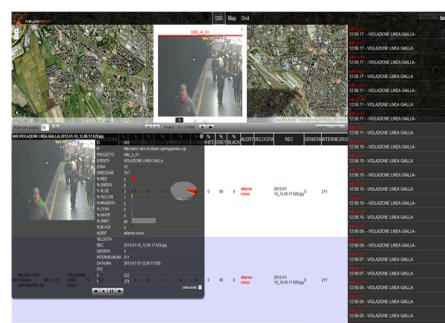

STORING IN A DATABASE DATA GENERATED BY EVERY SINGLE EVENT

Every information related to each event is stored in a DB: color, speed, direction, coordinates (x-y position in the field of view), etc.
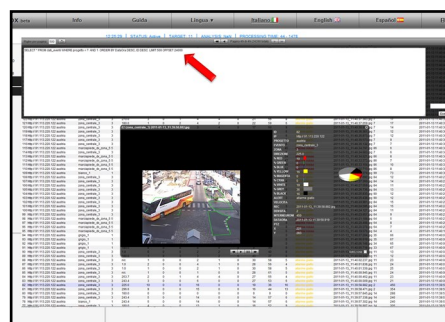

SENDING THE EVENT TO PREPROGRAMMED EMAIL ADDRESSES

Upon the occurrence of the (programmed) event, the corresponding frame will be sent (if so required) as an attachment, by the email function.
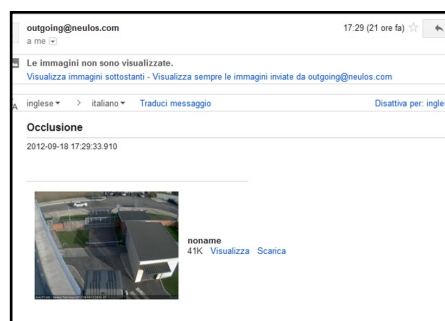
INTEGRATION WITH AUTOMATION INTERFACES

Building automation management of external hardware (input/output of information through external sensors and devices) associated with the event: spotlight control, siren control, gates control, announcements with pre-recorded voices, etc.
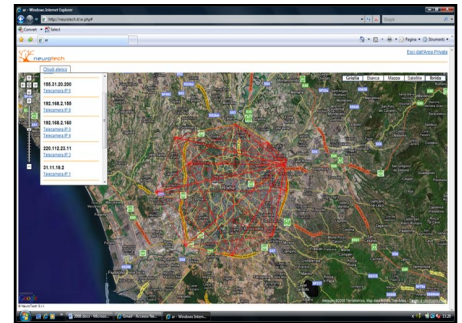
Functional features of the System

neulos
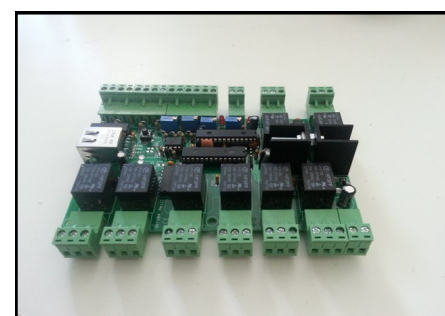
EVENT MANAGEMENT IN A G.I.S. (Geographic Information System)

The events provided by cameras and sensors are analysed by the System and georeferenced in a web user interface, accessible through the Internet.

### ASSOCIATING EVENTS WITH A 24/7 RECORDING

It is possible to associate the event frame, returned by the System, with a video a few seconds long that details the dynamic that generated said event.
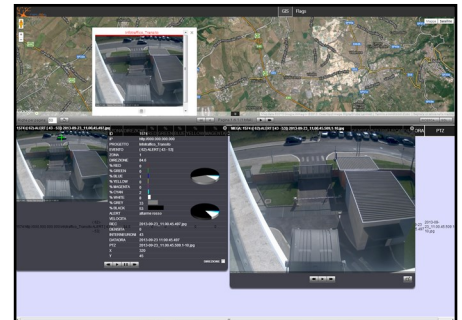

CALENDAR PROGRAMMING

It is possible to program days and hours in which the System should be operative through simple graphical interfaces.

Each calendar function (24/7 - 365 days/year) is operated via intuitive graphical interfaces.
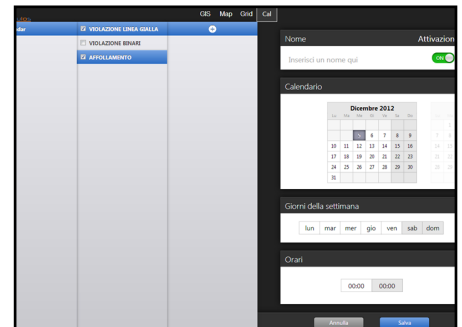
STATISTICAL ANALYSIS AND REPORTING

The System is capable of performing real-time statistical analysis, reporting the information generated by the system itself.
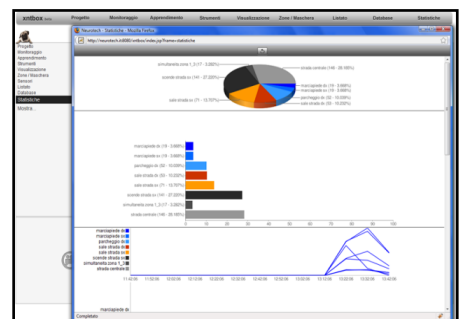
ROBUSTNESS TO SUDDEN CHANGES IN ENVIRONMENTAL LIGHTING

The System is capable of understanding every variation in environmental lighting both indoors and in open spaces, and it is capable of returning this information without disrupting the analysis of the dynamics, eliminating the return of false alarms.

