

# Biometric Security Systems

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## Identity

- Distinction of physical identity from electronic

## Identification

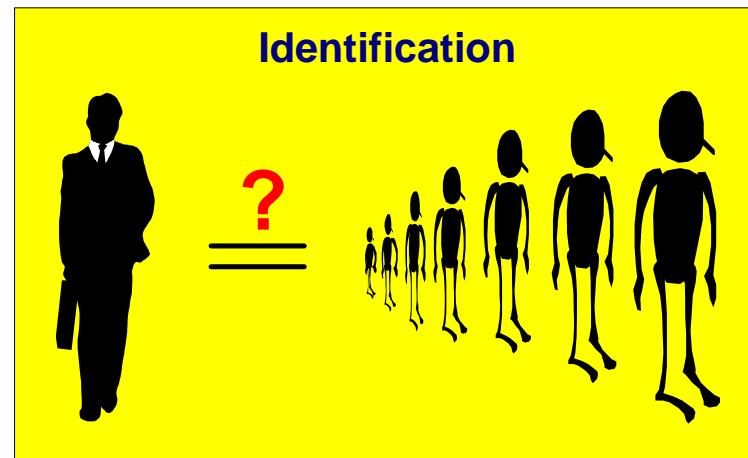
- Comparison 1:N

## Verification

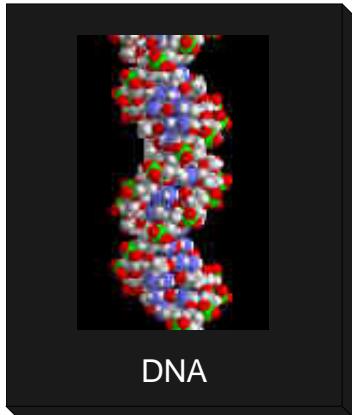
- Comparison 1:1

## Authorization

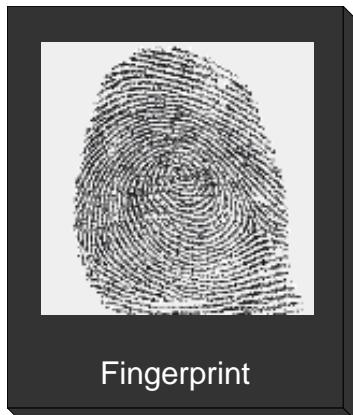
- Confirmation of identity



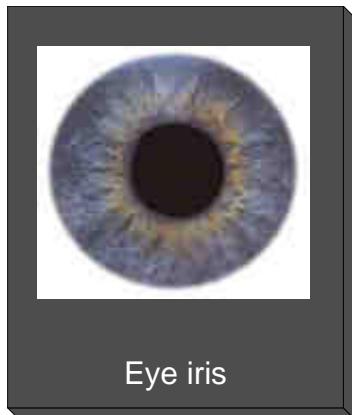
# Biometric characteristics



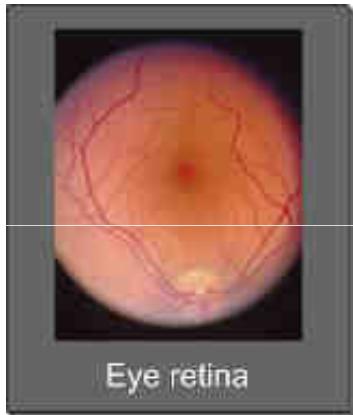
