Spoofing fingerprints
As easy as 1,2,3?

Ton van der Putte
Senior Consultant

Atos Origin

Biometrics 2001
London UK
November 2001

Atos Origin

How secure are biometric fingerprint recognition systems compared to other biometric techniques?
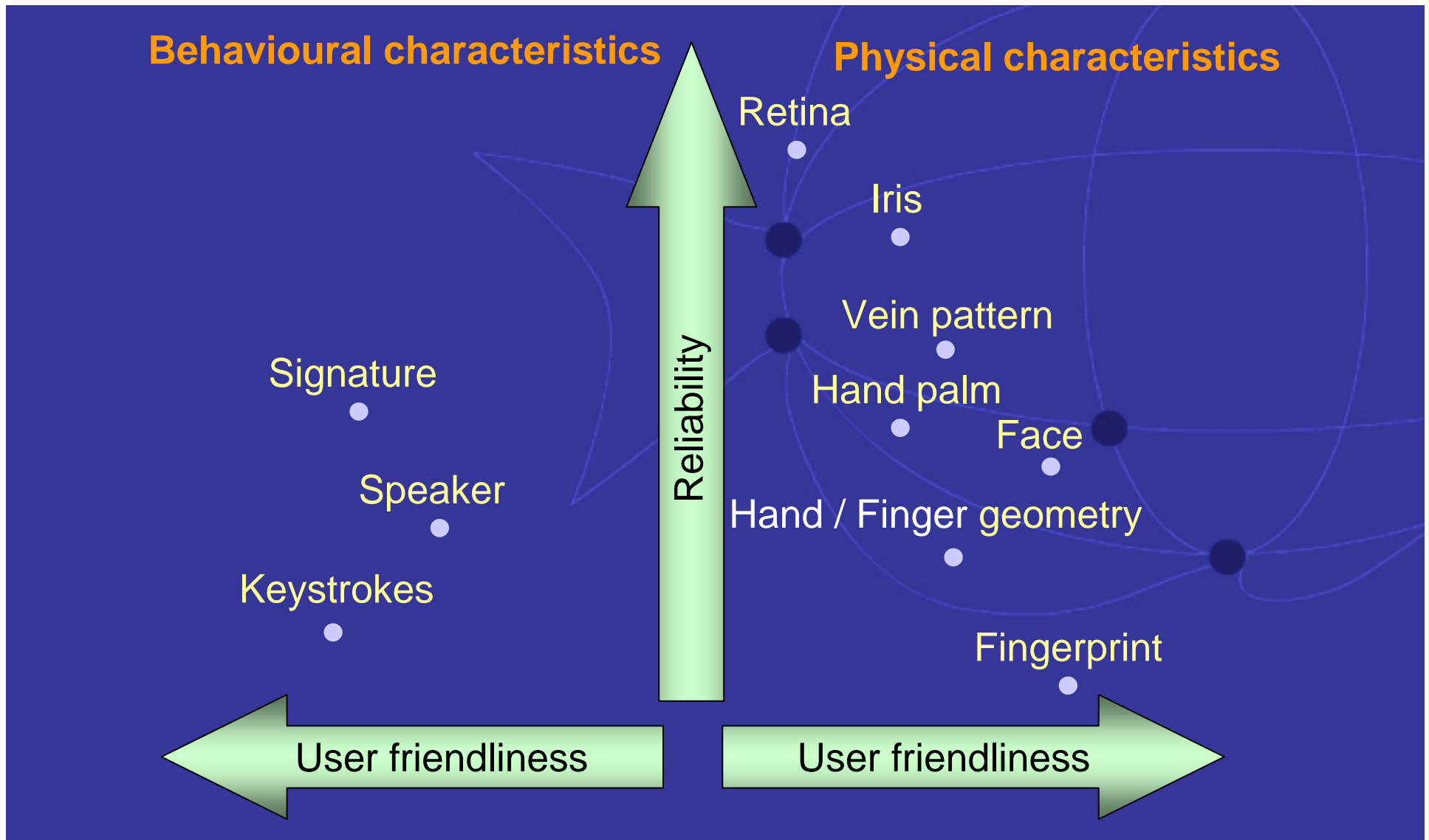
- ## Behavioural characteristics

