



## Best Practices for Securing Outdoor Areas with Video Analytics

### What You Will Learn

Video analytics promises to boost security efforts by automatically alerting personnel to take action when a security event occurs. Intelligent sensors never tire, can cover large distances, and “see” what the eye would miss, even in the absolute darkness. People can then make smart decisions when actual violations happen.

The key to the effective application of video analytics in the outdoors is to use best practices of installation and equipment selection to achieve stable operating performance.

This white paper presents several best practices for deploying outdoor video security solutions, including how to:

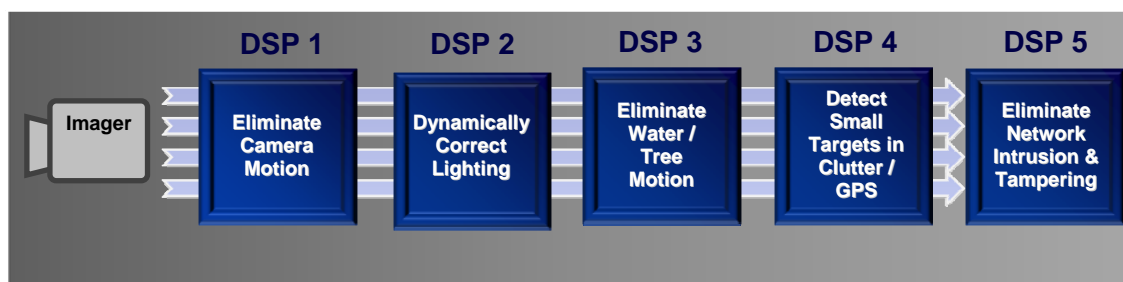
- Reduce outdoor security nuisance alerts
- Pinpoint security violations as they unfold
- Address blind spots under the camera
- Determine a camera’s true detection range
- Address nuisance alerts caused by changing lighting conditions
- Package to survive the outdoors
- Contain security costs: Seaport case study
- Use best practice tools that may be helpful

## Reducing Outdoor Security Nuisance Alarms

Outdoor surveillance cameras, which operate by detecting movement within their field of view, must contend with an environment that is constantly changing. Cameras are mounted high on poles which shake from slight wind or vibration. Clouds create moving shadows on the ground. Trees and leaves flap in the breeze, creating more movement. When you add in rain, snow and dust, such a dynamic environment can cause an abundance of nuisance alarms that quickly overwhelm security efforts.

Discerning legitimate targets from natural motion is a significant task considering the amount of data that a camera needs to analyze over a large outdoor scene spanning hundreds of meters.

Doing so is best accomplished with cameras that bring a high degree of video processing to analyze the scene. When such processing capacity is placed directly within the camera, 100 percent of the raw scene data becomes available to the video analytics, making it possible to examine the full visual detail of every video frame, eliminating – at the source – all the impediments that would otherwise trigger nuisance alarms.



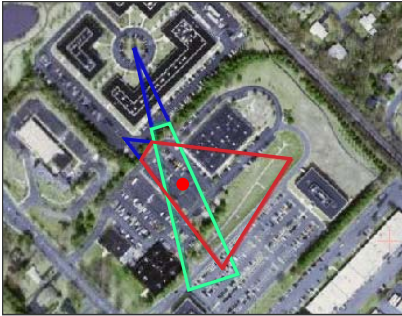
**Figure 1: Intelligent Camera with Multiple Processors**

Figure 1 illustrates such an approach, which requires multiple processors embedded into the camera. This allows the camera to first electronically stabilize the image to eliminate camera motion, dynamically correct for changing lighting, fog, rain, snow and sandstorms, and eliminate motion from small animals, blowing debris, trees moving in the breeze and reflections from water, while increasing the probability that pedestrians or other objects of concern will be detected.

Alternatively, systems that employ video content analysis outside of the camera must compress the scene data for network transmission, removing most of the finer scene details. In such systems, often as much as 99% of the data is removed. In the outdoors, the loss of so much detail proportionally degrades the ability to accurately detect targets. Such systems also lack the necessary image processing to compensate for the outdoor variables.

