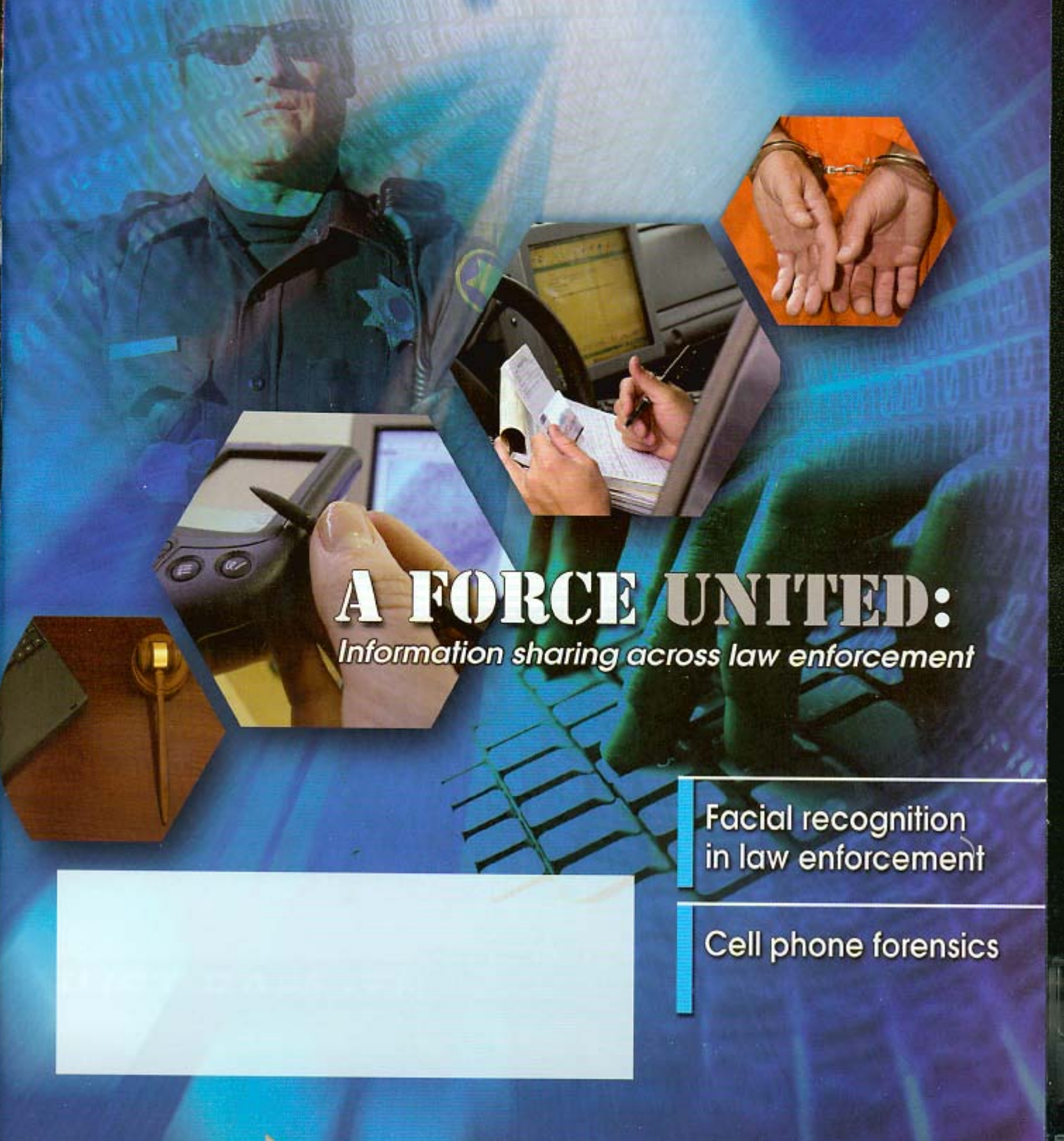


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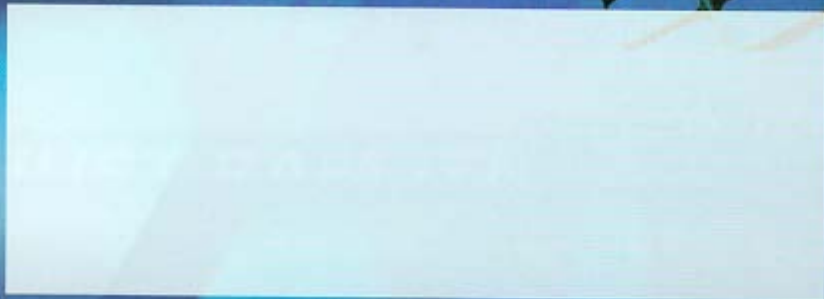


A FORCE UNITED:

Information sharing across law enforcement

Facial recognition
in law enforcement

Cell phone forensics





Putting a name to a face

Facial recognition systems help officers make timely decisions

Photos courtesy of Anmetrics

You've arrested someone for disorderly conduct, but he has no identification on his person. How do you know if he has a medical condition impacting his behavior, if he's wanted elsewhere or if he has a history of assaulting police?

