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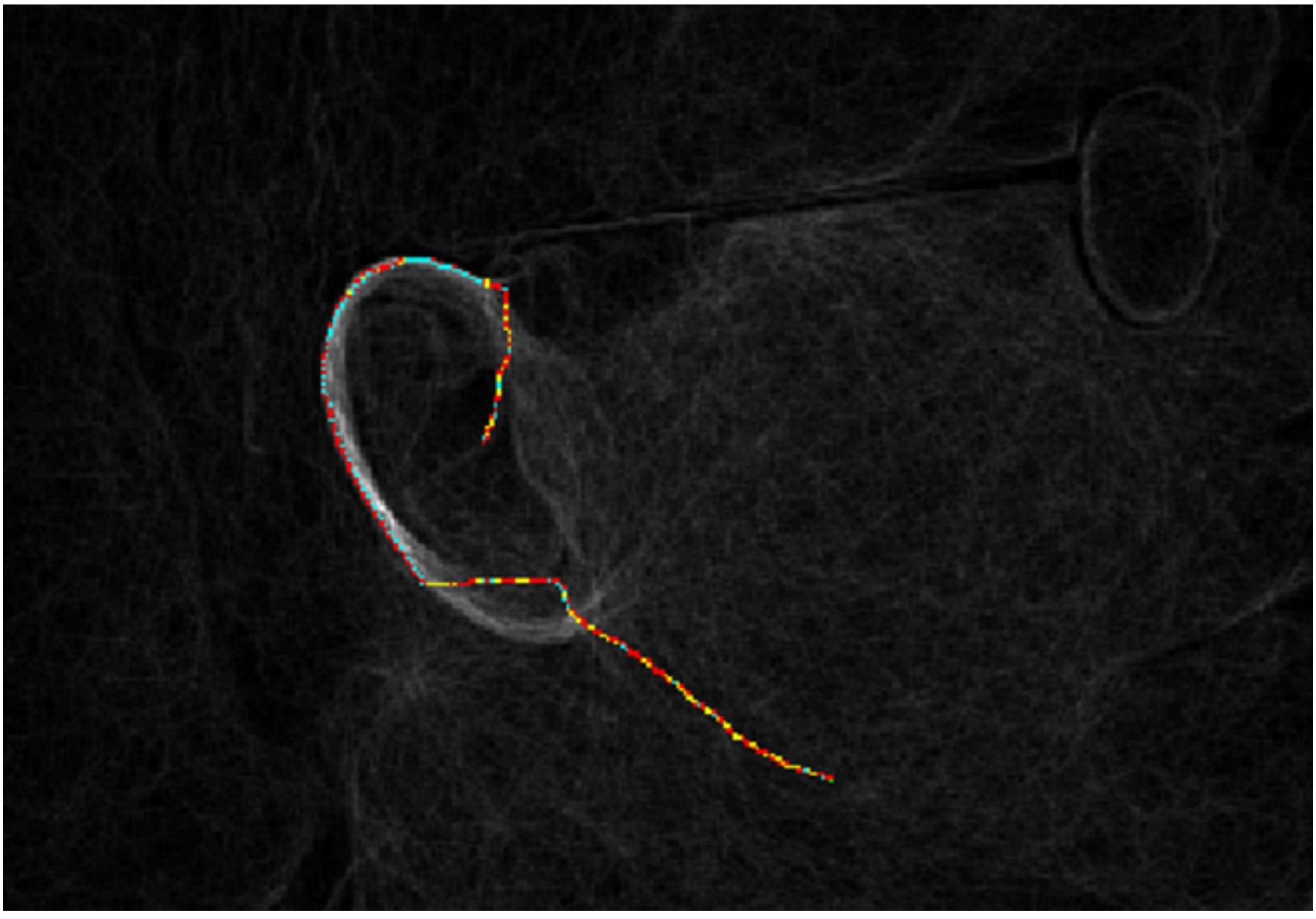
EARS COULD MAKE BETTER UNIQUE IDS THAN FINGERPRINTS



On a planet hosting 6.7 billion human beings, having proof you're unique is of tantamount importance. The ear, it turns out, may be the best identification yet.

