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Identifying Fingerprints at a Distance

Do you watch crime-solving television shows where the crime is often solved by analyzing the fingerprints, physical objects, and other particles left behind by the perpetrator? Watching TV CSI's (crime scene investigators) use their tools of the trade to ferret out significant leads

Photo 1—Each AIRprint unit has two digital cameras, a polarized light source, and the computer power to turn the photos that the cameras take into detailed fingerprint images.

from shards of glass, a petal from a flower, a discarded cigarette butt, or other seemingly insignificant refuse is fascinating.

Since criminals can also learn from watching TV, some news stories have reported that today's perpetrators often take extra care to avoid leaving evidence that can lead to their arrest. Even if a criminal leaves fingerprints at a crime scene, it is possible for them to hide in plain sight if they have never been fingerprinted.

The new and emerging technology that I am about to describe blew my mind when I first learned about it at this year's Consumer Electronics Show (CES–Las Vegas). During the show, I found myself in the middle of a heated discussion between two reporters in the CES pressroom. The company and the technology they were arguing about weren't represented at the show. However, what they were saying sounded so fantastic that I started to research the topic immediately. My normal coverage of CES will unfold in next month's column and starting this month at my website, www.technologytoday.us.

Imagine a technology that accurately records and analyzes a person's fingerprints at a distance of

1 meter from the sensor. That technology is AIRprint. By the time this column goes to press, the system might be certified to perform the same magic at twice the distance. As with most evolving technologies, we can expect that this technology will work over much greater distances sometime in the near future. (See Photo 1.)

Joel Burcham is the director of projects at Advanced Optical Systems, Inc. (AOS), the company that

created AIRprint. Under Burcham's leadership, AOS is involved with a number of projects for the Department of Defense (DOD), including a biometric corridor with biometric sensors for facial recognition. The company's goal is to create an AIR-

print biometric corridor that performs fingerprint identification and facial recognition at the same time. (See Fig. 1.)

At the present level of development, AIRprint can match an individual to a set of prints that are on file in less than one second. It can also perform the initial input of data if the person's fingerprints are not in the database. In its present format, it could be used to quickly identify people for entry into a secure facility, unlock the controls to extremely dangerous machines to qualified and approved personnel, or perform covert identification by putting a face to an unknown person of interest who has left fingerprints at a crime scene.
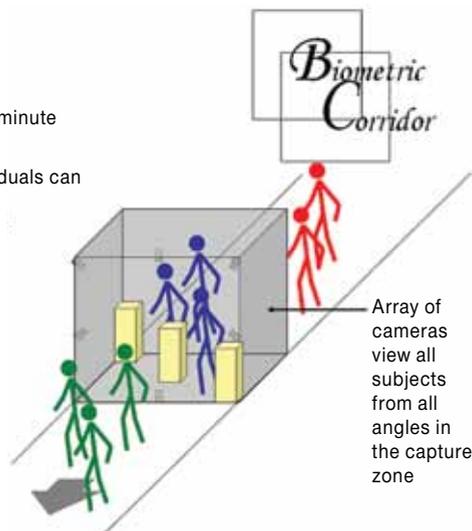
If you hold your hand at arm's length and look at the tips of your fingers, I am reasonably sure you won't be able to see the circular patterns and ridge formations on your fingertips. So how does AIRprint record fingerprints from a distance accurately enough to identify a person? In an email message, Burcham described

Biometric Corridor Design
Supplemental infrared lighting
2 meters long
Estimated to handle 60 people per minute
Multiple corridors can be adjacent
Established "Capture Zone"—Individuals can act normally and be identified

Fig. 1—A future biometric corridor will feature many AIRprint units, face recognition capabilities, and perhaps scanners that can detect weapons.

Array of cameras view all subjects from all angles in the capture zone

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Photo 2—The current AIRprint biometric corridor

what AOS has achieved, saying, "There is no such thing as magic, only physics. Anything is possible with enough imagination, money, and time . . . the more imagination, the less money and time are required."

Here is the physics behind the magic. The AIRprint camera box contains two digital cameras and a lamp that projects polarized light. When people walk through the biometric corridor, the light in the corridor is polarized. Each AIRprint snapshot is actually two separate stereoscopic photos of the same scene. The two photos are different because one camera has a polarized filter so it only records vertical polarized light rays and the other camera is filtered to record only horizontal polarized light rays. A computer quickly superimposes one photo onto another and the combined picture shows the ridges and valleys of the person's fingerprints with the same detail as if the fingers were placed on a police fingerprint scanner.

AIRprint is now operational and it has been successfully demonstrated to top-ranking officials in the U.S. military and also to appropriate personnel at the Biometrics Identify Management Agency (BIMA). BIMA is funded by the DOD with the set goal of "finding biometric ways of telling the good guys from the bad."

The goal now is to scale up AIRprint so it can be used to screen people as they pass through a biometric corridor. (See Photo 2.) This type of corridor could be located anyplace someone needs to screen large numbers of people quickly and efficiently. You must remember that the system in its present format can only identify people's fingerprints. It cannot determine if they seek entry for a sinister reason. It, of course, can be combined with facial recognition hardware and other systems to determine if the person in the corridor is a threat. The technology brings an entirely new meaning to the term "watch list."

Recalling the Facts

1. If a biometric corridor that only contained AIRprint technology was located at a sporting event, what kind of sinister people might it detect?

2. Why do you think two reporters would get into a heated argument about this technology? Build a case that supports or refutes its use at your favorite professional sporting event. Your teacher might select this topic for a classroom debate. ⊚