SightLogix


Automated Surveillance
To Rule Outdoors!
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Outdoor Surveillance

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Automated Surveillance to Rule Outdoors

Vulnerability starts at an organization's perimeter. When the perimeter is penetrated, access to any other part of an organization or its assets can be a simple task. Even with this clearly defined need for protecting the perimeter there has yet to be an outdoor video surveillance system that meets all the needs and expectations buyers deserve. When you understand the problems and complexity of what is involved in installing, using or specifying outdoor surveillance you will be able to separate marketing hype from facts allowing an informed decision. This paper describes the problems that make outdoor video unreliable, prone to false alarms, and restrict its range and effectiveness.

This paper also explains how SightLogix with their deep understanding of outdoor video surveillance and high-technology product development experience developed the SightSensor Systems. They are the first company to finally integrate everything you would need into one box and one system for outdoor video surveillance and analytics. The result is a sophisticated solution made simple and affordable.

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Outdoor Surveillance

The need for video surveillance is so strong that we have either accepted inferior solutions, or overpaid for complex convoluted systems. Digital technology, improvements in video analytics and lower component costs have alleviated some of these problems. However providing consistently reliable high quality video in an unpredictable outdoor environment remains problematic.

Imagine if before you got into your car you would have to assemble all the parts to make it work. Yet that is what we have asked designers, installers and users of outdoor video surveillance to do. This paper examines the challenges of outdoor surveillance, the complexity and issues needed to consider before designing a system and some simpler solutions for achieving the results.

Outdoor Surveillance Needs

Outdoor surveillance is useful for perimeter monitoring and warning as video provides information not available with other technologies. Areas outside are generally more vulnerable; not protected by walls and locked doors. With outdoor video the security team has the chance to detect an approaching threat early. The further away a threat is detected, the more response time there is available to the security team. In the case of a disaster, the response teams can generally get a better picture of the scope and nature of the problem from an outdoor camera than an interior camera with a limited view.

The problem with outdoor surveillance is that the cameras that make this possible are designed for indoor use. The typical solution for outdoor use is to put the camera in a weather-proof enclosure, but this does not begin to solve all the problems. Bad illumination, shadows, rain and snow, temperature extremes, strong winds, large areas to cover, limited network connectivity and potential network vulnerability are all challenges to effective outdoor surveillance.

The Lighting Problem

Bright sunny days and cloudy moonless nights are extremes on the spectrum of available lighting but they are typical for outdoor surveillance. Add to this the fact that the sun moves from east to west all day, creating changing shadows and potential glare problems, the lighting situation is always dynamic. Effective outdoor surveillance must be able to accommodate the various extremes in lighting conditions. Software that would attempt to detect moving objects or people needs to be able to ignore shadows while still detecting movement in those shadows. Light reflections off water are very common near large bodies of water or even the simple fountain or retention pond found in many industrial parks. These moving reflections often generate false motion alarms in many systems. These simple systems attempt to eliminate this problem by masking out the portion of the frame where this “motion” occurs, but the result is a hole in the system where motion is no longer detected at all.

The Weather Problem

Rain and snow along with temperature extremes are hard on electronic equipment and are the reason indoor cameras are placed in special enclosures when used outside. But even if the camera electronics are protected, temperature and precipitation can create a fog on the window the camera looks through dramatically reducing the field of view.

The Problem with Motion

Anyone who has fired a gun or looked through a telescope knows that at long distances a small change in angle at the source makes a big difference at the target. The same problem occurs with cameras mounted outdoors; the further an object is from the camera, the more a small movement of the camera appears to be large motion of the object. Wind moving a camera, even a little, can generate many false motion alarms. Software attempting to analyze video assumes that the camera is stable and not moving and wind introduces error making it difficult if not impossible to track small objects a long distance away.

The Coverage Problem

Longer distances and large areas are characteristic of surveillance outdoors. Usually the more area a camera can cover, the fewer cameras that are needed to cover the same area. Since the field of view, distance to the target, and image resolution determine the minimum size of a detectable target, the key to fewer cameras is reliable detection with the fewest pixels per target. Even though mega-pixel cameras are becoming commonplace today, but higher resolution is only effective if sufficient processing power is available to process all the pixels and the previously described problems of lighting and stability are solved.

The Bandwidth Problem

High resolution video generates a lot of video data. Sending that data from a camera to a recorder or computer for analysis requires a high-speed network, but high-speed, hardwired network connections are rare at outdoor locations. The common solution for limited network bandwidth is to limit the resolution or frame rate but that reduces the available data and, as a result, reduces the effectiveness of the coverage. Even if a high-speed network connection is available, most network administrators limit the amount of traffic dedicated to video surveillance.