Through a new shape-finding algorithm called "image ray transform," which boasts 99.6 percent accuracy, according to a study presented at the IEEE Fourth International Conference on Biometrics Sept. 29, the outer ear may

prove to be one of the most accurate and least intrusive ways to identify people.

Fingerprint databases of U.S. government agencies alone store the records of more than 100 million people, but prints can rub off or callous over during hard or repetitive labor. With the advent of computer vision, researchers and identification industries are seeking easier and more robust biometrics to get their hands on.

“When you’re born your ear is fully formed. The lobe descends a little, but overall it stays the same. It’s a great way to identify people,” said Mark Nixon, a computer scientist at the University of Southampton. and leader of the research.

"There’s real power in using the appearance of an ear for computer recognition, compared to facial recognition. It’s roughly equivalent if not better," said computer scientist Kevin Bowyer of Notre Dame, who is pursuing his own ear-recognition technology and not involved with Nixon’s work. "If you’ve got a profile image for someone, this is a great way to use it."

Recent technologies use computer vision to convert human features, such as faces and irises, even the gait of a person's walk, into reliable alternatives to fingerprints. Nixon and his team have pursued using ears as one biometric for years, and through what he called a "blue-sky research effort," his colleagues created the highly capable image-ray-transform algorithm.

The technology can identify an ear time after time with 99.6 percent accuracy. It works by unleashing a ray-producing algorithm on an image to seek out curved features. When a ray finds one, the software draws over the part and repeats the analysis. In a few hundred or thousand cycles, it cleanly paints the ear more than any other face structure.

"The rays fly around the image and get caught in tubular things. The helix, or outer edge, of an ear is a wonderful tube that rays keep hitting," said Alastair Cummings, the Southampton University computer scientist who developed the algorithm. "There are dozens of ways of doing ear biometrics, but this is a very good one."

From there, another program turns the curves into a unique set of numbers, something that could be used as an ear-based ID.

Nixon and Cummings acknowledged some limitations of the system, including hair covering the ears, less-than-ideal lighting conditions, and different IDs generated from different angles. And using the ear as a

biometric isn't without critics.

"I have seen no scientific proof that the ear doesn't change significantly over time. People tend to believe notions like these, and they are repeated over time," said Anil Jain, a computer scientist at Michigan State University who was not involved in the study. "Fingerprinting has a history of 100 years showing that it works, unless you destroy your fingerprints or work in an industry that gives you calluses."

Using the ear is not about replacing existing biometrics such as fingerprints, Bowyer said. Rather, it's about supplementing them, especially when it comes to catching crooks.

"It's easy to say, 'Hey there's fingerprints, faces and irises, why do we need more?' For some applications that's a valid question," he said. "But when you're doing surveillance, where a person isn't being cooperative for obvious reasons, you want anything you can get. If you have images of ears, it's dumb to throw that away."

What's more, he says, there really aren't studies proving the agelessness of any human biometric – including fingerprints.

"Who over the age of 40 could think these things don't age?" Bowyer joked. "Some have said 'irises are for life,' but in some of our lab's work we've noticed degraded biometric performance even in those."

To address limitations of the approach, the team is looking to demonstrate that ears do hold up over time. In addition, the researchers hope to pair their new biometric with other computer-vision technologies, such as face recognition, to bolster its reliability. And if the algorithm can be made to work quickly in three dimensions, a fuzzy clip of a criminal walking by a security camera could be turned into grade-A courtroom evidence.

"We've shown we can use ears, but can we process data that comes from a sort of normal scenario? That's the real challenge," Nixon said.

Images: Alastair Cummings/Southampton University (demo) 1) A man's profile processed by the image-ray-transform algorithm, with a multicolored ray detecting part of his ear. 2) Original photograph fed into the algorithm.

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