Integrating the imager directly with the video analytics – inside the camera enclosure, with a high degree of processing the edge – is the cornerstone of a smart camera's ability to accurately detect targets in the outdoor environment.

## Pinpoint Security Violations as They Unfold



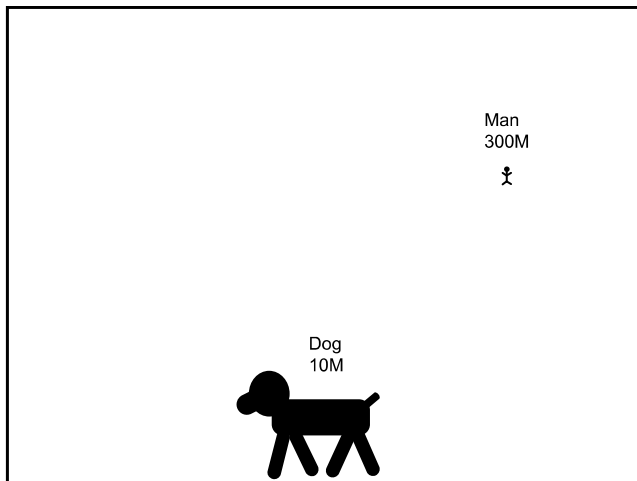
The goal for any security organization is to maintain awareness of the risks that are lurking and quickly obtain reliable information about the place and nature of an intrusion. Intelligent cameras can meet these goals when they are inherently “geo-registered.”

Geo-registration, which means that the camera’s field of view (FOV) maps the GPS coordinates of all points in the landscape under surveillance, unlocks key functional benefits:

**Situational Awareness:** Physical Security Information Management (PSIM) software can use the target location data to display the topological positions of detected objects, overlaid on a top-down map of the surveillance area.

**Steer PTZ Cameras:** PTZ cameras are often used to watch outdoor areas, but when applied to large areas, trying to use a PTZ camera's narrow view to find targets manually almost guarantees that events will go unnoticed. GPS information about detected targets can be used to automatically direct PTZ cameras to the exact location of an alarm to zoom and follow an intrusion in real-time.

**Geo-Registration Provides Detection Accuracy:** Geo-registration enables a three dimensional capability to ascertain the size of all moving objects in the field of view for making accurate security determinations. This is particularly important over expansive areas, where small objects close to the camera will appear substantially larger than a person standing off in the distance. This is illustrated in Figure 2.



View from the Camera  
Note: Dog at 10M is about 250X larger than man at 300M

**Figure 2: Depth Perception with Geo-Registration**

In this example, a dog at 10 meters from the camera is approximately 250 times larger than a man appears to be at 300 meters. Cameras that lack geo-registration will interpret that the dog is the larger object and

send an alert, while ignoring the person-sized object in the distance.

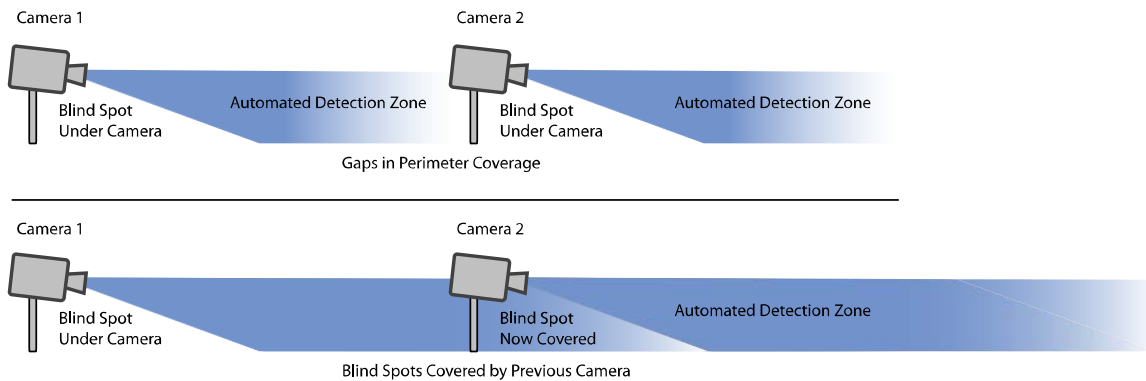
Conversely, cameras which employ geo-registration will detect man-sized objects anywhere within their field of view, whether near or far from the camera, and ignore small animals, blowing trash or debris.

