SURVEILLANCE

The New Security: Cameras That Never Forget Your Face

MOTION DETECTOR A computer monitor, pictured above, works in conjunction with a set of cameras in a security system that watches over a 384-acre port terminal in Long Beach, Calif.

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MANAGEMENT at the Sir Francis Drake Hotel in San Francisco had been suspicious for weeks. A houseman on the graveyard shift was not the most productive worker, and trying to reach him on his walkie-talkie was usually a lost cause. So when the employee could not be found one summer night, his bosses went to their new video surveillance system.

The camera network - using software from 3VR Security Inc., a San Francisco company that makes surveillance technology - already knew what the houseman looked like; facial recognition algorithms had built a profile of him over time. With a couple of mouse clicks, managers combed through hours of videotape taken that night by the hotel's 16 cameras, and found every place he had been - including the back entrance he slipped out of, three hours into his shift. He became 1 of 10 employees dismissed from the hotel since 3VR's surveillance package was installed last June.

Until recently, the only place where an employee could have been caught that easily was in a Hollywood script. Digital spy cameras can instantly pick people out of crowds on the television show "24." But real-world video surveillance was stuck in the VCR age, taking countless hours to sift through blurry black-and-white tapes. Stopping a problem in progress was nearly impossible, unless a guard just happened to be staring at the right video monitor.
But surveillance companies, using networks of cheap Web-connected cameras and powerful new video-analysis software, are starting to turn the Hollywood model into reality. Faces and license plates can now be spotted, in almost real time, at ports, military bases and companies. Security perimeters can be changed or strengthened with a mouse click. Feeds from hundreds of cameras can be combined into a single desktop view. And videotape that used to take hours, even days, to scour is searched in minutes.

Some experts question the effectiveness of such "intelligent video" systems, which are sold by ObjectVideo, Verint and VistaScape as well, and worry about the privacy implications. But Brian Russell, chief of the Drake's engineering and maintenance departments, is happy with the results. "People know we're watching," he said. "Word travels fast. Fear travels as well."

The first step in setting up the Drake's surveillance system was tying the hotel's cameras together. That has become easier in recent years, now that digital video images can be collected directly from the cameras that record them - through the same closed Internet protocol-based network that links the hotel's computers to one another.

But digital video requires far more space on the network than e-mail or Web pages do - so much that the extra data traffic can quickly cause the whole network to grind to a halt if it is not managed properly. The trick is for the system to send as little high-resolution video as possible - and instead pass on short descriptions about what the cameras are seeing.

That is where 3VR comes in. Every time someone passes in front of a camera connected to the system, the software logs a separate "motion event." The time and location of the event - along with a still picture - are sent to a security guard's desktop computer. The guard can then browse through these pictures instead of staring at a bank of black-and-white monitors showing images that are constantly changing, waiting for something to happen. If a picture catches the guard's eye, he can click on it to see the video of the scene.

The system shows more than what the cameras see. Often, it can tell who the cameras are watching, too. The 3VR software assigns an identification number to every person a camera spots, and establishes a profile based largely on the geometry of the person's face. Whenever the face is captured from a different angle or in a different light, the system creates another mathematical model. Each time a person is taped, another model is added to the profile, increasing its accuracy.

Once the profiles reach a certain critical level of detail, it becomes fairly simple to search the "motion events" to find out where someone has been - essentially the same as entering a name on Google. The video forensics made possible by such software can be valuable; similar technology was used to trace the suspects in the London terrorist bombing last summer. But 3VR can be set up to do more than retrace a person's steps. The system can also set off an alert almost instantly if someone on a watch list enters a building or a restricted area. That ability is one reason the Central Intelligence Agency has become interested in the company, said Gilman Louie, who recently stepped down as the chief executive of In-Q-Tel, the agency's investment arm. It took part in a $10 million round of financing for 3VR, a 25-employee company led by former executives at TiVo and Inktomi, an Internet distribution company.

"We've had cameras," Mr. Louie said. "But their biggest weakness is being proactive - 'Hey, this guy's been here before, stop him.' And that's because we've had to be 100 percent reliant on the operators. You can't expect a guard to remember a face months after the fact. But put a little intelligence into the recording box, and it can remember for months at a time."

For now - and the foreseeable future - 3VR's system is effective only in small, controlled environments where the lighting is consistent and only a few people pass in front of one
camera at a time. Picking out criminal suspects on the street or in a crowd - as the city of Tampa, Fla., tried to do in its Ybor City district from 2001 to 2003 - is still beyond the ability of 3VR and every other surveillance system.

3VR plans no such challenges any time soon, said Stephen Russell, the chief executive. "Stopping Osama Bin Laden, it's a sexy application," he said. "But it's just not what people do day to day. Enforcing a restraining order, that's more likely."

But Bruce Schneier, a security expert and the founder of Counterpane Internet Security, in Mountain View, Calif., questions the real purpose of systems like 3VR's.

"These things aren't designed to catch the bad guys," Mr. Schneier said. "They're for watching the good and the stupid. The bad guys, they'll just wear a hat and sunglasses the day that they want to avoid the camera." (Mr. Russell of 3VR says that his software can see through some disguises.)

To Mr. Schneier, the camera networks are part of a larger trend - along with Britain's plans to monitor every car on every major road, and the National Security Agency's domestic eavesdropping program - toward "wholesale surveillance, the kind of stuff Stalin only dreamed of," he said. "The question is, do we want that?"

But he says that intelligent video systems like 3VR's can fill an important, and less controversial, security need. "The cameras are best in no-man's land: 'If anyone climbs this fence, sound an alarm,' " he said.

Most companies that sell intelligent video software systems make setting up those rules a matter of a few mouse clicks. The systems can also notify a guard if a package is left on a railway platform, a car drives too quickly toward a building or a person walks up a down escalator, anything that seems out of the ordinary. VistaScape's software can also combine hundreds of cameras into a single, three-dimensional digital map. People and vehicles are represented by icons. Clicking on the icon brings up the view from the nearest camera.

"You can look at the whole facility - the movement of everything," said Steve Ruggiero, director of maritime security at Total Terminals International in Long Beach, Calif. He has installed an 80-camera network across the 384-acre property.

Surveillance-software makers may also find a market in retail stores, and not just for catching shoplifters. The algorithms that look for intruders could see whether checkout lines are moving and which displays are attracting the most attention.

"The cameras are there already," said Dan Bodner, chief executive of Verint, in Melville, N.Y. "All they have to do is buy the software."

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