

By Andrew Langerman

Millions of people have tuned in to “24” and watched Jack Bauer take a picture of a suspect’s face, send it to his central office and within seconds get an ID of someone on a watch list. Today, this fiction is reality, thanks to the increasing usefulness and effectiveness of facial recognition technology.

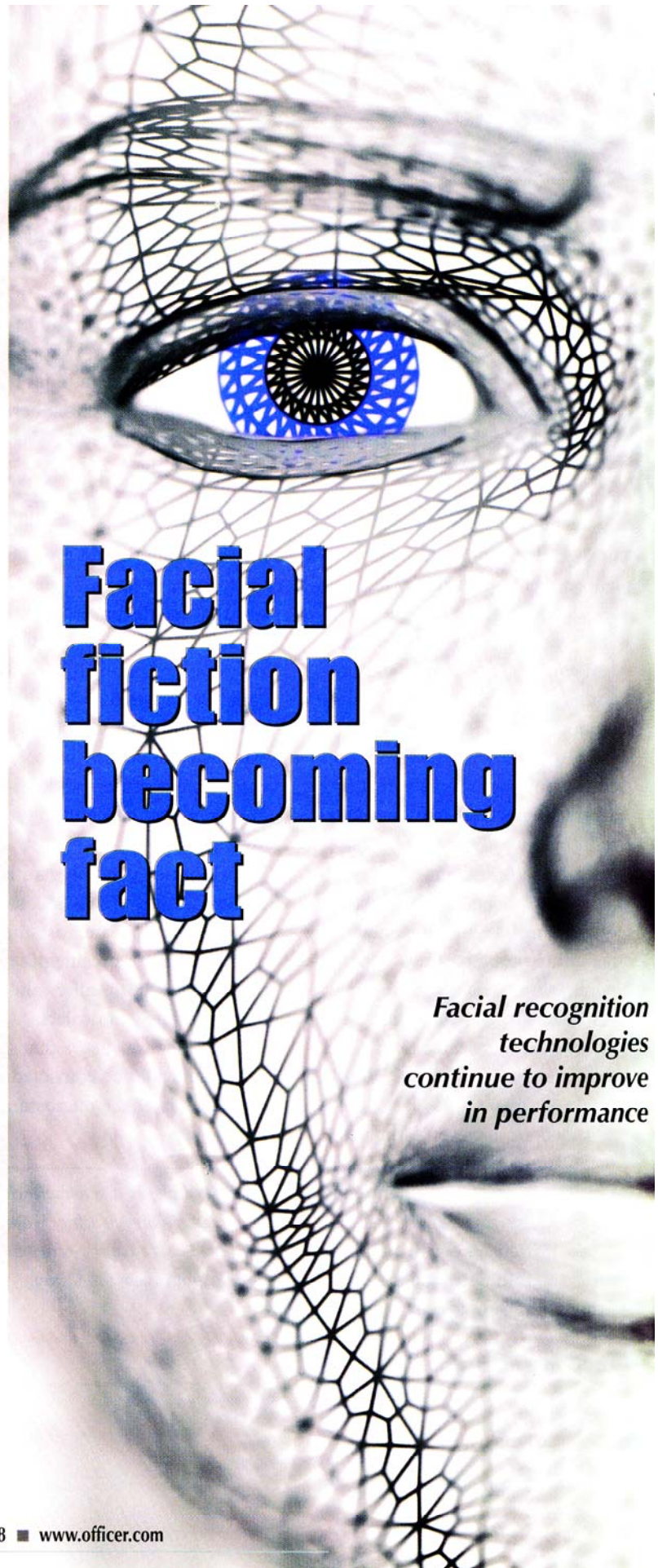
But, as is the case with most new-tech advances, there have been some bumps in the road. During early tests in cities like Tampa, Florida, the results were less than stellar. However, companies have made great strides in improving this technology.

In biometrics, the face is more complex than a fingertip, and there are many facial variations that make developing effective technology challenging. And a single face changes over time, adding variables such as hair, scars or wrinkles to the mix.

Today, facial recognition technology can assist officers with identifying suspects as well as finding missing persons. It can be especially helpful for AmberView, which adds functionality to Amber Alerts. Images of missing children can be delivered to a database, accessed by facial recognition programs and sent to officers in the field.

Imaging improvement

At its heart, facial recognition technology is about the image. There are a few conditions surrounding images in which the technology must operate. The first and simplest is finding a face in a controlled static background. In this situation, a program uses images with a plain, mono-color background or static background to create facial boundaries. This would be a best-case scenario, such as an image of someone standing still in an elevator. The second scenario involves moving images captured with or without color. In either case, there must be an algorithm that can calculate the moving area and identify facial boundaries and features. A third condition combines both static and movement in a larger area. The third



Facial fiction becoming fact

*Facial recognition
technologies
continue to improve
in performance*



A verification side-by-side view featuring a 2D verification image next to a 3D enrollment model



Above, an outside verification image, taken in bright sunlight with the suspect wearing sunglasses, is compared to the original enrollment image.

scenario is the most complex and the one that often happens during surveillance situations.