DNA



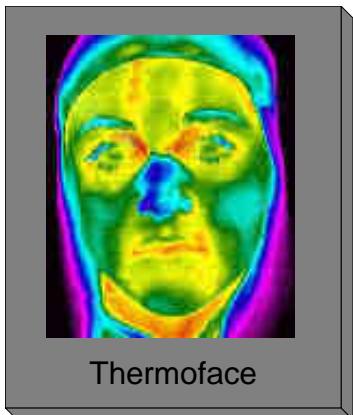
Fingerprint



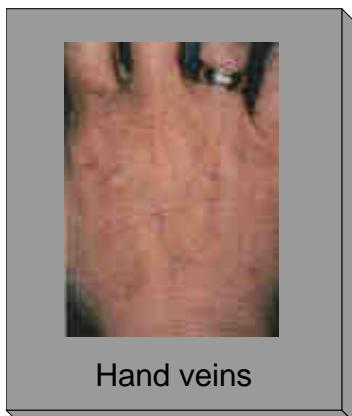
Eye iris



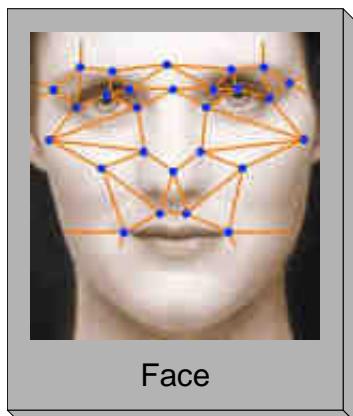
Eye retina



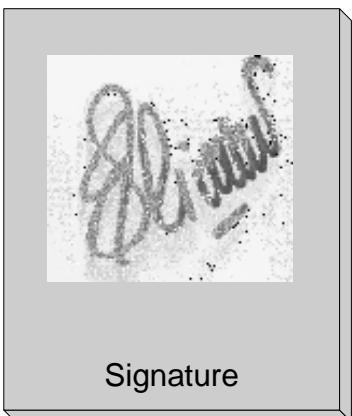
Thermoface



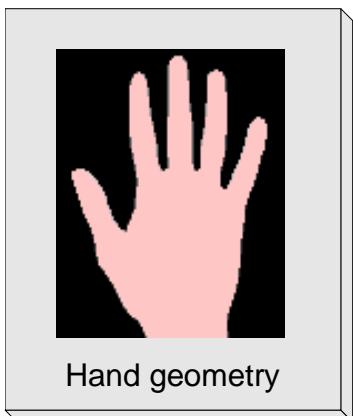
Hand veins



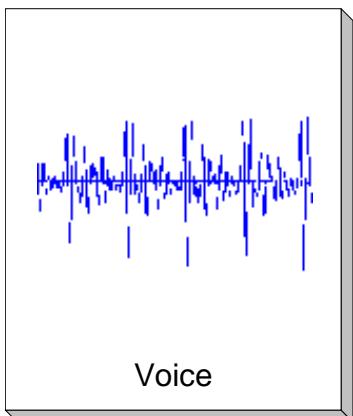
Face



Signature



Hand geometry

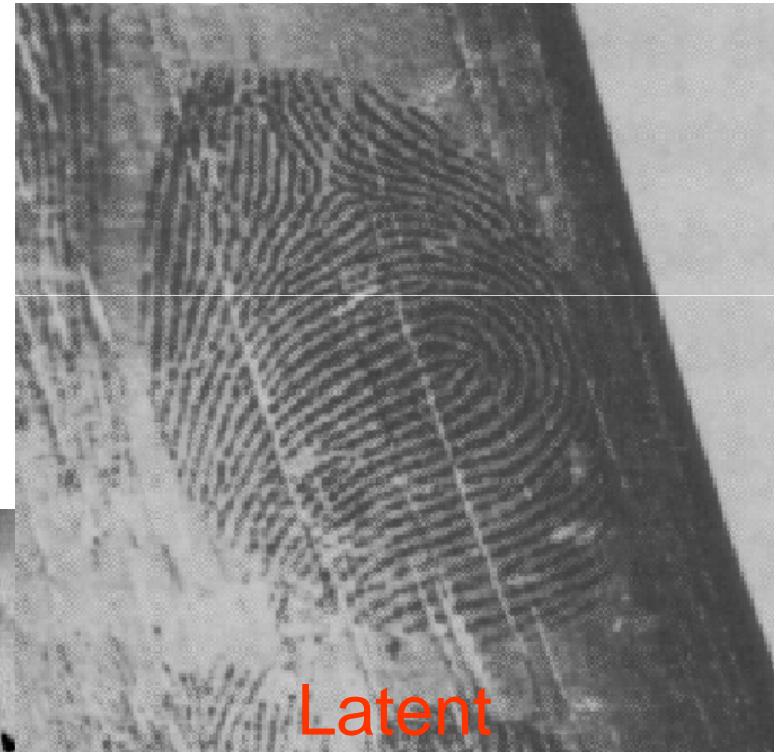
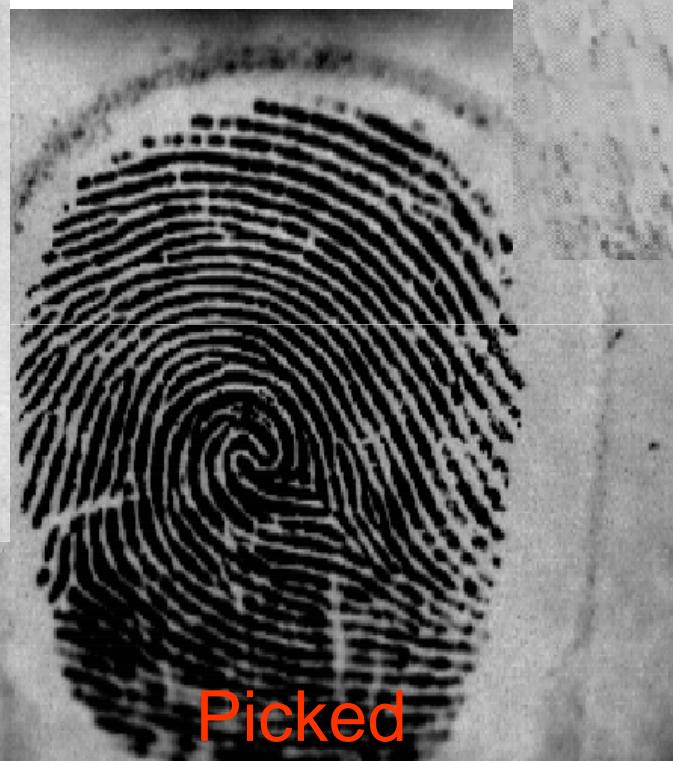


Voice

# | Types of fingerprints

→ There exist 3 types of fingerprints:

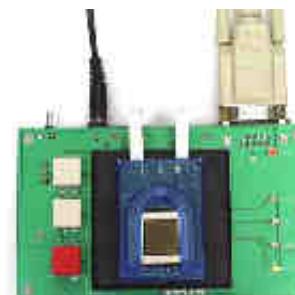
- Rolled (colored)
- Picked (live)
- Latent



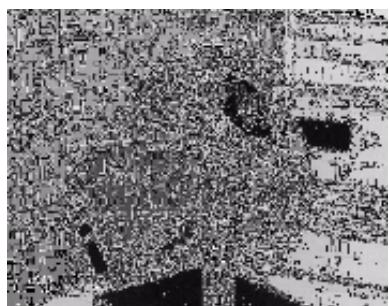
## Optical technology



## Capacitive technology



## Ultrasound technology



## E-Field technology



## Electro-optical technology



## Pressure sensitive technology



## Thermal technology



# | Finger fakes



Suprema SFM 3020  
(fake – rubber stamp)



Artificial fingerprints (SFinGe)

