TECHNOLOGY FOR STAYING AHEAD

Protective "smart" camera technology in place at the Beatrice Gilmore School in West Paterson, New Jersey

PHOTO: ASSOCIATED PRESS

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IT'S THE END OF A LONG MORNING ANSWERING rapid-fire questions from tough New York Metropolitan Area television, newspaper and radio reporters. NJIT's senior vice president for research and development, Donald H. Sebastian, is exhausted, but satisfied. The non-stop questions are about "smart" camera surveillance technology — one of the growing number of projects that NJIT is overseeing in its capacity as New Jersey's Homeland Security Technology Systems Center. In 2004, then Governor James McGreevey named NJIT to lead this initiative, a responsibility that the university continues to carry out for Acting Governor Richard Codey.

Safer students and shoppers

With verve and abundant data, Sebastian has detailed how the university is in the process of installing what will arguably be the nation's first smart camera system in a New Jersey elementary school. The program parallels a similar project launched last year at the Garden State Plaza mall in Paramus, where special cameras combined with computer technology scan the crowds of shoppers.

The cameras search for suspicious objects and behavior, such as an unattended bag or someone running the wrong way up an escalator. If the system detects something amiss, alarms will alert mall security personnel or the local police. In addition to monitoring images at a mall's security office, areas under surveillance could be viewed at police headquarters or even in patrol vehicles.

OF TERRORISM

Not long after Acting Governor Richard Codey took office, he pledged $100,000 for a pilot project to install the cameras in the Beatrice Gilmore School in West Paterson, New Jersey. When school opens this fall, the cameras will be online. Putting smart cameras into schools seemed like a natural follow-up to the mall project, especially in view of the horrific 2004 school slayings by terrorists in Russia. This technology might also help to prevent tragic events closer to home, such as the more recent deaths caused by a high school student in Minnesota.

"The devices won't be used to catch Johnny smoking in the bathroom," says Sebastian. "But they will recognize who does and does not belong in the building. The plan would also employ unique identification cards for all teachers and other school workers. The cards might even employ facial recognition technology."

Like the mall project, the school security cameras will operate in combination with computer software designed to focus on certain things while ignoring others. For example, the system could focus on people in the environment being scanned and search for faces programmed into a database. Schools won't have to employ someone to monitor a bank of computers full-time to increase security. This system will trigger an alarm that would alert an otherwise occupied administrator or assistant standing within 20 feet of the monitoring computers.

"We're creating extra eyes," says Sebastian. "We're creating extra ears. We're even creating extra brains with an intelligent system like this." This vital work will continue with funding that includes $470,000 that NJIT recently received from the U.S. Department of Homeland Security and NJ Department of Law and Public Safety for initiatives that encompass protection of schools and shopping malls.

In addition to developing technology that could thwart terrorist attacks, NJIT researchers are exploring ways to help emergency personnel work together more effectively.

Basing the Homeland Security Technology Systems Center at NJIT was a logical choice in light of the fact that protecting the security of New Jersey residents as well as the state's infrastructure has been a top priority for researchers at the university. NJIT's ambitious homeland security agenda has spawned more than a dozen research projects to date, ranging from minute sensors for detecting chemical and biological warfare agents to helping emergency-response personnel improve their per-

NJIT researcher David Mendonca has received a major grant from the National Science Foundation to study improvisation and decision-making in a broad range of high-stress situations.

formance. The following descriptions of recent high-visibility efforts typify an expanding research initiative rooted in NJIT's technological talent — talent that's helping the good guys protect New Jersey and the nation.

Improvising in emergencies

David Mendonca, assistant professor of information systems at NJIT, is investigating how training in improvisation can help improve the tactical response to large-scale, highly non-routine emergencies such as the 2001 World Trade Center attack. He is particularly interested in helping emergency workers — from volunteers to professional paramedics — do their jobs more effectively when circumstances require departing from previously established plans and procedures.

Mendonca's research is leading to advances in understanding the thinking processes of response personnel and in constructing new tools and training systems to support improvisation in emergencies. His work has involved studies of how improvisation happens in jazz and in emergencies, and has involved work with responders to the World Trade Center attack, the Port of Rotterdam (The Netherlands) and the U.S. National Fire Academy. The National Science Foundation recently granted Mendonca a prestigious Faculty Early Career Development (CAREER) award in the amount of $400,000 to continue his investigation of how best to help emergency-response personnel make the right decisions under pressure.