Facial recognition system providers say they have a way to answer all these questions quickly with the various applications for their products in the law enforcement arena.

One of the possible applications was reported in the February 17, 2007, edition of "The New York Times," where Adam Liptak wrote about an experiment in Massachusetts.

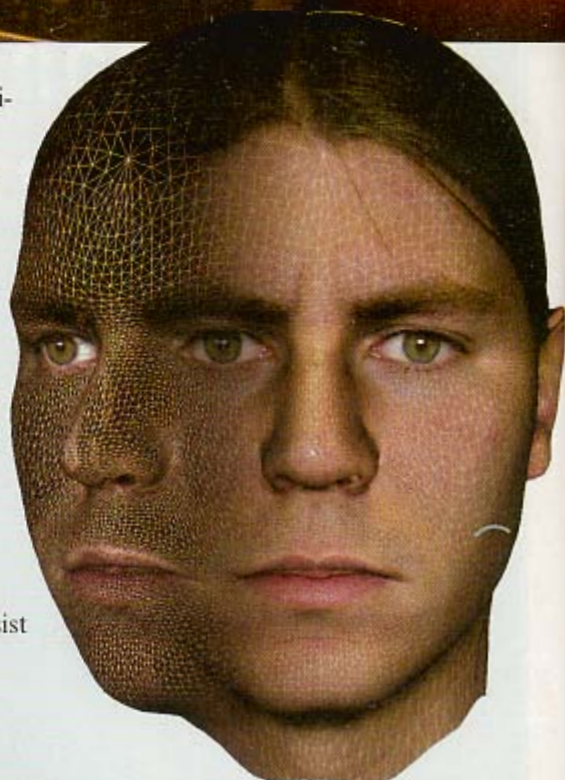
Three facial recognition specialists ran a photo from the America's Most Wanted Web site against the

state's database of 9 million digital driver's license photos. The mugshot looked like one driver, but the license had a different name on it. By alerting police of the similarity, officers were able to track down and arrest the suspect in New York City, where he was receiving welfare benefits under the alias.

While this mix of civil and criminal databases is not legal without a warrant in many states, there are many potential uses of facial recognition to assist law enforcement with catching criminals.

The universal image

Dr. Joseph Atick, executive vice president and chief strategic officer



The fence climber (top photo) is a difficult image to recognize, but a match was possible with facial recognition technology.



of the Identix Division of L1 Identity Solutions, is one of the pioneers in facial recognition.

"About 17 years ago, those of us in the biometrics field started think-

ing about the future,"

Atick recalls. "We saw significant promise if computers could learn to recognize faces. We knew they could match fingerprint patterns, an important tool in law enforcement, to narrow suspect

searches. We set out to develop the technology to help the law enforcement community with identification (ID) management and use the face as a biometric of choice."

One advantage of using face recognition is that photos are on most forms of ID and the police have used mugshots in identifying suspects for a long time.

"Although the technology we first used is primitive compared to today's, we began with the basics on a small database," Atick says. "We learned that the human's capacity for recognizing faces is limited to about 2,000, but we wondered what the limit was for a computerized

"Every person's skin is different, like a canvas is unique for each painting."

*—Dr. Joseph Atick,
L1 Identity Solutions*

system. Over the years we discovered that computerized facial recognition systems are highly scalable. They can store in memory an almost unlimited number of faces and search them with phenomenal speed."

For example, the U.S. Department of State uses a system to screen visa applicants, searching applicant photos against a database of 75 million faces, several thousand times per hour.

Facial recognition systems, usually a camera teamed with software on a computer linked to a central database, perform automated comparison of face images based on unique features of the face.

"The features used by the algorithm vary between suppliers,

but typically are ones that do not change significantly over time due to differences in facial hair, glasses or aging," Glen McNeil, criminal justice product manager for Sagem Morpho Inc., explains.