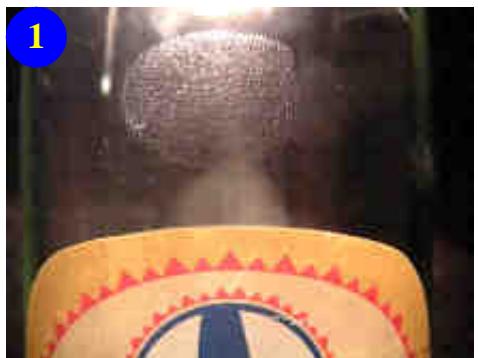


Artificial fingers

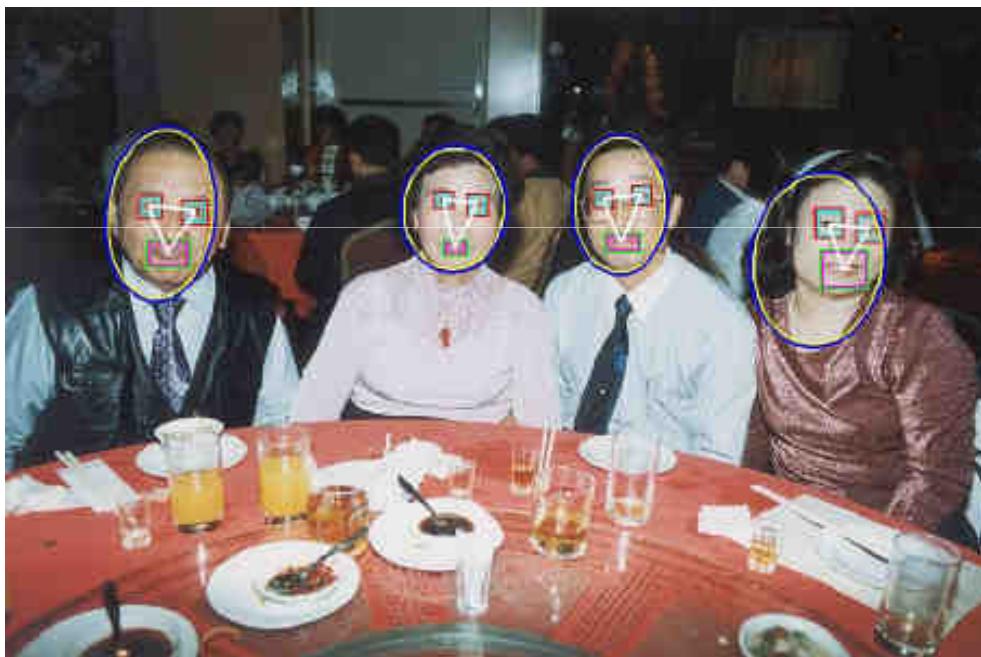
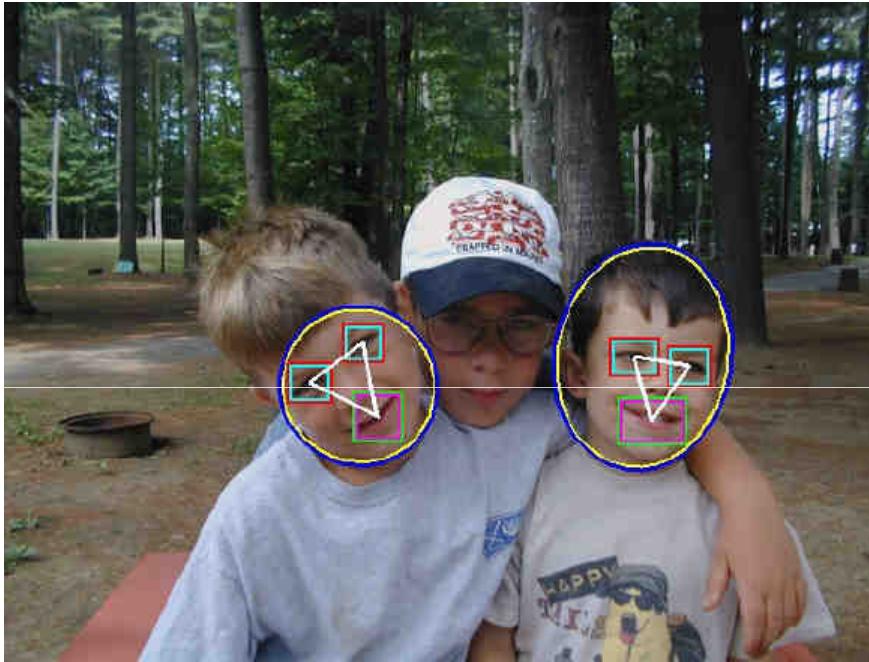


