

HOW VIDEO ANALYTICS IS CHANGING THE WORLD OF SECURITY

WHITEPAPER

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ABSTRACT

Security professionals draw upon decades of training and experience when developing plans to protect sites and people. Systems they design can cover a wide range of requirements, from preventing accidental deaths in residential swimming pools, to catching thieves in retail stores, to defending high-risk facilities from attack or intrusion. However, the underlying principles for security and safety are basically the same in all applications:

Situational Awareness: Knowing what is happening at the site, along with the expected activities and potential dangers.

Early Warning: Providing alerts and notification before serious problems occur. The sooner you can identify potential breaches or risks, the stronger your protection will be.

Controlling Access: Limiting those who are allowed to enter and when.

Recording Activity: Capturing information to identify and prosecute offenders creates a significant deterrent against crime, and provides evidence for prosecuting criminals.

Responsiveness: Preparation, training and tools to respond rapidly and appropriately when an alarm occurs.

It is rare to find a single technology that can improve every one of these five basic security functions at the same time. Video analytics are producing exactly such an impact. More importantly, systems that can extract information from video promise to bring us closer to how ideal security systems should operate:

- Unobtrusive for those who live and work on the premises.
- Automated, so they require minimal human effort when everything is normal.
- Responsive to threats early enough to prevent problems before they occur.

Advancements in all these areas created by video analytics explain why this new technology might be the most significant breakthrough for safety and protection in the last forty years. This paper takes a look at the many ways that video content analysis is changing the world of security.



DIGITAL GUARDS

It is easy to see why guard service is the most popular means for protection. Look at how easily guards can size up a situation and respond. What parent wouldn't want a lifeguard who could sit by their swimming pool to watch the kids as they play? What store manager wouldn't want a full-time assistant who could recognize odd cash register ring-ups, or unpaid products walking out the door?

Even better would be if we could find guards that were invisible, so that they would intrude on no one until needed; were inexpensive, so that we could afford to use them everywhere; never slept or looked the wrong way, so that they never missed anything; and we could always trust them to watch out for our needs rather than their own.

Video Analytics promises to bring us closer to this ideal solution than any prior technology. Advanced content analysis systems today already have the ability to:

- Automatically extract information from camera feeds and warn you when something might be going wrong. It is exactly like having your own digital guard.
- Alert people anywhere in the world, providing them video evidence of the detected event.
- Allow for live real-time remote viewing to track and stay in touch with what is happening.
- Open up audio loudspeaker communication with the site, so that intruders can be warned away immediately, before it is too late.

One remote guard using video analytics can now provide protection for 50 sites or more, making protection far more affordable than ever before. As importantly, all 500 – 1000 analytics managed cameras across those sites are continuously monitoring every scene, providing superior protection. Guard tour services, where guards physically walk through the premises on a cyclical basis, can see only a small percent of what is happening. This is no match for the lower cost and constant surveillance gained through video analytics.

Studies show that after 22 minutes, guards watching a video scene will miss up to 95% of all activity. The human brain is simply not designed for long periods of constant watching and waiting for something to happen. Video analytics, on the other hand, is tireless. It never blinks or is distracted. The most advanced technologies get smarter the longer they study a scene. This is exactly what analytics do best.

These intelligent systems are beginning to replace onsite guard services in some locations, and are delivering alerts and reports directly to some managers. In other cases, they act as force multipliers, helping guards provide better protection with fewer resources. However, this touches on only one aspect of the revolution that will change the face of security.



THE GROWTH OF VIDEO SURVEILLANCE

Video has become the fastest growing segment in the security market for good reasons. It provides awareness of the premises from anywhere in the world to anyone with authorized network access. It becomes the eyes (and with audio, the ears) for whoever needs to see exactly what is happening. Video also captures and records critical information that can identify intruders and vandals. This is a tremendous deterrent, since what criminal wants to be caught on tape?

Up until now, however, video has been unable to provide early warning of critical events unless monitored by a guard. Recording the crime does not prevent the loss. Watching a thief drive off in a stolen car does not offer the same benefits as catching them before they break in.

Surveillance video has grown rapidly since its conversion to digital. Networked video creates more flexible, remotely accessible systems, along with higher quality and efficient storage. But think of how much more powerful video becomes once the system can automatically, accurately recognize when something important is taking place.

With over 100 million surveillance cameras worldwide, and more than 10 million new security cameras being installed every year, it still requires a pair of eyeballs to extract useful information. Cameras are literally blind without someone watching them. Most are recording video to digital hard drives or even VHS tape, but who can possibly look through the billions of hours of archived data? The vast majority of what is stored will never be used.

