GOTCHA!

Criminal mugs captured in computer memory

By JOHN TRAVIS

One of FacePrints' best runs: From top to bottom are first-, fourth- and 10th-generation faces. In the fourth-generation face, both hair and chin were "locked" even though the chin was not identical to the suspect's. The fourth picture depicts the suspect's face as digitized from a mug shot.

*T*he days of the police sketch artist could be numbered. A new computer program may render a more dependable likeness of culprits than the methods employed at police stations today, researchers say. The key to their criminal-depicting technique is that witnesses are not forced to recall a suspect's face, but can merely recognize individual features.

The new program, called FacePrints, "breeds the face of the criminal suspect," says Craig Caldwell, a New Mexico State University graduate student developing the software. He and his advisor, Victor S. Johnston, described a prototype of the program at July's Fourth International Conference on Genetic Algorithms, held in San Diego.

FacePrints initially presents a witness with a computer screen displaying 20 faces, randomly selected from among more than 34 billion possibilities. How the witness numerically rates each face on its similarity to the recalled appearance of the criminal will determine which 20 new candidate mug shots the computer offers up next.

As screen after screen of revised faces appears, the witness can even keep features that seem correct. "If they liked the hair, they could lock the hair," explains Caldwell. Within 10 generations of 20 faces, he says, FacePrints can match or beat any other composite method.

Caldwell and Johnston tested the system by videotaping a simulated robbery with an actor as the criminal. "Witnesses" then watched the tape and used FacePrints to produce a composite image of the actor. Even seven days after the "robbery," witnesses working with the program consistently produced composites similar to the actor's face, says Caldwell.

FacePrints' effectiveness derives from the difference between recognizing a face and recalling specific features, Caldwell notes. It's relatively simple to recognize a familiar face in a crowded room. But describing your best friend's features — eyes, hair, nose, mouth or chin — to a stranger poses a surprisingly difficult task. Other composite methods, such as sketch artists and physical or computer overlays of features, depend on accurately recalling each feature. With FacePrints, witnesses can subconsciously recognize features that they could never effectively describe, Caldwell says.

A genetic algorithm, acting on a witness' ranking to narrow in on a criminal's face, drives FacePrints. Incorporating elements of genetics and natural selection, genetic algorithms represent a powerful tool for computer searches (SN: 11/25/89, p.346). Just as a mother's and father's genes determine their child's features, FacePrints' computer codes — mathematical expressions defining the eyes, hair, chin, nose and mouth — merge to create new composite renderings of a face. Witness ratings determine which faces are the "fittest" and which of their features will be reproduced when creating the next generation of 20 faces.

"It's exactly the kind of problem genetic algorithms solve," says David E. Goldberg of the University of Illinois at Urbana-Champaign, author of a book on genetic algorithms. "It's a wonderful application."

FacePrints "offers a magnificent opportunity to law officers," Caldwell adds. Future versions of FacePrints, which now runs on a Macintosh computer, might include color and three-dimensional faces, Caldwell says. Also, since the face is stored in computer form, it can easily be sent to other police departments or merged with additional witnesses' composites to form a super-composite. This final ability may significantly enhance the picture's likeness to the real culprit, claims Caldwell.

Before FacePrints replaces the human police artist, however, the program must be expanded considerably. Today it only contains features of male, college-aged Caucasians.

Nor will FacePrints guarantee a picture-perfect match of the suspect. If a witness has difficulty remembering a face or if the criminal lacks distinctive features, the composite sketched may bear little resemblance to the culprit's countenance. But police already face that problem with other composite methods, Caldwell notes.

FacePrints, whose development was financed by the Department of Justice, may also have applications beyond criminal apprehension. Watching people rank faces can help social scientists understand the cognitive processes involved in recognizing and evaluating faces, says Caldwell. Another New Mexico State graduate student will even attempt to characterize beauty by having subjects "breed" their ideal face with the program, he says. □