Fake fingerprints of different materials

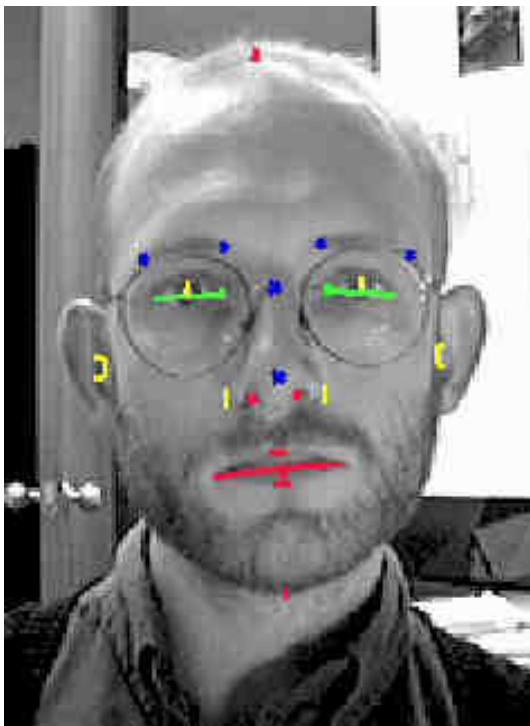
# | How to produce a fake finger(print)?



# Face detection



# Face recognition



Patch Model

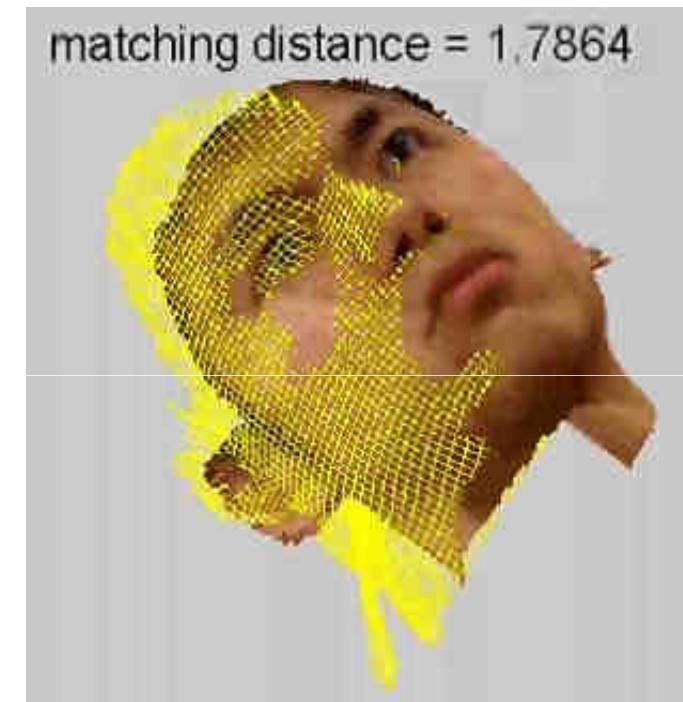
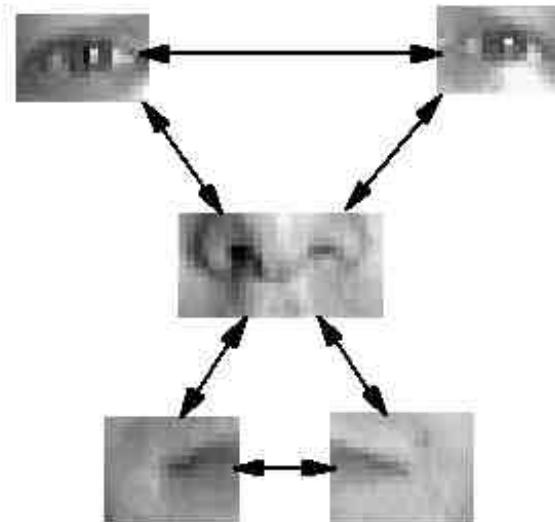
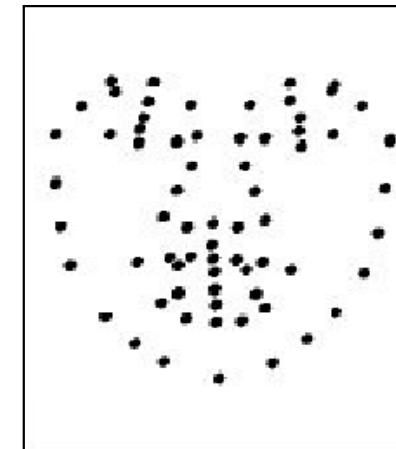


