

Biometrics in a pervasive environment – ultimate convenience, or ultimate control?

M. Angela Sasse

Professor of Human-Centred Technology

Head of Information Security Research

Department of Computer Science

University College London, UK

Some basics

- Enrolment = capture of biometric feature and generation of biometric sample and/or template
- Raw data (images) or templates?
- Identification or verification?
 - Identification = capture & compare to all stored samples
 - Verification = present user ID and compare against specific stored template



cont.

- Where is sample/template stored?
 - Token carried by user (e.g. passport)
 - Database
 - Both
- Distance between enrolment and verification
 - How long ago?
 - Live updating of templates
 - Differences in equipment and algorithms
 - Standards/APIs

Many biometric techniques

Physical

- Fingerprint
- Finger/Palm Vein
- Hand geometry
- Face recognition
- Iris
- Retina
- Earshape

Behavioural

- Dynamic Signature Recognition (DSR)
- Typing pattern
- Gait recognition
- Heart rate analysis

**Voice analysis
(speaker recognition & pattern analysis)**

Error rates

- Failure to enrol (FTE): characteristic missing
- Failure to Acquire (FTA): characteristic present, but cannot be recorded at sufficient quality.
 - usability: universal access
 - security: alternative identification may be less secure
- False Acceptance (FAR): accepting someone other than enrolled user
- False Rejection (FRR): rejecting enrolled user
 - high FRR reduces usability
 - High FAR reduces security

Will pervasive functionality be available to people who cannot be enrolled, or don't want to be? What are the consequences of false acceptance and rejection?

HOME > NEWS > NEWS TOPICS > POLITICS > LAW AND ORDER

Airport face scanners 'cannot tell the difference between Osama bin Laden and Winona Ryder'

Airport face scanners designed to verify travellers' identity against their passport photographs are working at such a low level that they would be unable to tell the difference between Osama bin Laden and the actress Winona Ryder, it has been claimed.

By Duncan Gardham, Security Correspondent
Published: 9:00PM BST 05 Apr 2009



Osama bin Laden and Winona Ryder: airport face scanners reportedly cannot tell the difference Photo: GETTY; EPA

In a leaked memo, an official says the machines have been recalibrated to an

Share | Facebook | Twitter | StumbleUpon

1 diggs digg it

0 tweet

Email | Print

Text Size + -

- Law and order
- News
- UK News
- Travel News

Performance

- User performance depends on
 - frequency of use:
 - Frequent users complete faster and with fewer errors, infrequent users need step-by-step guidance and detailed feedback
 - Degree of cooperation
 - Total usage time (not just for matching)
- Quality of enrolled and presented samples has key impact (e.g. fingerprints 1 or 10 at a time?)
- Different performance for identification and verification (1-1 verification or 1-many identification)

Last Updated: Wednesday, 17 September, 2003, 08:38 GMT 09

[E-mail this to a friend](#)

[Printable version](#)

Eye scan school opens doors

A £14m Sunderland secondary school opens its doors to pupils on Wednesday, after a delay of a week and a half.

The Venerable Bede Church of England school should have opened on 8 September but building works also overshot a second opening date last Friday.

Staff and governors at the so-called "super school" have said that the best is worth waiting for with a building and facilities fit for the 21st century.



The system will be used for ordering school dinners

Last Updated: Monday, 13 September, 2004, 15:29 GMT 16:29

[E-mail this to a friend](#)

[Printable version](#)

Eye scanner project is scrapped

A Wearside school which became the first in Europe to use a futuristic eye-scanner has scrapped the scheme because it was too slow.

Venerable Bede Church of England School in Ryhope, Sunderland, introduced the hi-tech system to take away the stigma felt by pupils entitled to free meals.



The eye scanner has been scrapped for being too slow

The scanner was able to identify pupils anonymously by taking a picture of their eyes.

But the scheme has now been replaced by swipe cards because it was too slow.