"Disasters routinely create non-routine situations," Mendonca says. "History repeatedly teaches us that flexibility and an ability to improvise are key to emergency preparedness and response. While we must plan, we must also plan to improvise."

One of Mendonca's goals is to develop computer software that can help people improve their ability to improvise. Down the road, Mendonca hopes to create a course in improvisation for New Jersey emergency-response personnel, as well as an online homeland security academy based at NJIT. Also in the planning stage are presentations to high-school students in the Newark area that would introduce them to the emergency-response field. "Newark is an appropriate place to reach out to local students since we're so connected to the 2001 World Trade Center attack," he says.

Stopping cyber thugs

Protecting legitimate use of the Internet and thwarting those who would use it for terrorism and other illegal activity is a mounting 21st-century challenge. Among the toughest problems has been countering data-hiding techniques that terrorists — and others up to no good — can use to conceal even large amounts of information. How to halt these cyber thugs is the subject of a new book by Ali Akansu, professor of electrical and computer engineering at NJIT.

Data Hiding Fundamentals and Applications: Content Security in Digital Multimedia (Elsevier-Academic Press 2004) develops a theoretical framework for data-hiding techniques. "Encryption and data hiding are two technologies that play major roles in information security and assurance," Akansu says. A key issue in content-security solutions is the imperceptible insertion of content and information into multimedia data.

"Our government thinks terrorists might use data hiding to pass information to each other by

PHOTO: BILL WITTKOP

posting seemingly innocuous images on the Internet. My intent is to help information-security engineers learn to decode information hidden in a cover image and retrieve the secret messages."

The insights presented in Akansu's book place data-hiding techniques within a framework that tells readers how to calculate the payloads — the allowable hidden bits of information — and to crack the code of data hiding. He details, for instance, how a Hollywood company's films were illegally copied onto pirated videos and sold on the street. But he also shows how there are techniques that make it possible to detect such pirated videos and trace them back to their source.

"The Internet revolution offered efficient and open solutions for information delivery," Akansu says. "But this development brought with it concerns about security, monitoring and the use of information by qualified end users. Hence, information security is already a household term that will stay with us forever."

Alerting health workers

Despite the anthrax scare in 2001, one could make the case that concern about such chemical attacks has greatly diminished. Not so in the office of the Information Resource Development group at NJIT. Even before 2001, Thomas J. Terry Jr., the group's associate vice president, was developing a rapid-response system for health officials under contract with the New Jersey Department of Health and Human Services. Thanks to the work of Terry's group, urgent information can be relayed within seconds to health officials in each of New Jersey's 627 municipalities via the New Jersey Health Alert Network (HAN).

Via the HAN network set up by Terry and his colleagues, the appropriate officials would receive a telephone call, fax and/or emails. They can be alerted about the outbreak of disease or the detection of harmful chemical, biological or radiological contamination. The network is hosted in a secure facility with access to multiple high-speed phone lines and the Internet.

NJIT has also created a computerized network known as the Electronic Disease Reporting and Management System (EDRMS). EDRMS allows health and emergency management offices to be tied into an overall warning system. These offices receive further essential information, such as data about disease incubation periods, the effects of exposure and countermeasures. "This is an important step for securing any jurisdiction," says Terry. "It allows decision makers to have fast and easy access to information vital in an emergency."

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Many threats, many resources

Back in his office, Sebastian is thoughtful about the spectrum of NJIT's homeland security initiatives. He says that the emergence of this issue is certainly not a positive social development. However, since this reality of life in the 21st century has presented NJIT researchers with the challenge, he is optimistic about positive outcomes.

"As we successfully introduce ways to counter specific terror threats," Sebastian says, "I think NJIT will emerge as a national leader in developing and deploying effective, affordable and sustainable approaches to homeland security. While we have virtually every type of vulnerability packed into the boundaries of this state, we can also bring the most resources to bear in confronting these vulnerabilities. With technology and progress on our side, I am confident that we will succeed." ■

For more on homeland security, see these articles from *NJIT Magazine* in the online Publications Library at www.njit.edu: "A New Phase in Fighting Terrorism," fall 2003 and "New Perspectives on Port Security," spring 2004.