The Network Perimeter Hole

Many companies today have established the perimeter of their network as the first line of network defence. Firewalls and limited Internet access are used to separate the dangerous outside world from the hopefully safer internal network. Assuming a high-speed network connection is available to the camera providing outdoor surveillance, this introduces another potential problem. Any connection to the outside world must be considered a potential external network access point. Outdoor cameras connected to the network must be considered as external devices and managed accordingly.

The Installation Nightmare

As if the challenges listed above were not enough, the solutions to these problems can be equally challenging as the integrator attempts to manage the interactions between light levels, camera resolution and frame rate, motion sensitivity, alarm thresholds, camera calibration, and bandwidth limitations. Finding the optimal settings can be frustrating and demand a knowledgeable expert.

Outdoor Surveillance Solutions

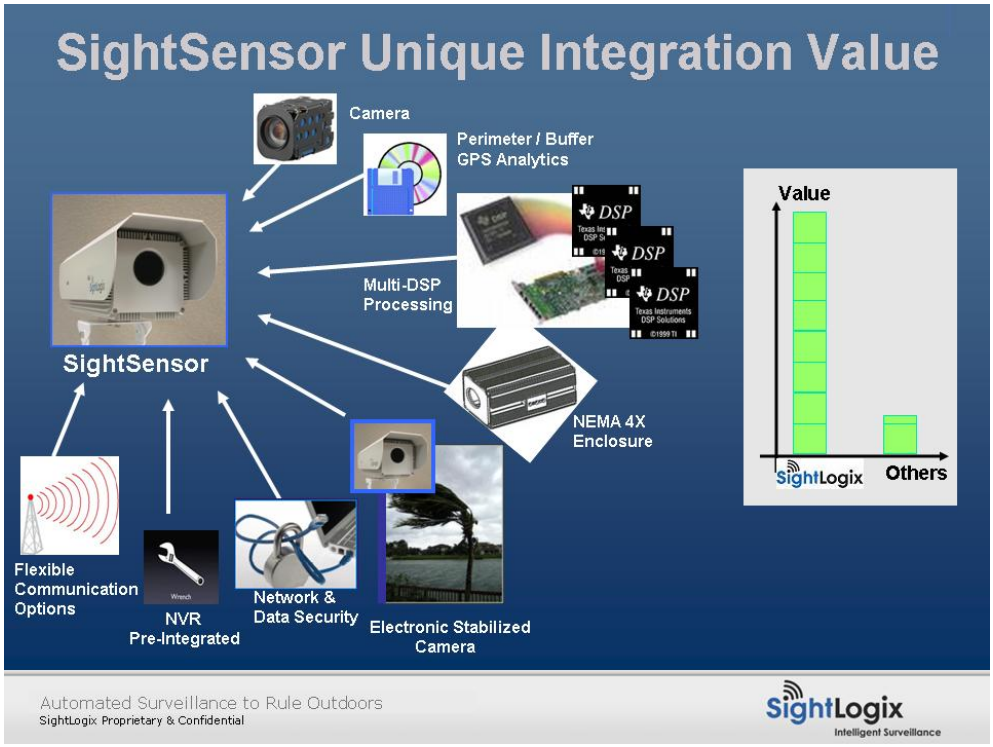

Figure: SightSensor integrated surveillance solutions, designed for the outdoors

SightSensors from SightLogix have been designed specifically to address the problems of outdoor surveillance. These cameras are designed as a solution system, meaning they are easy to install and contain everything needed without requiring the installer to be a technical expert. The complexities of set-up and calibration have been solved and default modes provide the benefit of SightLogix many years of experience with these kinds of systems.

The Lighting Solution

SightSensors are offered in both visible and infrared spectrum versions, which can also be combined in a single package. The visible light version consists of a fixed position day/night camera and optics package. Color viewing is supported during daylight switching to low-light Near Infrared (NIR) viewing at night or for low light conditions. Built-in optional backlight compensation and automatic white balance adjustments help to deal with the changing position of the sun or external lights introduced into the field of view such as vehicle headlights. The infrared version consists of a fixed position long wave infrared camera capable of seeing in complete darkness. Attempting to control outdoor lighting over large areas can be difficult, but with these camera options the installer has the ability to make choices that best balance the video surveillance needs with the available lighting conditions rather than trying to accommodate a camera designed for indoor use by controlling the lighting conditions.