"We were aiming for it to scan 12 pupils a minute, but it was only managing 5 so has been temporarily suspended as we do not want pupils' meals getting cold while they wait in the queue."

Careful balancing of business process requirements and security requirements needed.

Total Usage Process

- Time quoted by suppliers often only refer to capture of live image & matching
 - Walk up to machine
 - Put down bags, remove hats, etc.
 - Find token (if used)
 - Put on token (if used)
 - Read token
 - *Wait for live image to be captured & matched*
 - Walk away & free machine for next user
 - Plus average number of rejections & re-tries

Average verification time today 12-20 seconds, longer with infrequent usage – what speed to we need for identification in pervasive environments?

Performance: Smartgate Sydney Airport

- Problem: speedy & secure immigration
 - Technology: Face recognition system
 - Users: Qantas air crew (2000)
 - Performance:
 - FAR “less than 1%”
 - FRR 2%
 - “could be faster” (average 12 secs)
 - Several re-designs necessary, including updating of image templates
 - Extended to travellers with ePassports in 2009:
- <http://www.smh.com.au/travel/travel-news/sydney-airport-opens-smartgate-20090926-g742.html>



Performance: BKA face recognition trial

- Railway station with 20,000 passengers/day
- 2 month trial of 3 systems
- 200 people on watch list, who passed through every day, making no effort to conceal their identity
- FAR fixed at .1% (= 23 false alarms/day)
- Best performing system at under most favourable detected caught 60% (down to 20%)
- “not worth the investment” or “catching 6 out of 10 bad people is significant progress”?

Usability Issues

- Recognising when you are recognised, and which feature
- Current technology requires people do adapt, instead of adapting to people
 - “iris dance”
 - “neutral expression” in face recognition
- Difficult to make work for different user groups (e.g. iris and face for dark-skinned people)
- Contextual variables of operation

Contextual: light interference



User Acceptance

- Acceptance requires
 - perceived need for security
 - convenience (or at least - no inconvenience)
 - trust in operator (data protection, opportunistic usage for other purposes)
- Acceptable of modes of operation
 - Veils?
 - Hygiene
 - Fear of attacks, being mis-identified, covert surveillance, ...

Last Updated: Thursday, 31 March, 2005, 10:37 GMT 11:37 UK

[✉ E-mail this to a friend](#)

[🖨️ Printable version](#)

Malaysia car thieves steal finger

By Jonathan Kent

BBC News, Kuala Lumpur

Police in Malaysia are hunting for members of a violent gang who chopped off a car owner's finger to get round the vehicle's hi-tech security system.

The car, a Mercedes S-class, was protected by a fingerprint recognition system.

Accountant K Kumaran's ordeal began when he was run down by four men in a small car as he was about to get into his Mercedes in a Kuala Lumpur suburb.

The gang, armed with long machetes, demanded the keys to his car.

It is worth around \$75,000 second-hand on the local market, where prices are high because of import duties.

Integrating biometrics and other technologies

1. Face recognition to CCTV
2. Stress or lie detection to face recognition
 - Thermal imaging
 - Microfacial movements
3. Lie detection to speaker recognition
4. Iris diagnosis
5. Analysing lipids left by fingerprints

Last Updated: Sunday, 2 April 2006, 07:10 GMT 08:10 UK

 [E-mail this to a friend](#)

 [Printable version](#)

News Front Page



[Africa](#)

[Americas](#)

[Asia-Pacific](#)

[Europe](#)

[Middle East](#)

[South Asia](#)

[UK](#)

[Business](#)

[Health](#)

[Science/Nature](#)

[Technology](#)

[Entertainment](#)

[Have Your Say](#)

[In Pictures](#)

[Week at a Glance](#)

[Country Profiles](#)

[In Depth](#)

[Programmes](#)

[RSS](#)

[What is RSS?](#)

[BBC SPORT](#)

[BBC WEATHER](#)

[BBC ON THIS DAY](#)

Fingerprints hide lifestyle clues

By Mark Ward

Technology correspondent, BBC News website

Fingerprints could soon help police narrow down their list of suspects by giving clues about the lifestyle of whoever left the prints at the scene of a crime.