"The products can be used on photographs as well as live still images and video images," says McNeil. "Facial recognition products can be used to identify an individual through a one-to-one comparison, like an e-passport check, as well as search a database, like a watch list at a border crossing, or to check for a duplicate enrollment."

Jonathan Forrester, vice president of marketing for ALIVE Tech Inc., describes two kinds of facial recognition systems. "The first is two-dimensional," he says. "It takes a digital photo and measures points on a face, such as the base of the nose to the edge of the right eye. There are 50 to 60 points on a face."

These 2D systems work well if the camera is directly in front of the person, Forrester points out. But if the face is at an angle to the camera, which happens with surveillance tapes or photos, the recognition is reduced significantly.

One problem can be caused by light casting shadows on the face, but other factors that affect 2D accuracy include facial hair, shadows, glasses, sunglasses, hats and aging.

According to suppliers, 3D systems take care of many of the problems encountered with 2D systems. These systems look at face shapes, contours, the width of the nose and depth of the eyes for up to 20,000 points.

"When you get that many points, you can even differentiate between

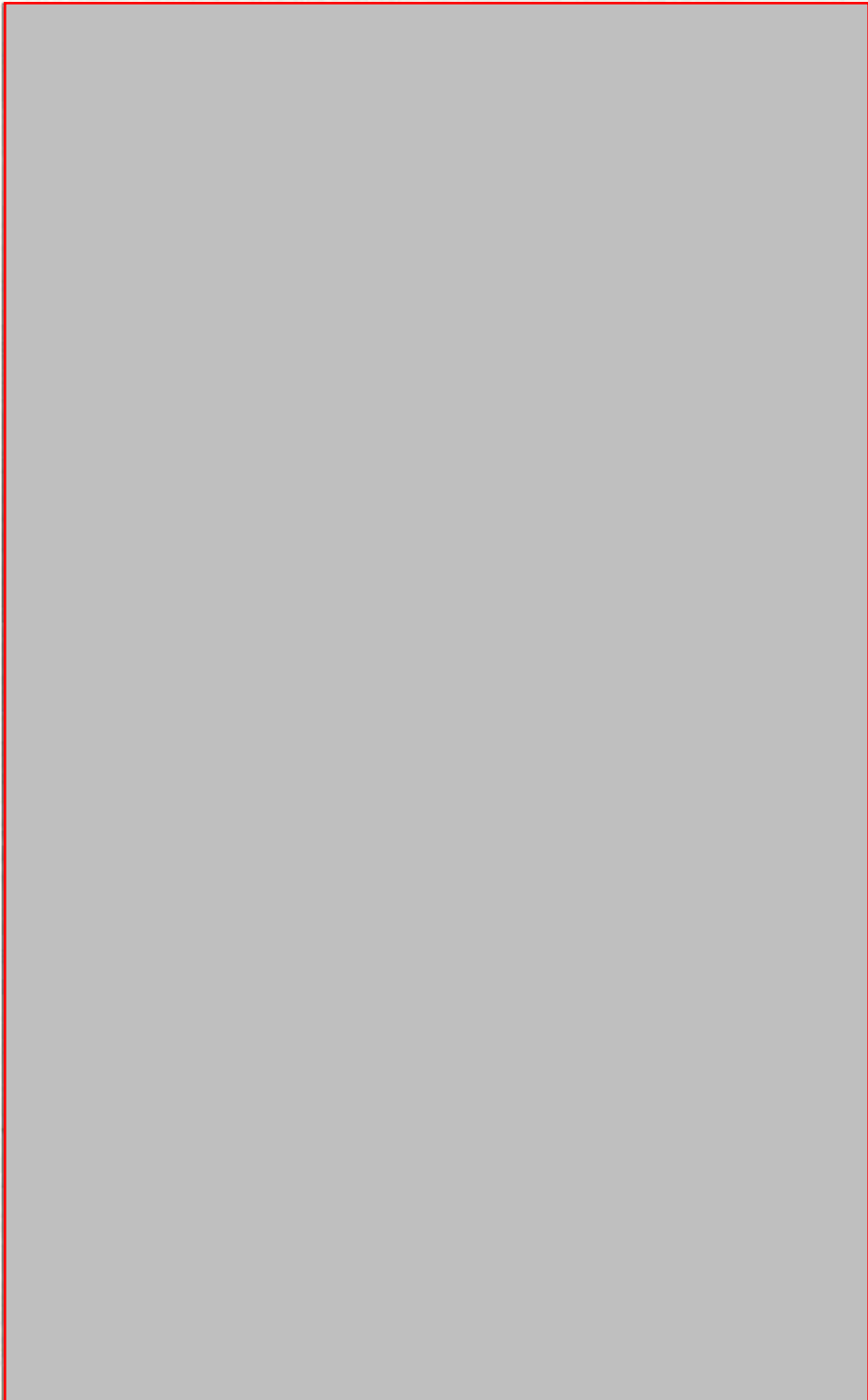
identical twins," Forrester says.