  - **keystrokes dynamics**

  - **speaker recognition**

  - **signature dynamics**

- ## Physical characteristics

  - **iris recognition**

  - **retina recognition**

  - **vein pattern recognition**

  - **face recognition**

  - **recognition of hand or finger geometry**

  - **fingerprint recognition**

Reliability versus convenience

Behavioural characteristics

Physical characteristics

Retina

Iris

Vein pattern

Signature

Hand palm

Speaker

Face

Hand / Finger geometry

Keystrokes

Fingerprint

Reliability

User friendliness

User friendliness

Theory of fingerprint verification

- **Recognition on basis of the pattern**
  - Loop, arch, whorl patterns
- **Recognition on the basis of minutiae**
  - lines that end, split into forks, form island
- **12 points rule law enforcement**
  - is empirical defined
  - one in 15 million
- **Commercial fingerprint scanners**
  - 8 minutiae
  - FAR one in a million

Fingerprint scanning technologies

- **Optical sensors with CCD or CMOS cameras**
- **Ultrasonic sensors**
- **Solid state electric field sensors**
- **Solid state capacitive sensors**
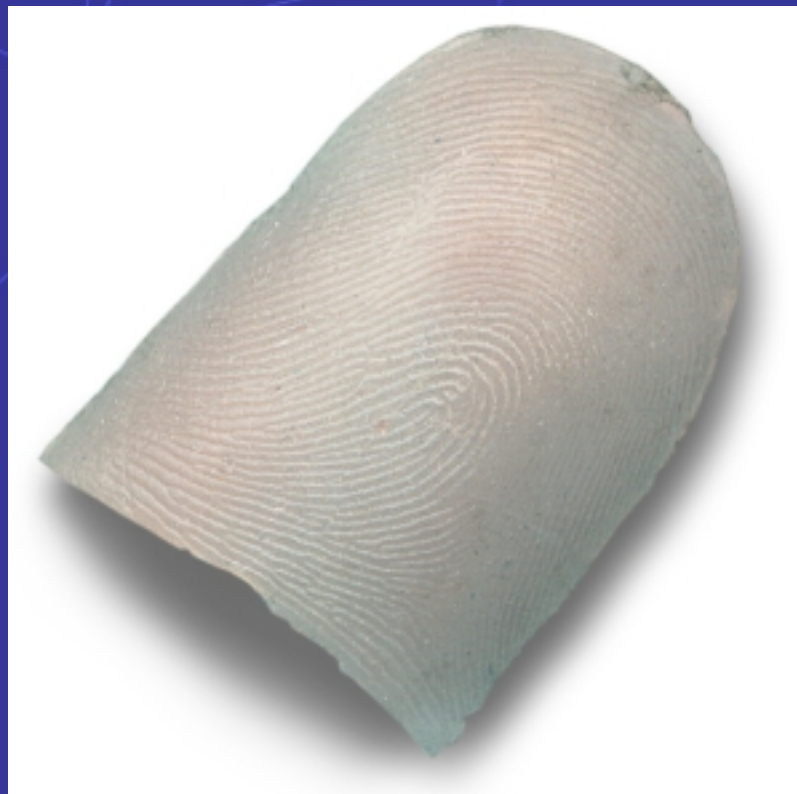- **Solid state temperature sensors**
- **Light emitting polymer**

- **Scanners cannot distinguish real fingers from a dummy**
- **Problem:**
  - **skin (epidermis) is almost dead material**
  - **silicone dummy is dead material**
- **Two methods for counterfeiting:**
  - **with co-operation of the owner**
  - **without co-operation**

- **making cast**
  - **30 minutes**
- **preparation time**
  - **2 - 3 hours**
- **incredibly simple**
- **co-operation**

Duplication with co-operation

1

2

3

4

5

- **lift fingerprint**
  - **< 1 minute**
- **preparation time**
  - **1 - 2 days**
- **dental technician**
- **unnoticed**

Duplication without co-operation

1

2

3

4

5

Recognise counterfeits (claims)

- **Temperature**
- **Conductivity**
- **Heartbeat**
- **Relative Dielectric Constant**
- **Blood pressure**
- **Detection under epidermis**
- **Other exotic methods, in general:**
  - **if no reveal of detection method, consider it as nonsense**

- **Don't use fingerprint recognition for:**
  - **identity documents**
  - **value transactions**
  - **physical access to secure area's**
- **Acceptable application**
  - **Access PC, acceptable in combination with a smart card**

- **Develop a life detection sensor that is an integral part of the fingerprint sensor**
- **The life detection sensor should be able to detect real (human) skin or detect that it is not skin at all**
- **In case of real skin detection, the life sensor should also detect that it is the skin of a living finger**

Atos
Origin

Ton.vanderPutte@atosorigin.com