Researchers in the UK are uncovering the ways fingerprints are changed by age, smoking, drug use and even some personal grooming products.

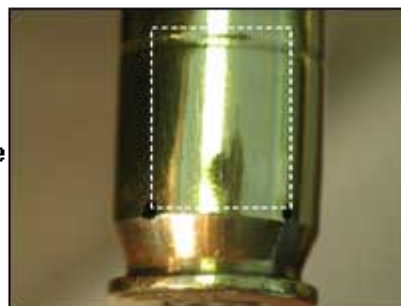
The work also promises to help obtain good quality copies of prints that have gone unnoticed for days or weeks.

Related work aims to find prints on guns and bomb fragments that are often among the most difficult to recover.

Led by Dr Sue Jickells from Kings College, London, the work on getting more from fingerprints started by looking at the chemical components of prints and how they change over time.

Dr Jickells said much of the material left behind when people touch anything are fat molecules, or lipids.

"There are a lot of lipids in fingerprints," said Dr Jickells, "and there are a lot of possibilities for that."



The technique can spot prints invisible to naked eye

SEE ALSO:

- [Police armed with new technology](#)
30 Mar 06 | West Yorkshire
- [Shoeprint analysis to fight crime](#)
31 Mar 06 | Technology
- [Police call for DNA holding power](#)
28 Mar 06 | Scotland
- [Teacher wins police DNA battle](#)
23 Mar 06 | West Midlands
- [Shoppers can pay by fingerprint](#)
08 Mar 06 | Oxfordshire
- [City hosts first 'CSI-UK' summit](#)
19 Mar 06 | Bradford
- [Fingerprints on Trial](#)
12 May 02 | Panorama
- [Students in crime scene scenario](#)
30 Nov 05 | Dorset

RELATED INTERNET LINKS:

- [EPSRC](#)
- [Forensic Science Service](#)
- [University of Wales, Swansea](#)
- [Oinetia](#)

TSA's express security grounded

Updated 6/23/2009 2:29 PM | Comments [181](#) | Recommend [60](#) | E-mail | Save | Print | Reprints & Permissions | [RSS](#)

Steven Brill



By Robert Deutsch, USA TODAY

By Thomas Frank, USA TODAY

More than 250,000 frequent fliers who pay \$200 a year to speed through airport security lines lost that privilege Monday when a company that runs the expedited lines went out of business.

Verified Identity Pass, which operates its Clear program in 18 airports, said Monday that it would shut operations at every airport by 2 a.m. ET today. The program started at Orlando International Airport in 2005 and grew to major hubs such as Atlanta, Denver, San Francisco and Washington Dulles.

- Share
- Yahoo! Buzz
- Add to Mbox
- Facebook
- Twitter
- More
- Subscribe
- myYahoo
- iGoogle
- More

BLOG: CLEAR registered travelers will not be refunded

A statement on Verified's website said the company "had been unable to negotiate an agreement with its senior creditor to continue operations." There was no information about whether enrollees would get refunds.

The announcement is a huge blow to lengthy efforts by travel groups and Congress to ease airport screening for "trusted travelers" who clear a background check.

"I don't see any future in Registered Traveler," said David Castelveter, a spokesman for the Air Transport Association, an airline trade group that had opposed the program.

The push for faster screening began after the 9/11 attacks, when tightened security led to massive lines in airports and complaints from travelers. The Transportation Security Administration (TSA) created the Registered Traveler program that lets companies establish exclusive security lines at airports.