## Addressing Blind Spots Under the Camera

Many outdoor surveillance designs will narrow a security camera's field of view to increase the camera's detection distance in an effort to decrease costs. Doing so will extend the "blind" spot under the camera leaving gaps in coverage that may extend great distances.

The example shown in Figure 3 depicts two perimeter security designs using cameras mounted at twenty feet off the ground with a seven degree horizontal field of view. In the top design, the coverage range of "Camera 1" stops near the base of the pole of "Camera 2", leaving approximately 60 meters of unprotected area where intruders can enter undetected.

The secure approach is shown in the bottom design. Here, a longer range cameras are used to extend the automated detection zone of "Camera 1" to cover the blind spot of Camera 2.



**Figure 3: Addressing Blind Spots**

## Determine a Camera's True Detection Range

Understanding a camera's true automated detection range represents another best practice for addressing potential gaps in your perimeter security design. Doing so is accomplished by measuring the camera's detection range when a person walks directly towards the camera, rather than across path of the camera's field of view, as shown in Figure 4.



**Figure 4: Determining a Camera's True Detection Range**

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Walking across a camera's view creates a lot of motion, making it easy for the camera to detect the object. On the other hand, when a person moves directly towards a camera, the camera's detection is limited mostly to leg motion, which is a much smaller variation and more difficult to detect at greater distances.

In the real world an intruder will just as likely walk towards a camera as across its view. As a best practice, be sure the camera manufacturer provides the reliable detection distance at which a pedestrian can be detected walking towards the camera under environmental conditions that reduce image contrast, such as rain, snow, and fog. A solid perimeter security design must be prepared for these worst-case but common situations.

## **Addressing Nuisance Alerts from Changing Lighting Conditions**

Outdoors, widely changing or poorly lit environments create unique difficulties for video analytic cameras. Cameras which employ a high degree of image processing and extract 100% of the scene information are often able to maintain a high detection rate even under low or varying light conditions.

However, headlights that sweep across a visible camera's field of view represent a special challenge, even in areas where extra illumination has been added. This is because the amount of lighting that can be added along a perimeter is small compared to the intensity of the headlights themselves.

The use of From/To rules can be effective where headlights cause nuisance alarms. Unlike more common "trip-wire" rules, which are triggered when a detected object crosses an arbitrary line in the camera's field of view, more sophisticated From/To rules use spatial characteristics such as size, speed, bearing and persistence.

From/To rules are invoked when an object that maintains persistent tracking and represents the size of a pedestrian moves from one region of the scene (the "From" zone) and enters the other area of the scene (the "To" zone). In this case, the camera will determine that the detected object represents a credible threat and send an alert. This is accomplished with the combination of a pedestrian-sized filter along with a From/To zone to greatly reduce the likelihood of headlights causing a nuisance alert with a visible camera.

The use of thermal imagers represents another desirable approach for solving lighting challenges. These include surveillance applications over water, where reflections would cause difficulty for visible cameras, or for surveillance applications that take place in total darkness.

## **Packaging to Survive the Outdoors**

Enclosing an indoor surveillance camera in a protective enclosure might protect against some conditions, such as rain, but it does not protect against humidity, sand, and extreme temperatures. In the outdoors, normal expansion and contraction occurs due to the thermal changes throughout the day, allowing grit, dust or humidity to possibly enter the camera housing and impact the electronics, while reducing the service life of the camera.