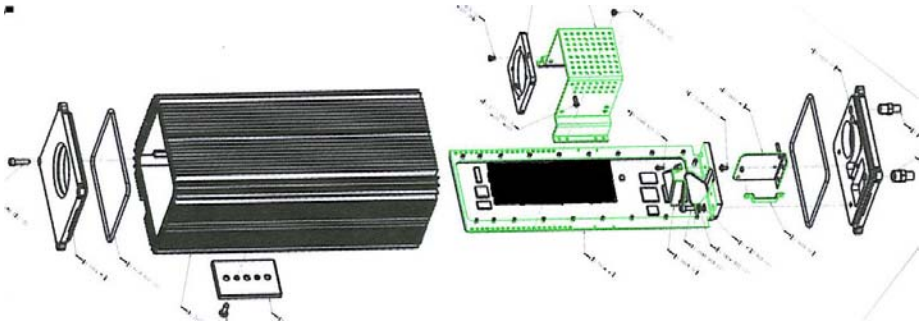

Figure: SightSensors are packaged in a NEMA 4X enclosure for 24/7 operation, anywhere

The Weather Solution

SightSensors are packaged in a sealed, nitrogen-filled enclosure with a camera-appropriate viewing window to prevent internal condensation that might obscure the camera's view. This enclosure along with an optional heater for extreme cold environments allows the camera to perform easily from -22°F to 122°F. This package has been certified to Mil-STD-810 for temperature, shock, and vibration. The enclosure is rated for IP 66 or NEMA 4X which means the camera will be undamaged by rain, sleet, snow, windblown dust, splashing water, hose-directed water or the external formation of ice on the enclosure. This camera was designed to live outdoors.

The Motion Solution

High powered processors integrated with the SightSensors allow the camera to recognize motion caused by wind, shadows, lighting conditions or vibration and separate that from the motion of an object or person crossing the field of view. The resulting image allows the camera to reliably recognize the motion of very small images at much longer distances possible with standard cameras. This feature alone dramatically reduces the rate of false motion alarms, but when combined with the on-board video analysis capability this becomes one video alarm source you shouldn't ignore.

Extreme Coverage

With high-resolution imagers combined with powerful processing, the SightSensor can accurately detect an intruder at up to 1,500 feet away from the camera even in less than ideal outdoor conditions, which is three times the distance of a typical camera. Increasing the distance by three increases the area covered by the camera approximately ten times. More area covered by each camera means less cameras needed which, in turn, results in lower installation and maintenance costs.

The Bandwidth Solution

High resolution and high frame rates result in exponentially higher amounts of video data. Lowering either of these parameters, to squeeze the data through a limited data connection, results only in lost data. SightLogix makes use of the advanced processing power in the SightSensor to watch the video for you and use sophisticated analysis techniques to send alarms only when an unusual condition occurs. The SightSensor has two simultaneous video feeds and can present live video as well, but the net-centric SightSensor is designed to operate over low-bandwidth wireless networks and be a well-behaved component of any IP network. The system administrator can determine the bandwidth used and the rules under which an alarm is sent or simply rely on the default modes developed with years of experience by the manufacturer.

Network Protection

With the increase in wireless networks and mobile users many network administrators are beginning to realize that the days of defending the network perimeter are numbered, but SightLogix understands the importance of protecting the network and has designed the SightSensor to support authentication and encryption for all communications and video signals. Configuration and software upgrades all require confirmed and encrypted communication. The latest industry standard encryption standards are used and standard IP network protocols observed.

Integrator Ready

SightLogix cameras are distributed through security and IT integrators. System set-up must be easy because the typical training session takes only about an hour. One of the best features of the SightSensor is that SightLogix has already done the hard work and packaged a reliable camera that solves the various challenges of outdoor surveillance in one, easy to install and easy to operate package.

SightLogix has also developed the **SightSurvey** tool that allows the integrator to prepare a very impressive proposal for their customer by using Google Earth's satellite maps to provide an overhead view of the customer site and easily overlay the proposed camera fields of view. The additional distance and area of coverage provided by the SightSensor becomes evident as well as giving the customer an excellent idea of the views that will be provided by the cameras. The proposal then becomes the installation plan further simplifying the installation for all involved.

More Than Outdoor Expertise

Beyond outdoor solutions, SightLogix recognizes that some issues are universal to video and has addressed many of these concerns as well.

Analytics

Nobody can or wants to watch hours of video where nothing interesting happens. Psychological studies have proven that even when people are paying attention to a video they tend to miss behaviors or actions they were not looking for. Video analytics bring the power of the computer to analyzing the video in real-time for situations that you, your experts, or general industry experience have determined to be worthy of special attention.

