

## Recognising even the worst fingerprints



Asker Bazen

For Asker Bazen, fingerprints do not hold many secrets anymore. In fact, the remaining secrets are the ones that challenge him the most. Recognising a print that is damaged or partly missing – that is what Asker wants to make possible. He obtained a VENI grant from the Netherlands Organization for Scientific Research NWO for excellent research. Within CTIT, a working group is currently being formed, focusing on biometry and security.

“If a comparison between fingerprints fails, in most cases it is because the quality of the print is not good enough. Maybe the finger has a small wound, or is cold or wet. These circumstances can have a major influence on the quality of the print and recognition. For me that is the challenge: extracting as much information as possible even from a print that is basically lousy. Can we still predict the lines in a fingerprint when part of it cannot be seen at all? Within the Content Protection and Security (COPS) group, we have now combined some security research of several CTIT groups. Apart from my own research, we have started research into face recognition, and topics like smartcards are included as well.”

“As part of my PhD work, I developed two major fingerprint verification methods. With the three-year grant NWO has given me, I want to merge these two methods to obtain even better results. The first is the method of elastic matching. The fingerprints found at a certain crime scene, let’s say, can be on quite a different surface than the ones in the database at the police station. What I try to do is find the ‘minutiae’ in the fingerprint: the ends and connection points in the lines. This is not a trivial image recognition problem, but using smart methods, we can find all twenty to fifty points in a single print. Comparing these points with the ones in the database, you can try to find a match, stretching the prints to some extent, shrinking them in other places. This method really produces good results.”

### Examples of current projects:

- Multiple Robust Methods for Fingerprint Identification (STW)
- Development of a Software-Radio-Based Embedded Mobile Terminal (STW)
- Adaptive Wireless Networking (Freeband Impulse, Ministry of Economic Affairs)



“Secondly, I have been looking at the main directions of the lines in the fingerprint. If you make images of these four angles, you get ‘cloudy’ pictures, describing the concentration of the lines of one angle. This is a very fast way of comparing; we can make up to 50,000 comparisons per second. At first, we believed that this was only for primary and coarse classification, but I have discovered that it yields quite good results.”

“I believe fingerprinting is a cheap way of checking a person’s identity, for checking access permission, etc. There are more accurate ways, like scanning the iris, but you need sophisticated and bulky cameras to do that. Basically, fingerprint recognition is quite simple. We already see sensors and smartcards on the market, some admittedly working better than others.”

“We recently completed a small project concerning the ‘handprint’ instead of the fingerprint. The way a person holds a gun, for example, is quite unique. Using this print, you can prevent unauthorised persons from using a gun. The method uses a special sensor film that measures the pressure of a number of points of the hand. The recognition method is basically the same as it is for fingerprints using the ‘cloud’ method. Having done just preliminary experiments, we have discovered it works better than we’d even expected. Of course, one of the next steps will be to introduce some compact electronics into guns, and up to now, most guns are purely mechanical. That’s someone else’s concern, we have proved the method to be effective.”

“Fingerprint verification and identification is still quite ‘hot’, although not much research is done in the Netherlands. I used to send in a contribution to the international Fingerprint Verification Contests regularly held in Bologna. Companies and research institutes can test the performance of their new methods there. In the past, I made contributions using the elastic method. Even the early versions did well then. So I expect to win combining elastic matching with the ‘cloud’ method.”