Image with  
highlighted points

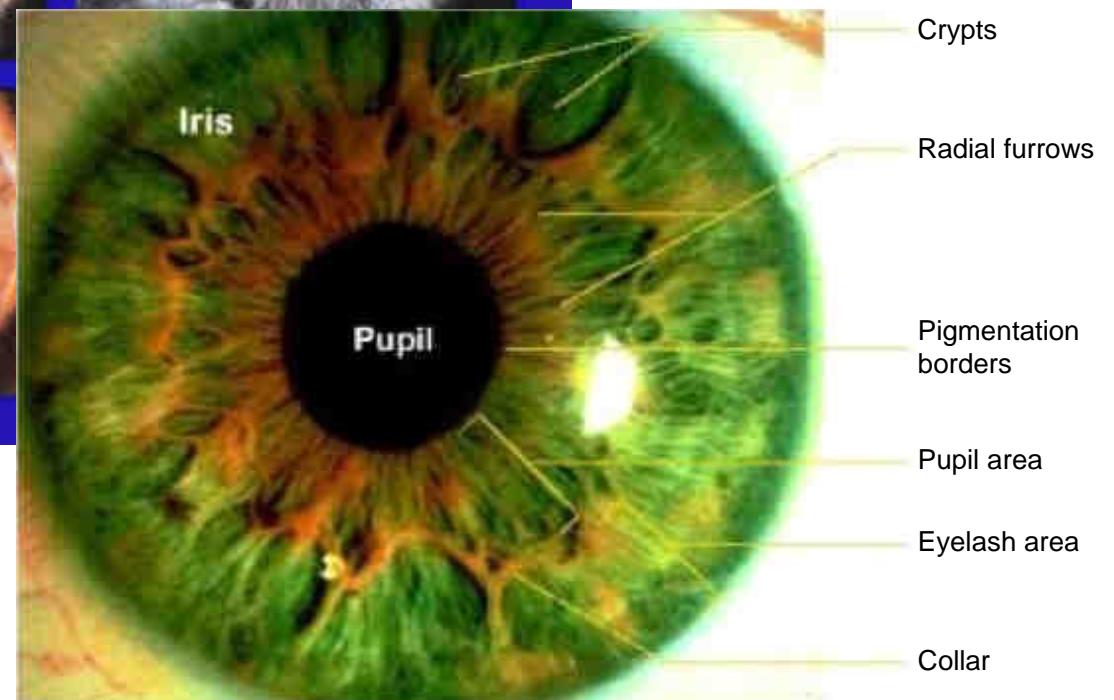