Video Analytics promises to change that. If cameras were useful before, when people had to watch monitors to see what was happening, they become far more powerful once analytics can extract action instantly from the scene and report it automatically. And recorded video becomes much more valuable when you can search through terabytes of data to mine the critical images you need at the click of a button.



NETWORK MANAGEMENT

The move to digital video has increased the growth rate of cameras because it enables easy access across LAN and WAN networks. However, the bandwidth requirement for video has placed a significant added demand on IT networks. High quality streaming video with VGA resolution can require 2-3 Mbps. Twenty cameras operating at this rate on a typical network can use up all available bandwidth.

New compression technologies are improving this gradually, but Video Analytics promises to solve the problem. Rather than streaming all the cameras all the time for storage and viewing, intelligent analysis allows you to transmit video only when something important is taking place. This not only allows hundreds of cameras to be used on a single network, whether wireless or wired; it also proportionately reduces the cost of video storage.

A single camera recording full resolution and full frame rate video using high quality compression will need about 1 GB of hard drive space every hour. This means that 10 cameras requiring 30 days of storage use up more than 7 TB. This is why you will find few installations that use full frame rate, high resolution recording unless it is absolutely necessary. They compromise by reducing quality to save storage space.

Video Analytics, however, offers the promise of high quality video for every important event. No need to trade off image quality for storage space or bandwidth. As the demand for mega pixel resolution grows, which increases the data generated inside the camera by four to ten times or more, content analysis will make it practical to usher in a world of higher resolution and superior quality video without straining networks.



ALARM VERIFICATION

The alarm industry grew out of the need for automated detection of intrusion and life safety dangers. Intelligent sensors have grown rapidly to serve this market need. Digital dialers made sensor information available to central monitoring stations, which were then able to notify authorities for the proper response.

However, if you can't see what is happening at the premises, how do you know if the alarm is real? Over 95% of all calls that monitoring stations make to local police and fire departments are false alarms. With the number of alarm systems growing every year, a huge burden has been created for law enforcement. Many communities have started demanding alarm verification to avoid wasting valuable resources, and penalties for false alarms are now common to offset the costs.

Video analytics promises to not only send timely verification clips of critical incidents for easy viewing by remote monitoring centers, but can also separate false events from real alarms. Video systems today can automatically recognize smoke and fire, determine if a real person tripped a sensor, and recognize who that person is. This is just the beginning.

There is hardly an alarm sensor used today that could not be verified automatically through video analytics: Glass break detection, doors opening and closing, motion sensing, fire and smoke alarms. Plus, video provides additional valuable information to monitoring stations, allowing them to see exactly what is happening and who is doing it. As the cost of cameras continues to drop rapidly, it is only a matter of time before video analytics becomes a part of every alarm system.



ACCESS CONTROL

Most security problems can be avoided by simply controlling access. It is now standard practice for large facilities to require badge readers and electric door locks. The big push today is to merge physical door security with network access. Why not use one credential to control both?

Passwords are the bane of IT managers. More problems occur from lost codes, and more breaches are caused by weak passwords than any other cause. The use of credentials significantly improves the problem, but this still doesn't verify the person with the badge is who they say they are. And badges can easily be lost or misplaced. Thus, biometrics is becoming the fastest growing segment in access control.

What few realize is that facial recognition, using video analytics, can be as reliable as fingerprint sensors, and are far less intrusive. Iris scanners, which are video cameras with analytics, are even more reliable, but have been difficult to use in the past. This is changing with new long-range technologies appearing. New products are already being tested that can eliminate the need for access control cards. In many cases today analytics are being used to provide higher levels of security. But we are not far from the day when video analytics will start eliminating the need for badges altogether.

Video analytics systems are also effective at detecting "tailgaters" – when more than one person or vehicle enters through a door or gate only authorized for one. Without the ability to see, it is hard for a system to recognize this breach.

People counting and crowd control are other areas where video analytics have begun to impact the market. And license plate recognition has become an integral option for gate control and parking lot monitoring.

RETAIL LOSS PREVENTION

Video content analysis is not only becoming more prominent as the front line for guard services and remote video monitoring, it is also being deployed in a rapidly expanding range of applications where it acts like a digital assistant manager: to keep an eye on business. For example, retail stores are placing cameras to monitor how long customers are waiting in line, to measure in-store traffic flow patterns, to track lost children, to analyze the effectiveness of marketing displays, to detect slip and fall accidents, and to watch the shipping and receiving docks.