Verified dominated the business, getting hired at 18 of the 21 airports with reserved security lines. The exceptions: airports in Jacksonville, Louisville and Reno. Verified said in May that its lines had been used 2.5 million times. Last year, the company announced plans to provide express security lines at NFL games in Atlanta, Denver and San Francisco.

The concept of expedited security lines faced obstacles. The TSA insisted that passengers enrolled in Registered Traveler go through the same security screening as ordinary travelers. Verified founder Steven Brill had urged the TSA to allow people in his program, who passed background checks, to get easier screening, perhaps by keeping on their shoes or coats at checkpoints.

Brill said Monday that he had left Verified in March to start a news-industry business and that he was surprised the company could not reach an agreement with creditors. The private company was funded by Lockheed Martin, GE Security, Lehman Bros., and several venture-capital firms.

Risk – operator going bust



Beating the system - Fingerprints

- Simple
 - Activate latent prints: breathing, bag with warm water
- Sophisticated
 - Lift print with tape or photograph
 - Gelatine print (gummy bear attack)
 - lasts 1x
 - Silicone print
 - Surgery



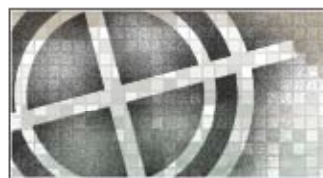
Chaos Computer Club strikes again

- Pay-by-touch system in German supermarket chain
 - Superglue
 - Plastic bottle cap
 - Digital camera
 - PC with laser printer
 - Plastic foil
 - Wood glue
- Published fingerprint of German Home Secretary



[Login](#) | [Sign up](#)

The Register®

[Hardware](#) [Software](#) [Music & Media](#) [Networks](#) [Security](#) [Public Sector](#) [Business](#) [Science](#) [O](#)[Environment](#) [Biology](#) [Physics](#) [Space](#) [Rise of the Machines™](#)

Focus on the possibilities of the web
with PEER 1 Managed Hosting.

Official sponsors of the Vulture 1 space launch with **The Register**

[Print](#)[Post comment](#)[Alert](#)

Surgery fools Japan's fingerprint checks

Dab madam nabbed

By [John Oates](#) • [Get more from this author](#)

Posted in [Biology](#), 8th December 2009 10:38 GMT

A Chinese woman arrested in Japan had surgery on her fingers to fool biometric border checks when entering the country.

The 27-year old woman, Lin Ring, who was deported from Japan in 2007, paid for surgery to remove and switch the fingerprints from her left to right hands, and presumably vice versa. Japan uses fingerprint scanners to check travellers entering the country.

Lin reportedly entered Japan illegally via Kansai Airport last December using someone else's passport and her new dabs. She was arrested last month for entering a fake marriage to a Japanese man. Police then noticed scars on her fingers and thumbs and investigated

A simple memory
upgrade makes your
system run faster and
more efficiently.



Beating the system - Iris

- Simple
 - Picture of eye stuck on glasses
- Sophisticated
 - Coloured contact



Beating the system - Face

- Simple
 - Replay attack (Photo or video of person)
 - Glasses with strong frames
- Sophisticated
 - Mask (Mission Impossible attack)



<http://www.heise.de/ct/english/02/11/114/bild7.jpg>

Conclusions

1. Technology with much potential, but lack of maturity
2. Error rates are still too high can render system uneconomic or unsafe
3. Need careful selection and configuration for
 - User groups
 - Context of use
 - Primary task
4. Consider “purpose creep”
5. Implications for privacy and choice ...

How do we get the balance right?

“To realize the promises of these technologies, personal information that previously was not captured, disseminated or collated has to be constantly exchanged. In ambient societies there will be no ‘practical obscurity’. There are no technological hurdles that make it too costly to collate the fragmented traces of an individual’s actions. Fundamentally, the vision of ambient societies relies on trading access to personal information for convenience.”

Riegelsberger, Sasse & McCarthy (2005):
Depending on the kindness of strangers: Trust in ambient societies.