Dr. Jonathan Phillips leads the team that tests facial recognition technology for the National Institute of Standards and Technology (NIST). NIST's latest testing results report a positive change within the technology. "Performance has improved greatly over the last four years," he says, "and there is performance-excellence with higher-resolution images under perfect control."

Phillips predicts the technology will continue to improve, if developers can create systems that reliably and consistently produce higher-

resolution images. The software's algorithms can only make the most out of the information presented, and lower resolutions mean less information. "So far 6 megapixels [of resolution] have given us the best results," Phillips points out. "However, it is important to remember it is not purely the number of pixels but other conditions, such as lighting, that influence outcomes."

2D versus 3D base images

The NIST report yielded several interesting results. One of the biggest debates surrounding facial recognition is the quality of 3D images vs. 2D ones. Some people

believe a 3D image gives a program a more complete picture, while others think high-resolution 2D images offer the most quality.

Phillips addressed this issue in the tests. "We took our results and compared the performance of high-resolution 2D and 3D sensors," he says. "We found the results to be comparable."

Testing revealed that while software programs have advanced greatly, it is the acquisition devices that must now change. "There will be a significant change as there is a greater availability of higher-resolution capture devices at affordable prices," Phillips says. Testing also showed algorithms were equal to and sometimes better than humans at recognizing an unknown face from an image such as a picture.

When it comes to the imaging debate, Dr. Joseph Atick, executive vice president and chief strategic officer of L-1 Identity Solutions of Stamford, Connecticut, does not believe 3D imaging is the future of the technology. "Higher-resolution 2D is more important than 3D," he says. "In 3D all you are getting is facial structure. With higher-resolution 2D images you receive more

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Animetrics90 identity system captures images via a surveillance camera using FACEngine 2D to 3D technology and finds the match from a watchlist.

information to help identify a face.”

He adds that 3D information could be created from a 2D image without needing the complexities of a 3D camera system. Atick believes there is too much hype with 3D imaging, and recent NIST test

results confirm his belief.

Facial recognition technology was originally developed to help landmark the face with approximately 80 characteristics. However, these characteristics are not the only information that helps identify a face.

“Four years ago, we discovered that high-resolution images gave us skin texture analysis,” Atick explains. “It helped improve facial identification, and we just didn’t feel there was a good return on investment for 3D [compared to high-resolution 2D].”



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Offerings address challenges

Several issues continue to challenge the facial recognition market including negative perceptions, tight budgets, image collection limitations and more. But manufacturers continue to develop new technologies to confront these challenges.

Paul Schuepp, CEO of Conway, New Hampshire-based Animetrics, feels facial recognition technology received a bad reputation because of previous failed attempts. He believes one of the technology’s limitations is that it is too controlled in trying to compare faces on documents to a central database. “The real need is a passive/active surveillance mode,” Schuepp explains. “Lighting and environment vary greatly and this can be a problem. For example, a camera in bright light will actually lose information and [parts of data will] get washed out.” The ability to account for the variables is essential for the technology.

Schuepp believes part of the problem is the way algorithms look at pixels. Unlike a fixed image found in fingerprints, the face is always changing and that creates challenges. When it comes to the image debate, he says, “most programs today work in 2D, but it really is a 3D world. You need to have X, Y and Z angles at your disposal.”

With Animetrics’ FACEngine, a camera zooms in on faces and compares them to a database in a 3D

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way, taking into account lighting, angles and more. FACEngine also can turn a 2D image into a 3D avatar, which Schuepp says is especially important with AmberView where time is of the essence.

Jonathan Forrester, vice president of marketing for Alive Tech, sees a combination of tight budgets and perceptions as limiting the technology's growth. "Public perception is that fingerprints are infallible, but if you look at it, you will find cases of wrongful arrests and false releases," he says. "Also, when was the last time you walked down a hallway and were able to identify someone based upon their fingerprints?"

Alive Tech has had success with its facial recognition technology in the law enforcement community of its home base, Atlanta, Georgia. Here the Geometrix 3D ID System assists in prison enrollment and release. "There are 100,000 images in our database and we have had no false releases," says Forrester.

The product helps address the tremendous number of aliases used by suspects. Forrester notes that about 56 percent of all suspects booked have an alias. "With Geometrix," he says, "once your face is in the database, it cannot be duplicated."