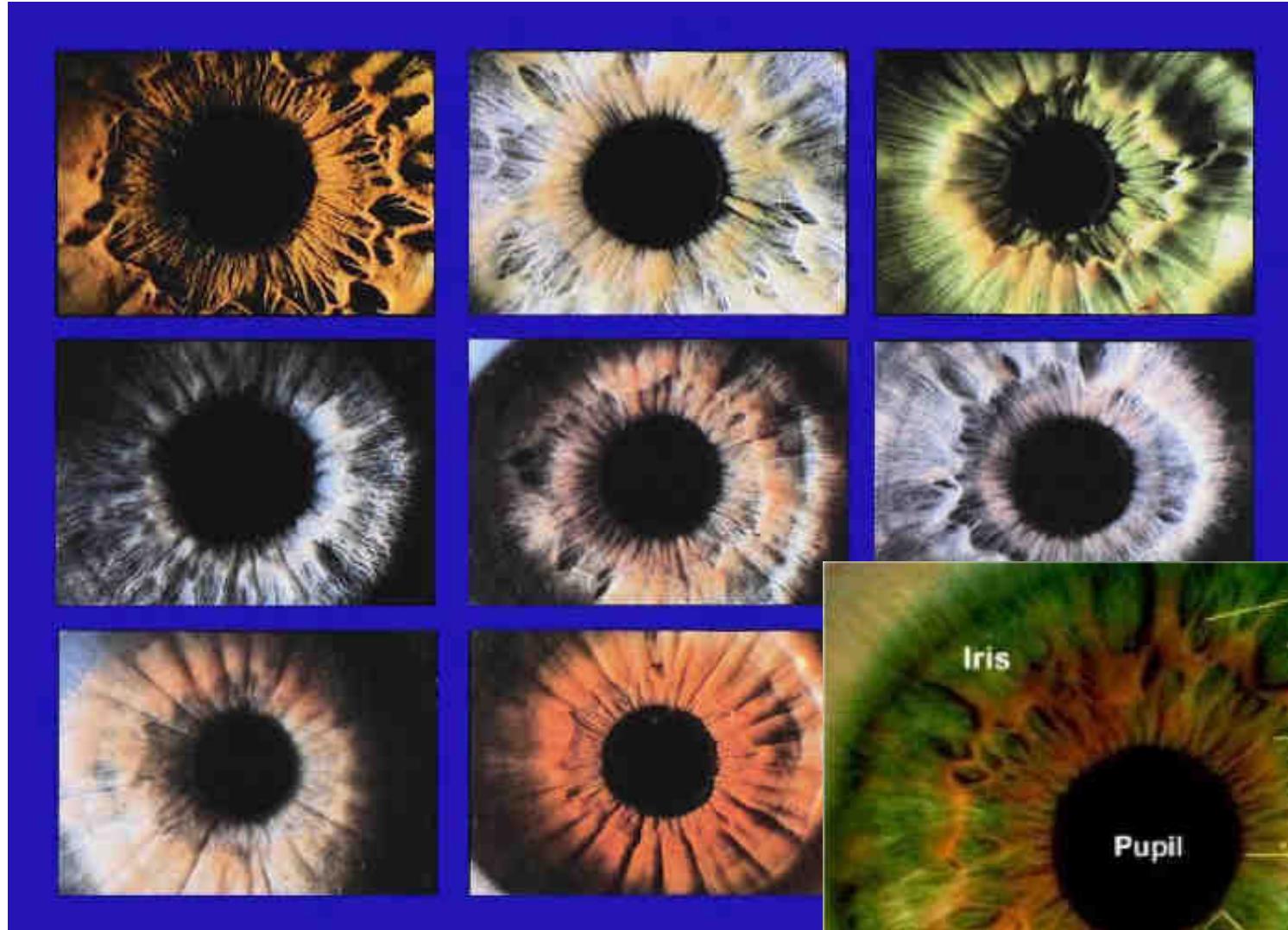