"The match made by the software is based on a statistical score," says Paul Schuepp, president and CEO of Animetrics Inc.

"The scoring technique is part of the face recognition algorithm,

and the score is about how close the incoming face image or probe comes to the face or faces in a gallery."

Certain criteria are set that define the score boundaries, so a high score means the comparison is a match or most likely, a medium





score means the comparison is possible but not assured, and a low score means that it's most likely not a match.

"The point is the facial recognition software does not know if the match is definite. It's all about statistics," Schuepp says.

"This is the same for fingerprint or iris matching, but the face is the most difficult," he says. "It's ever changing with many variables such as expressions or head rotation, and the environment has an effect with lighting, shadows and background."

Atick notes that in addition to making a topographical "map" of

the face for comparison purposes, a new technology emerged on the

market four years ago that identifies micro-features and performs a skin texture analysis. "Every person's skin is different, like a canvas is unique for each painting," Atick says. "Now the new generation of facial recognition software can take the topography and fuse it with the skin texture signal. You get a higher accuracy and have a higher confidence that the match is correct."

What's available

ALIVE Tech Inc. offers both 2D and 3D systems. "Most sheriff departments have a 2D database of mugshots," Forrester says, "but we

recommend 3D systems for most law enforcement applications."

Animetrics sells facial recognition software with a family of products under called FACEngine ID, according to Schuepp.

"We have versions that do surveillance such as watch list searching in uncontrolled conditions," he says. "We offer authentication versions for access control, and we have the capability of generating a 3D rendering of a face from a 2D photo."

"The 3D information of the face is used to make our facial recognition algorithms better and work more robustly in uncontrolled conditions," Schuepp continues. "But the 3D rendering also is a useful output from a product we

call FORENSICA. It is being used for the Amberview program, part of the missing children U.S. Amber Alert system.”

LI has various subsidiaries to market its own technology and offers LI Identity Solutions for various applications the customer or department needs. For example, Identix has a well-known surveillance package called Argus. It allows real-time checks in public places to nab shoplifters and similar applications.

“Sagem offers five main kinds of facial recognition applications that may be combined to provide what a customer needs,” McNeil says. These include civil enrollment, identity management, criminal iden-



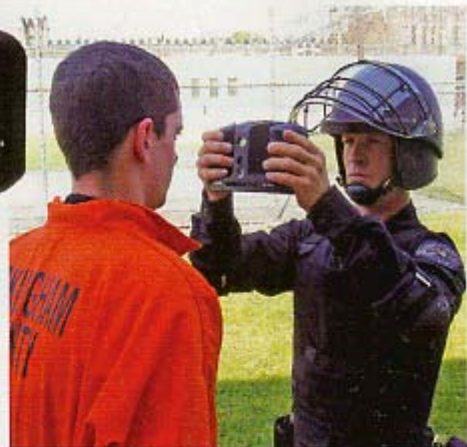
SecuriMetrics, an LI Identity Solutions company, produces a system called HIIDE, a multi-modal biometric device.

tification, crime solving and covert surveillance. For instance, Sagem has a video surveillance product that performs a real-time assessment between a live face capture and a stored enrollment image.

Advantages of facial recognition

Suppliers say there are many applications for face recognition products in law enforcement.

“The most common include searching large databases for bad guys, the most wanted or suspects,”



Schuepp says. “They can help with verification of travelers at border crossings, check people against blacklists, such as shoplifters, perform remote surveillance and analyze collected surveillance video.”

McNeil agrees. “The facial recognition applications drawing the most interest from law enforcement today include use during booking, jail intake and release,



Jonathan Forrester uses his own face to test ALIVE Tech's system. In the photos above, the program identifies him despite sunglasses, and retrieves and displays his aliases.

watch list comparisons of both photo and video, and as a witness identification tool."

He says the advantages of using facial recognition systems include:

- Extensive government databases of facial images, including mugshots, driver licenses or passports.
- Improved quality with inexpensive and commercial-off-the-shelf facial and video capture technology.
- Ability to covertly capture visible facial images, unlike fingerprints and DNA.
- Facial evidence is often available at crime scenes, such as video footage and witnesses.
- Facial image processing does not require complex and expensive laboratory processing as do other biometrics such as DNA.