Facilities using the system also can share databases, increasing the chances of catching aliases and preventing false releases.

Forrester believes professionals can no longer rely on the old method of human facial recognition based on print photographs and memory. There are many different ways in which this technology can add value. "If someone tries to use a stolen prox card, at a courthouse for example, the system will compare the per-

son's face to the prox card owner," he says. "When the faces don't match, the system will lock the person out and raise an alert."

Thomas Zielke, vice president of biometrics for Cross Match Technologies Inc., believes the cam-

eras used in the field need to change. "The [camera] technology today is still sensitive to changes in the face," he says. "The quality from the police record is sharp, but the camera image isn't the same quality." One solution is to use a lower-

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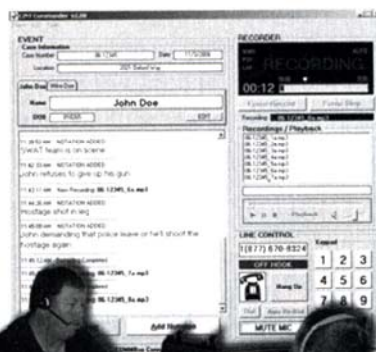
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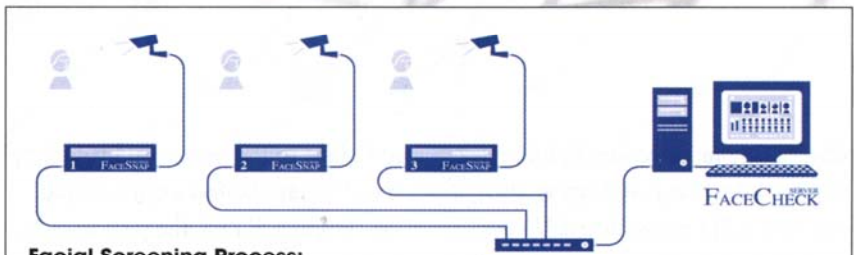
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- Individuals enter the secure area as the system captures facial images.
- The device instantly compares individual facial patterns against data on predetermined watch lists for real-time identity verification.
- Subjects on watch lists trigger alerts that immediately notify security personnel, and those not on watch lists quickly pass through the controlled area.

quality camera image then utilize software to sharpen the quality and a filter to help identify the face.

Cross Match of West Palm Beach, Florida, offers two law enforcement products. FaceSnap Recorder is an intelligent media recorder. "Since many images from surveillance cameras have low quality, at the base level FaceSnap helps filter out faces, which is very useful if there are only a few people you are interested in analyzing," Zielke explains. At the advanced level, the product has tools and systems that can analyze video footage and help match faces against a database.

The second product is FaceCheck Server. This program matches faces against a database and can help analyze images over an extended period of time. The software can determine if there is any pattern in the images, such as one person who appears repeatedly at a certain location.

FaceCheck Server works best with a high-resolution image but has the ability to make adjustments in post-processing to improve image quality. This feature is available in commercial products such as Photoshop, but is not at that level of quality yet. "Photoshop shows us what is possible, but it is done manually," Zielke says. "With facial recognition technology, these adjustments need to be done automatically."

L-1 Identity Solutions offers two products for the law enforcement community. Viisage is a rapid, on-demand, facial identification system used by the Pinellas County (Florida) Sheriff's Office. And Identix is currently used by the U.S. State Department and houses 75 million images. Both products help professionals identify faces within a controlled or stable background.

Identix has access to the Avis search engine, which allows a rapid

F SCAN Recorder is an intuitive system from Cross Match, which enrolls individuals in less than 30 seconds.



Cross Match's F SCAN FaceCheck system verifies identities in real time per customizable thresholds.

search to match a face against images in a database. The State Department's system processes 2,000 to 5,000 requests per hour.

The newest entry in the L-1 product line is HIIDE, which can analyze biometrics of the face, iris and finger. It uses an image capture device that is no bigger than a SLR camera. "With HIIDE an officer can match a suspect against all of the variables," Atick says. Currently approximately 1,000 U.S. Department of Defense agents use HIIDE, and Atick believes this is the future of this technology.

Facial recognition technology has come a long way. Experts and designers believe it must become a mainstay of biometrics and law enforcement. The ability to identify a subject by face in the field is critical when a suspect refuses to cooperate or is dangerous. At stationary locations, such as correctional facilities or borders, the technology can help improve security and prevent false entry or release.

Atick sums it up, saying, "Facial recognition is the next frontier for law enforcement. It took some time, but we are at the point where the technology works robustly and it gives value to the officer in the field." ■

Andrew Langerman is a business and freelance writer who lives in New Jersey. He may be reached at andrew@gotwriter.com.

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