Developing Face Recognition Technology to Match Forensic Sketches to Mug Shots

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Face recognition technology is moving forward at a fast pace to address several requirements in security and law enforcement domains. Research in MSU's Pattern Recognition and Image Processing (PRIP) Lab in the Department of Computer Science and Engineering (CSE) is helping to make that happen. The recent research of CSE PhD student Brendan Klare and colleagues is a good example.

Klare, working with Zhifeng Li, a post-doc, and University Distinguished Professor Anil Jain, developed algorithms and created software to help automatically match hand-drawn facial sketches to mug shots stored in law enforcement databases. “State-of-the-art commercial face recognition software is not designed to match sketches to photographs,” says Klare. “They are designed to match photographs to photographs.”

The sketches used in this project are called forensic sketches, drawn by police sketch artists by interviewing a witness to obtain a description of the suspect. Traditionally, these forensic sketches are posted in prominent public places in hopes that someone will recognize the suspect and contact authorities. The reason that the sketches typically cannot be matched to the photos is that the sketches contain different textures compared to the photographs that they are being matched against. Further, the accuracy of the forensic sketches depends on the details and preciseness of the verbal description of the suspect's face provided by the witness. Being able to match a sketch to a mug shot in a database will speed the work of law enforcement agencies in apprehending suspects.

This project is the first large-scale experiment on matching operational forensic sketches—and the results have been impressive. “We improved significantly on one of the top commercial face recognition systems,” says Klare. “Using a database of more than 10,000 mug shot photos, 45 percent of the time we had the correct person in the top 50.” All the sketches fed to the matching system were from real crimes where the person was later identified; a race and gender filter also was used to improve the matching accuracy and to speed up the search. This research project and its results appear in the March 2011 issue of the prestigious journal IEEE Transactions on Pattern Analysis and Machine Intelligence.

Klare is the first to say that more work needs to be done in this area. “This is a step in the right direction in an important area of pattern recognition,” says Klare. “A system specifically designed for this problem is what is needed. With more effort this could be a very valuable tool for law enforcement.”

Future stages of the project are planned to improve its accuracy and user interface. Several law enforcement agencies have agreed to deploy the system developed by Klare in order to try it in real-world situations.

Klare earned his bachelor's and master's degrees in computer science. As he was deciding what area to pursue for a doctorate degree, Klare became fascinated with pattern recognition and computer vision. “We are trying to get computers to replicate some of the common things we do, like seeing things,” says Klare. He is enjoying the opportunity to work under Jain, one of the world’s leading experts in not only face recognition, but biometric technology in general.

Klare is in this third year of work on his doctorate. He hopes to complete his dissertation soon, and then he would like to continue with biometrics research, probably with the federal government.

“Sketch recognition is one of several exciting projects related to law enforcement currently being investigated in the PRIP Lab,” says Jain. “Other projects deal with latent fingerprint matching, latent palm print matching, face recognition in surveillance video, use of scars, marks and tattoos (SMT), and detection of fingerprint obfuscation. We are grateful
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to the Michigan State Police, the FBI Biometrics Center of Excellence, and the National Institute of Justice for supporting our research.”

PRIP lab project descriptions and publications can be accessed at http://biometrics.cse.msu.edu

Journal article in *IEEE Transactions on Pattern Analysis and Machine Intelligence*

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