# VCA FENCING OFF INTRUDERS:
CHALLENGES FOR VCA IN PERIMETER DEFENSE

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Integration of video content analysis (VCA) in perimeter defense is one of the most challenging use cases as it has to cope with many sources of noise and be able to generate an alert without too many false alarms. Technological improvements and competition between vendors have brought prices down and further increased the presence of VCA not only in high security facilities but also in commercial and residential installations.

The origins of video content analysis (VCA) for perimeter defense are in video motion detection (VMD) technology that has been present since the early 2000s. In the beginning, VMD was only used to detect motion. Later, advancements allowed systems to estimate and differentiate size, color, speed, and direction.

The common use of VCA is for preliminary warning of possible suspicious events. "A physical perimeter is preferred as a first form of defense and as a visible deterrence to intruders," said Pieter van de Looveren, Global Marketing Communication Manager for Video Systems at Bosch Security Systems. "VCA supports perimeter security as an extra set of eyes supporting security personnel in
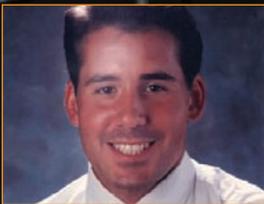
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the control room by alerting them when needed and helping them quickly retrieve the correct evidence when something happened." In other words, video analysis analyzes real-time images continuously to instantly detect suspicious events and alert operators when needed.

"The basic premise of analytics along a perimeter is intrusion detection," said Matt Bretoi, VP for North America Field Sales at FLIR Systems. "Many VCA solutions provide an extra level of intelligence, such as object classification, which significantly cuts down on false alarms especially when paired with thermal imagers. This is a critical factor for most end users. Another key benefit is the integral capability to visually assess and verify the alarm. Lastly, an analytics solution is not dependent

on fencing and even provides detection well beyond, or inside the perimeter if designed correctly," he added.

In addition, VCA also has an added value of not only complementing the physical barrier but also the abilities of the operators. It helps maintain situational awareness, an important feature that might be lacking in case there are low-level operators guarding the site or a high turnover rate of operators. It also helps keep the operators focused. "The same way we can't watch several football matches at the same time and keep track, it is also impossible for an operator to focus all the time on all the different screens," explained Nicholas Grange, Technical Director for South Africa-based C3 Shared Services. "The

most common use of VCA in South Africa is as a secondary layer of protection, to allow early detection of a threat before it reaches the boundary, thus creating extra reaction time. This is critical for our installations which usually have a perimeter several kilometers long, such as power stations, big housing estates, mines, and golfing communities."

TIPS TO ENHANCE VCA ACCURACY IN PERIMETER

The outdoor environment poses many challenges to VCA solutions. Meteorological challenges such as moving clouds, shadows, rain, snow, and lightning, as well as environmental challenges — lay of land, lights from passing cars, neighboring facilities, and fauna and flora — all generate many false alarms.

"In some verticals, for example in jails, a reasonable rate of false alarms are not a major concern, as guards can afford to check every alarm whether true or false. However, in other installations, where end users are more sensitive to false alarms, a high false alarm rate may force the users to lower the alarm threshold, compromise sensitivity, and maybe even miss intrusions," explained Hagai Katz, Senior VP of Marketing and Business Development at Magal Security Systems.

Two factors that greatly increase the success of perimeter VCA are proper illumination and sterile areas near the perimeter. However, these measures are not always

easy to create and maintain. In addition, in order to provide comprehensive security, a large number of cameras will have to be deployed at relatively short distances. "Therefore if we want a system that is composed solely of cameras we will need many cameras that will have to be connected to a central control room, with enough storage space for the video feed and constant calibration of the cameras and analytics making this a complex and expensive system to set up and maintain," added Katz.

To reduce false alarms, users can perform period calibrations of the analytic, choose a VCA that operates based on several alert criteria, or install a thermal camera. "We conduct periodic adjustments due to seasonal changes as well as changes in field of view such as new buildings, roads, and flora," said Grange.

"If you are looking for an exterior application in an uncontrolled environment, then you will want to have an analytic with multiple levels of criteria before detection. The more levels of criteria will improve the accuracy and drive down false alarms" explained Todd Brodrick, Director of Southwest USA at Pelco by Schneider Electric.

THERMAL CAMERAS REDUCE FALSE ALARMS

The combination of a thermal camera with video analytics is another way to overcome the false alarms problem. Thermal cameras are ideal as they do not require any light and can cover greater distances compared to visible light cameras. As such, they are not influenced by many of the factors that cause false alarms in regular cameras such as moving lights, leaves and trees, shadows, and other sources of noise and clutter the video analytic has to analyze.

Another significant benefit that thermal imagers provide is the consistently higher contrast, especially at night. Thermal imaging provides an optimized and more stable stream of information for the analytics to work with. This allows for fewer cameras to be deployed, lowering costs. In addition, thermal cameras are low-maintenance and require lower inputs to run, thus making them more 'green' compared to other technologies.

However, thermal cameras are not perfect. They give operators less forensic evidence to identify an intruder (for example, thermal cameras do not provide an intruder's clothes color). Thermal cameras are more expensive, and despite the fact that they can 'see' through smoke or at night, they are still affected by weather conditions, especially heavy fog or rain. The presence of water droplets in the air diminishes the infrared radiation and with it the range of the thermal camera. Intruders can take advantage of these weather conditions to infiltrate the perimeter.

UNMANNED CAMERAS

A recent edition to perimeter security systems is surveillance robots that travel on a monorail along the fence. "The robot is equipped with cameras and laser sensors to ensure the integrity of the fence and detect any anomalies or movement up to a distance of 20 to 30 meters from the fence," described Katz. "Short-range cameras and a PTZ camera allow the monitoring of the fence and tracking any intruders. The laser works as a 3D radar, mapping the fence's surroundings, and analytics are used to detect any changes, for example a hole in the fence or an object placed near the fence. If an intruder is reported, the robot acts as first responder and rushes to the intrusion point, relaying video to the control room to verify the alert." The benefits of this solution are constant monitoring and patrolling along the perimeter fence, replacing human patrols and freeing up security personnel to take care of only verified alerts.

FUTURE DEVELOPMENT

The challenge facing VCA providers is to continue improving the reliability of their solutions, reducing false alarms, and making the setup as simple and short as possible. Fortunately, advances in computing power and algorithms make this a feasible reality. Closer collaboration between vendors, distributors, and systems integrators in defining problems and providing training will also enhance the practicality of VCA use in perimeter defense. a&s

LATEST TRENDS IN REMOTE MONITORING

The emergence of new mobile clients has greatly increased remote monitoring capabilities. Remote monitoring through a mobile client on a smartphone or tablet (e.g., by a manager or security guard) is more common, and so is off-site monitoring. Better compression algorithms allow a central control room to monitor many sites — either in-house or outsourced to a third party. This makes it possible for the smaller commercial customer to monitor alarms and provide proper response.

Additional integrations are perimeter lighting. Once an intruder enters a defined perimeter area, the lights can go on. Furthermore, two-way audio can be added to the camera to alert the intruder and let them know the police are on their way. "We are seeing this more and more going into a video monitoring center. Similar to the traditional burglar alarm that was connected to the security company, the new technology allows us to get the alert, identify, and dispatch security guards based on actual verified events," explained Todd Brodrick, Director of Southwest USA at Pelco by Schneider Electric.