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Features

The challenge of the September 11 terrorist attacks falls heavily on the information technology community. Authorities are crying out for help solving problems ranging from information stovepiping by intelligence agencies to the lack of a national monitoring system to detect bioterrorism attacks. The money is there, and politicians are looking to the scientific community for answers. In this issue of DG Online, we examine some of the Digital Government research already underway to bolster Homeland Security. The message is clear: Good science can ensure that the terrorists don't win

Super Detective

Hsinchun Chen has hooked up most of Arizona's police files. But could he do the same for New York or Washington?

In almost every police department, there's a guy who knows where the bodies are buried, who remembers which gangster was married to whose sister-in-law, and who can spot a gangbanger's car by its make and model.

The trouble is, that cop isn't there when a rookie patrolman tries to run a license plate from a drive-by shooting report. Or he's in a different department; criminals don't respect city limits. Enter COPLINK, a University of Arizona Digital Government project to link disparate intelligence resources for a consortium of law enforcement agencies including Phoenix and Tucson police.

"This is a super detective," says lead investigator Hsinchun Chen, founder of the University of Arizona's Artificial Intelligence Laboratory. "It knows every address, telephone number and license number in the department system, and their associations."

Launched in 1997 with a National Institute of Justice grant, COPLINK initially focused on Web-based database consolidation and warehousing for the Tucson Police Department.

"It was a leap of faith for me to get into the police domain," says Chen. "One of my students, who was a 25-year veteran in the Tucson police department, he talked me into it."

With the help of a National Science Foundation grant, Chen is exploring issues of intelligence analysis, human-computer interaction and multi-agent processing. The initial software module, called COPLINK Connect™, merges stand-alone databases, such as mugshot files, vehicle identifications and crime locations, within departments and enables information-sharing with neighboring jurisdictions. A second module, COPLINK Detect™, leverages artificial intelligence techniques to help police ferret out hidden links between people, organizations, locations, vehicles and weapons.

The system produces data in minutes in an easy-to-navigate, point-and-click display that an officer can master with minimal training. A secure intranet keeps highly sensitive and confidential intelligence away from prying eyes.

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Research Spotlight

"Through COPLINK's work on text mining and visualization, we have designed algorithms for entity extraction based on part-of-speech tagging, finite state automata and multilayered perceptron. The algorithm identifies critical intelligence information, i.e., people's names, addresses, properties, etc., in crime report narratives. The resulting "entities" are then used to develop criminal link associations and to identify themes based on selected statistical and neural network-based algorithms. We also developed an "expandable hyperbolic tree" visualization method, which allows investigators to explore criminal associations through a graphical, zoomable, tree-like display based on hyperbolic geometry.

"In a second area of research, we have used a multi-agent architecture to create an infrastructure that supports autonomous, proactive case alerting and collaborative filtering. Users specify search scenarios of interest with their agent programs, and in return, the system automatically alerts them to new case information or similar investigations on their laptops, PDAs, cell phones or pagers. With selected fuzzy matching and link analysis algorithms, officers and investigators gain timely access to new information and cases in other departments or jurisdictions." Hsinchun Chen, University of Arizona, McClelland Endowed Professor, Management Information Systems, Director, Artificial Intelligence Lab and Hoffman eCommerce Lab, in Tucson, Arizona.

Slides (3.40MB)

The results, according to its users, are amazing. In a preliminary test case, a federal agency asked Tucson police to help track down a homicide suspect. The feds didn't know the suspect's name; in fact, the only clue they had was a confidential informant's tip that the suspect had a sister living in Tucson who had been assaulted several years before by her boyfriend. The agency pulled the boyfriend's name from the complaint, and Tucson ran it through COPLINK. In less than a minute, the system returned the names of both the woman and her brother, the suspect.

"COPLINK allows you to define data, and see what the relationships might be," says Joseph Hindman, computer services administrator for the Phoenix Police Department. "For detectives to do that in a traditional records management system would take more time than they have."

Chen's faith in his project was renewed after the September 11 terrorist attacks, when he attended a meeting in Toronto of the International Association of Police Chiefs.

"The deputy commissioner of the New York Police Department was there, and he presented a vivid, emotional timeline of the events at the World Trade Center," says Chen, referring to the terrorist hijack attacks that destroyed the twin towers. "A lot of grown men were crying, including myself...The deputy commissioner said the only way to prevent this kind of thing from happening is to share intelligence information between law enforcement agencies at different levels, local, state or federal."

COPLINK will cover police for 70 percent of Arizona's population by early 2002, but its potential is much broader, Chen says.

"L.A. and New York would be 10 or 20 times that, but our approach could apply very easily," Chen says. "Largeness is not an issue."

Some 20 to 30 agencies have approached Chen since 911 about using COPLINK in their jurisdictions, he said. He and his research team are working to extend its capacity by mining text from crime report narratives as well as the formatted data sections. Another new direction is to alert police, on their laptops, patrol car consoles, PDAs, cell phones or pagers, when new case information comes in, or a similar investigation emerges.

The Phoenix Police Department is coming on board in December; a group of suburban agencies from the surrounding valley will follow next year. In all, the system will serve law enforcement for 1. 5 million people. Hindman explains the agencies' eagerness to join the project this way:

"Historically, there's always been competitiveness between departments that made data-sharing not as prevalent as it should have been," Hindman says. "We're data rich but information poor."

Chen plans to push the crime analysis function even further, developing software to automatically warn police to watch out for a certain gang in a specific location, or even to predict new crime waves.

"It can be even more proactive, make decisions for you, but you still control it," Chen says.

Key to the program's success has been the close collaboration between police and scientists, Chen says. The Tucson department paid for a full-time officer on the COPLINK team.

"In most of the studies we have to pay the subjects or drag them in, but in our project, we even saw people bribe colleagues to get a copy" of the software, Chen says.

"They've been paying a great deal of attention to talking to detectives and getting their opinion of what type of tools they need, and that's really showing up in the software itself," Hindman says. "It's of value because they've had a hand in designing it."