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To address this, choose cameras which have been sealed and nitrogen-pressurized to keep weather from entering into the enclosure, even in extreme conditions. For example, some cameras can operate in environments that range from the Canada Oil Sands to the Middle East due to their sealed enclosures and thermal dynamic packaging to manage heat from the processors.

## Contain Security Costs: Seaport Case Study



The same multi-processing power that gives video analytic cameras their ability to accurately detect targets often gives them extended range and area coverage – in many cases three times as much distance or area as other cameras. As a result, there is a proportionate project cost savings – typically on the order of 50% – from the elimination of the extra

cameras and poles, construction, trenching, power and network connectivity that would have otherwise been required.

A recent video analytics application at a seaport exemplifies the ROI from using long-range and accurate outdoor surveillance to minimize costs, as opposed to limited-range alternatives.

In this situation, the port had originally designed a perimeter deployment using 80 cameras of megapixel type mounted 300 feet apart. Several practical problems arose when the port project went out for design. For one, much of the perimeter was in areas with little or no lighting, making the megapixel technology ineffective, while cutting down on each camera's range, leaving gaps in the perimeter with no coverage. The design was also plagued by cost overruns that exceeded the budget; 80 cameras meant the purchase and installation of 80 poles along with the wiring and trenching costs to bring network connectivity to each. Adding to the cost concerns was the need to wire beneath the rail line that bordered the perimeter.

By selecting long-range thermal intelligent video cameras, the port was able to reduce the number of cameras for the deployment from 80 to 20, while extending coverage over the entire perimeter, eliminating all gaps in coverage. Instead of 80 megapixel cameras, 20 thermal cameras were placed at 1500 feet apart, while providing 24 hours of automated surveillance, day and night, with no gaps in coverage.

In the final analysis, the port was able to reduce their overall project costs – cameras and infrastructure – by 40%, savings hundreds of thousands of dollars, while gaining a security system with minimal nuisance alarms and great security efficiency in the outdoors.

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## Best Practice Tools that May Be Helpful

SightLogix has developed an online tool called SightSurvey which can determine a camera's automated detected range while considering issues such as blind spots and obstructions as part of a best-practice security design.

SightSurvey allows security planners to adjust camera angle, Field of View, and camera pole height on "virtual" cameras overlaid on a Google Maps depiction of an actual site to ensure proper coverage. The software also provides a very accurate camera count that includes the GPS locations of each camera to aid in accurate positioning.

- **More information about SightSurvey:** <http://www.sightlogix.com/sightsurvey.html>

SightLogix also offers a no-cost Design Support Center to walk security professionals through the various issues that arise when planning a perimeter security layout and apply technology in the most successful manner.

- **SightLogix Design Center:** [http://www.sightlogix.com/design\\_support\\_request.html](http://www.sightlogix.com/design_support_request.html)

## Conclusion

Deploying video analytic systems for outdoor areas and site perimeters can be surprisingly cost-effective while at the same time, be trusted, secure and highly accurate. By applying a best practices approach, organizations can meet outdoor security objectives with much higher levels of accountability and cost effectiveness.

SightLogix is an established technology leader in proactive, long-range and wide-area automated surveillance solutions specifically designed to protect critical outdoor infrastructure and key assets. The company's open-architecture, Intelligent Video Surveillance system provides full situational awareness to increase the effectiveness and efficiency of security manpower.

## Information and Resources

- To perform an online perimeter security design of your facility in minutes, visit: [www.sightlogix.com/sightsurvey.html](http://www.sightlogix.com/sightsurvey.html)
- To request Design Support, visit [www.sightlogix.com/design\\_support\\_request.html](http://www.sightlogix.com/design_support_request.html)
- To read more about SightLogix technology, visit: [www.sightlogix.com](http://www.sightlogix.com).
- To request a meeting with a solution specialist, email [info@sightlogix.com](mailto:info@sightlogix.com) or call 609.951.0008.

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