...self control

MDS Control verifies the correct efficiency of every single camera, performing (where available) several actions to restore the correct functioning of the installation.

Whenever these actions don't allow the recovery, the System sends an automatic alarm to those in charge of the installation.

The following are some actions that the System is capable of performing automatically:

♦ video connection verification;

♦ automatic attempt to recover the connection and eventual report of the dropped connection;

♦ creation of a log file with information about connections / disconnections / recovery;

♦ verification of lighting conditions adequate to performing the analysis;

♦ control of conditions of good visibility (fog, smoke, etc.) expressed as percentage and alerts related to one or more predefined thresholds;

♦ reporting camera failures;

♦ reporting the changing in position / misalignment of the cameras;

♦ reporting video occlusions: e.g. obscuring;

♦ reporting failures of automation devices associated to the video analysis System.
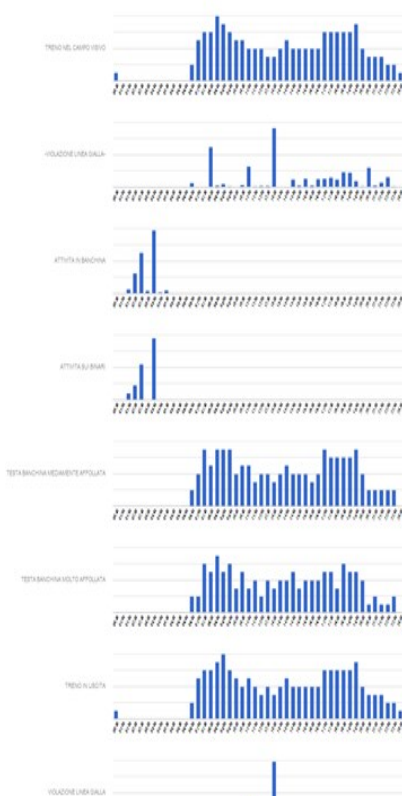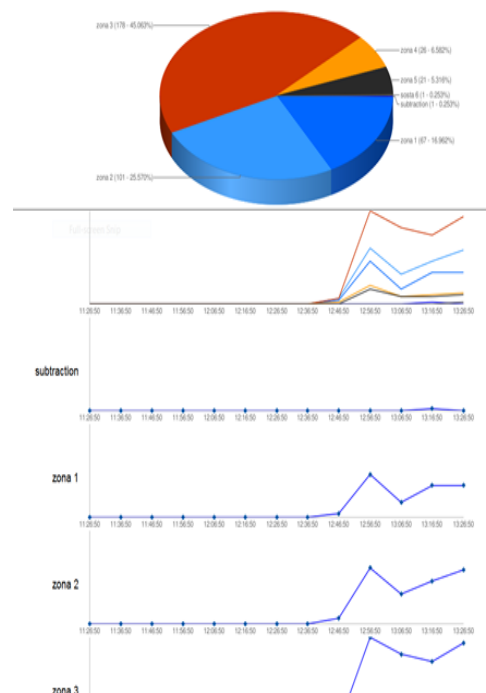
...reports and structured data

MDS Control draws up general statistics on the operation of the System, detecting and aggregating information requested by the Customer.

Following are a few possible activities:

♦ number of generated alerts by type;

♦ alerts description: type, time, reoccurrence (frequency, periodicity, infrequency), etc.;

♦ events associations: dynamics, combination of events, etc.;

♦ operation of the System (anomalies on a single camera, anomalies on a single machine, System anomalies, etc.);

♦ extraordinary events recognised by the System but not programmed on the scene;
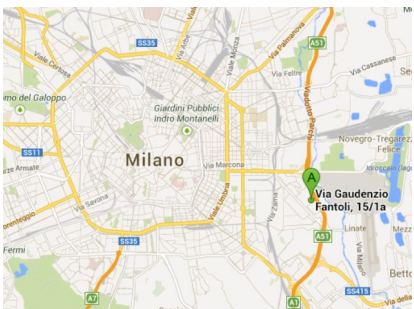
♦ events not recognised by the System.

The generated statistics are utilised to create new controls to be implemented in the programming of the scene, that is to suggest new controls aimed at reinforcing the dynamics to be analysed.

Contacts
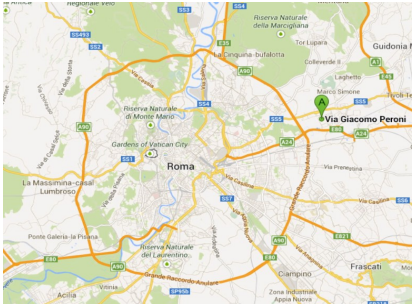
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