According to Forrester, in the metro Atlanta, Georgia, area, Cobb, Douglas and Cherokee counties have installed the ALIVE Tech 3D system at their jails for identity management. "This is important because so many criminals use an alias," he says. "One county found that 56 percent of arrestees have an alias, and some have up to 15."

These false names may clog up

the system, but once the person's face is entered in the database and is subsequently arrested, the system will alert the officer that the suspect in question is already enrolled. "It virtually eliminated the criminal's ability to use an alias if he was arrested before and has an image in the system," Forrester points out.

The systems help after booking, too. "For example, at the Adult Detention Facility in Cobb County, our 3D facial recognition system creates a biometric template of every inmate booked into the facility," he says. "Upon release, the system uses that template to verify the correct inmate is being released. The county now has more than 100,000 inmates enrolled and has not had an erroneous release since the system was installed in April 2004, with more than 350,000 data transactions."

Forrester says this is important because every year, thousands of inmates are mistakenly released, due to the many aliases and ability to force another inmate to trade identification items. Later, the other inmate due for release points out the problem — and the wrongly released person has already fled the area. "The cost of recapturing the

inmate would probably pay for a facial recognition system," he notes.

Atick says facial recognition helps the officer in the field, and the Pinellas County (Florida) Sheriff's Department is already using it for jail management booking and visitor ID.

"The sheriff's department has issued a wireless camera to deputies in patrol cars," Atick explains. "When they stop someone without identification, they can take a picture of the driver and place the camera in a docking station within the patrol car."

"With the push of a button, the image is sent to a central computer. In a few minutes the deputy is presented with the closest matches to the subject, in a gallery and rank order format. It's a great ID tool."

According to Atick, in the future, the deputy could receive information such as wants or warrants on the suspect, as well as the person's criminal history, with this method of identification.

Possible drawbacks

While facial recognition systems seem to have significant potential in law enforcement, the suppliers



The suppliers agree, this tool, combined with other ID systems, can

benefit law enforcement.

metric market alone is \$3 billion in 2007, of which 13 percent is for face," he notes, citing data from a report by the consulting and technology services firm International Biometric Group (IBG).

"Facial recognition is very effective as an investigative tool and to narrow the target population of suspects," according to McNeil. "If used in a multi-modal biometric system, which combines facial identification with a strong biometric such as fingerprint identification, the end result is much higher accuracy than any one biometric alone."

McNeil agrees law enforcement must be careful about relying solely on face matches, and he points out the accuracy of facial recognition algorithms is improving rapidly. For instance, the recently published NIST Face Recognition Vendor Test (FRVT) 2006 reported an order-of-magnitude decrease in error rate has been achieved since FRVT in 2002.

Atick concurs. "We see facial recognition systems as an evolution toward the law enforcement goal of multiple biometrics, so you can think about identity verification, not just face or fingerprint matches," he says. "Perhaps the use of a device no larger than a single lens reflex camera can enable the officer in the field to capture fingerprints, face and eyelids, and dispatch the biometric data wirelessly to ascertain someone's identity."

"New developments in capture technology, improved video surveillance systems, 3D facial imaging, and more attention to the quality of equipment and capture environments combine to make facial recognition not only a viable technology, but an extremely effective law enforcement tool," McNeil says.

Sagem Morpho's product compares video surveillance to stored images for instantaneous results.



SecuriMetrics, an L1 Identity Solutions company, which produces a system called HIIDE, and is used by the U.S. Department of Defense in Iraq and Afghanistan.

Forrester says the cost of the system may be a drawback, but his company created a solution for strapped departmental technology budgets. "In the past, a single enrollment station with camera and software could cost almost \$100,000," he recalls. "In an effort to get this technology in more departments, we ask them to purchase the hardware, which includes the computer and camera for between \$15,000 and \$20,000, and we'll give them the software. Then we charge \$2 to \$3 per bed in the jail per month as an operating cost. This lowers the price significantly."

Atick points out the cost of technology is usually a big factor when it's first introduced, but over time, you get more for your money.

"There's value today from face recognition's accuracy and capability," Atick says. "It's part of an arsenal of tools law enforcement needs to establish identity. It's key to know who you are dealing with so you can react properly." ■

Kay Falk is an independent writer with more than 18 years of experience in writing for trade publications. She can be contacted at (920) 563-1511.

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