SightLogix uses the power of the advanced processors in their package to bring the power of video analysis out to the camera. In addition to the image stabilization and clarification mentioned previously, the processors can also analyze the content of the video. The SightSensor is able to track as many objects as there are in the field of view. The entire field of view can be divided into a collection of zones, each with different alert criteria. Alarm zones can be associated with a set of rules that specify more precisely the conditions under which alarms are generated. These rules restrict alarms by time, by tripwire, by previous path, or by target attributes such as target's size, speed, direction and shape (aspect ratio). Tripwire alarms can be triggered on entry, exit or both.

There are three major advantages to moving this analysis capability out to the camera:

1. The first advantage is that he data being analyzed is closer to the source providing the ability for the software to even adjust video parameters in real-time to optimize the data for the best analysis possible. Optimizing video in real-time requires very quick feedback that is simply not possible over standard information networks. By having this processing power at the camera, the SightSensor can provide image clarity in a wide variety of scenarios not possible with other technologies.

2. The second advantage is that this architecture provides massive parallel computing capability with each camera independently, simultaneously analyzing its own video in real-time. Analysis of video acquired by a SightLogix camera is not affected by the number of cameras in the system or by the amount of traffic on the network, or by other processes running on the NVR or other system computers. Alarm behaviors will be reliably detected in real-time and reported promptly.

3. The third advantage of this on-camera processing power is that the determination of whether the video data is interesting or not is made before the data even leaves the camera. You can choose to minimize network bandwidth by sending only the alarm notification, or you can choose any combination of alarm notification and video data up to sending both video feeds at maximum resolution and frame-rate if your system can handle it. Having analysis power at the camera gives you meaningful bandwidth control not available if you have to process the video data after it has been transmitted.

Geographic Calibration

Determining the size of an object in the field of view or its distance from the camera is a matter of human judgment in many systems. This leaves a lot of room for error and is not useful for automated video analysis. As a result some systems are calibrated by having the installer take measurements from the camera to various fixed targets in the field of view and then entering that information laboriously into the analysis software.

SightLogix has greatly simplified this process and improved the resulting information by making use of geographically registered maps such as the satellite maps available through Google Earth. Calibration is a simple matter of locating the camera by placing an icon on the map and then marking two points of reference on the map that are in the camera's field of view. Software from SightLogix, called **SightMonitor**, uses these three points to configure the camera. Once configured, the camera can provide GPS coordinates for any object in its field of view and provide these coordinates in any alarm notification.

Mobile Solutions

SightLogix has a Mobile Deployment Kit designed as a self-contained system mounted on a trailer complete with battery backed solar power, wireless network communication and an adjustable pole-mounted camera. One person can easily transport and install this system in minutes providing flexible solutions to meet dynamic situations. An even more portable solution, the Rapid Deployment Kit comes in two carrying cases and provides the camera, tripod, connecting cables, and installation instructions. This solution provides reliable intelligent video quickly and easily at high-risk venues or short-term events. For both of these solutions the behavioral and alarm rules can be pre-

configured to minimize set-up time or default modes are also available requiring no software set-up at all.

Integration Ready

A camera is obviously only one component of a video surveillance system. SightLogix understands the need to provide a component that is easy to integrate as well as easy to install and operate. The SightSensor emulates the control protocol of the widely used AXIS IP camera to minimize integration with existing systems.

About SightLogix

SightLogix is led by a seasoned management team with successful backgrounds in product development and business. The business managers are veterans of video surveillance, IT security and camera markets. The SightLogix technical team is comprised of innovators who have led the development of several generations of video processing and camera electronics architectures.

In earlier engagements, SightLogix' founders led the evolution of the first generation of IVS architectures primarily designed for indoor and short-range applications. They created SightLogix specifically to address the need for a viable outdoor IVS solution

If you have further questions about SightLogix or SightLogix's products you can contact Mr. Deepam Mishra, Vice President of Marketing at dmishra@sightlogix.com or see our Web site at www.sightlogix.com. SightLogix is located at 745 Alexander Rd, Suite 5-6, Princeton, NJ 08540, USA

This white paper was written by Warren Simonsen of Sandra Jones and Company under the direction of Deepam Mishra of SightLogix, Inc. It is the result of the review of the products and information supplied by SightLogix and interviews with select SightLogix personnel, our own market and engineering knowledge, available existing third-party market data, and information obtained from multiple data sources including our own files, the internet and engineering resources.
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