In other words, video analytics can be designed to work just like an assistant manager to monitor and report just about any kind of activity. Where it is creating the most interest for retail, however, is in loss prevention.

Shrinkage for retail stores in the US alone was over \$40B in 2006, and continues to increase every year. Almost half of theft comes from employees, according to many studies, with a significant percent focusing around the cash register. As a result, retailers are beginning to install systems that use video analytics to detect improper cash returns and sweet hearting (when employees work with shoppers they know to steal from the store). Did the person at the return counter bring their product in from their car, or did they pick it up off a store shelf? Is a cash return being rung up when no customers are nearby? Are employees leaving out the back door with unpaid products? Video analytics can detect these losses and are showing significant improvements to retail profitability.



OUTDOOR SECURITY

Some of the most difficult and expensive areas to protect are outdoor areas and perimeters. Fencing is often deployed, but construction sites, for example, still experience over \$1B in theft each year, with less than 10% ever being recovered. Campus security has evolved significantly on most universities and colleges, yet over 60% of campus crime occurs in their parking lots. More and more utility substations are experiencing theft of wire, as the cost of copper rises, and protecting the perimeters of airports and high-risk facilities have always been one of the most challenging and expensive for security providers.

Guard services are often deployed when the need is high enough to outweigh the costs. However, guards have a difficult time covering a large area, and it isn't easy for people to keep watching and waiting for something that might never happen. Where guards excel, however, is responding to incidents once they are detected.

Many types of outdoor security sensors have been used for years, including buried seismic cable, IR beam detectors, outdoor PIR motion sensors, fence sensors, and others. The problem with all of these technologies, however, is that they produce large numbers of false messages and they are blind to the cause of the alarm. When these sensors are installed outdoors far from the nearest guard, how do you know when the detection is real? The answer, in most cases, is to install video cameras to allow validation of the alarms.

Since cameras are being installed for verification and recording purposes, why not turn them into intelligent detectors?

Video analytics are creating a new paradigm for outdoor security. Without the need for any other sensors, they produce fewer false alarms and more reliable detection. The one limitation is that adequate lighting is required. If this isn't available, another outdoor sensor can be used to turn on IR or visible lighting for visual recognition.

When solar power and satellite links are included, video content analysis systems can be used in even the most remote locations. Systems often include cameras with pan, tilt and zoom capability, so that remote personnel can see exactly what is happening. In some cases, video analytics are able to seize control of the PTZ cameras and automatically track and follow intruders, handing off each target to the next camera as they cross through the premises. Two-way audio is often used to warn the perpetrators away. Some systems can estimate distances to the intruder and include GPS radios to instantly display the target location and movement on a map.

Systems based on video analytics are far less expensive than other solutions yet produce far better results. In automobile dealerships, for example, fencing has been taken down once it was discovered that video recognition with remote monitoring created a superior deterrent. As a result, sales revenues for these car dealers have grown, since people are now welcomed and encouraged to peruse the lot to see the latest model cars.

Outdoor security has been so difficult in the past that it was often overlooked or avoided by security installers unless absolutely necessary. Video analytics is changing this, by making outdoor protection cost effective, reliable and easy to install. It can even reduce the cost of trenching cables, required by other outdoor sensors, by deploying portable systems with wireless links and solar power. This cuts installation costs dramatically, while offering much better detection and recognition.



THE FUTURE

Video Content Analysis has started making an impact, but the revolution has just begun. Digital video becomes far more valuable once it is paired with automated recognition. It is now possible to create instant alerts that capture video whenever anything is detected. No need to store terabytes of useless data. No need to tie up networks. And everything can be stored in a database that is easily searchable.

The power of guards is multiplied with video analytics. Live video and two-way audio combined with recognition offers instant response and situational awareness from anywhere in the world, through sensors that never blink or sleep.

Other security sensors can be verified and become more intelligent in combination with video analytics. Access control becomes almost transparent and easier to use, and it provides more useful information.

Outdoor security is finally practical and reliable.

As we move from the early stages of visual analytics to the more advanced technologies, where sophisticated behavior recognition becomes possible, the transformation of security to a solution based on video analytics will become even more obvious.

Fortunately, we do not have to wait to start reaping benefits from this new technology. There are practical applications today that provide better protection with significant cost savings. This is just the beginning of a change that will reach across and transform the whole world of security.

VideolQ is proud to be a pioneer and technology leader in this historic revolution.