Important  
points

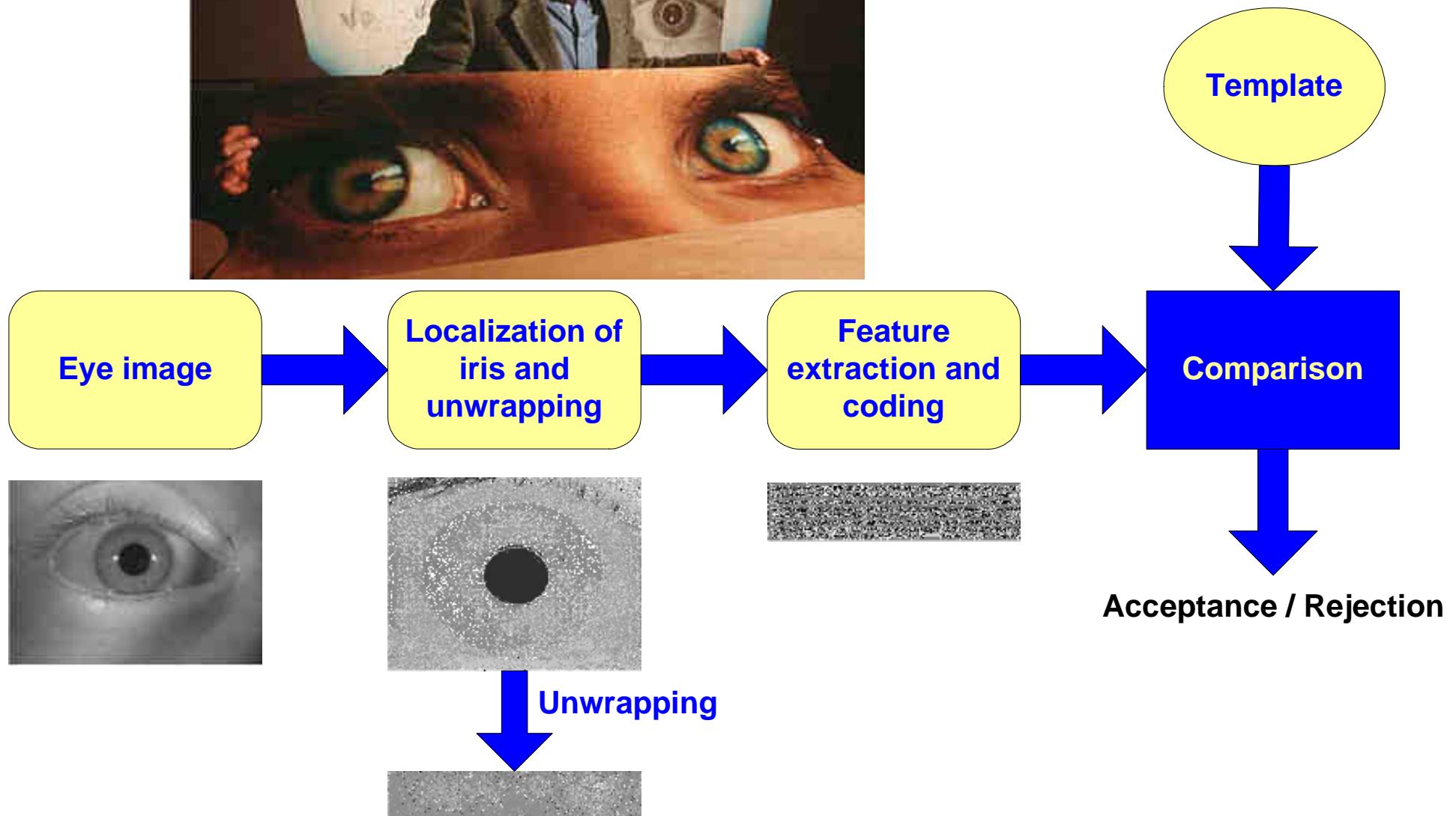


Texture without  
a form

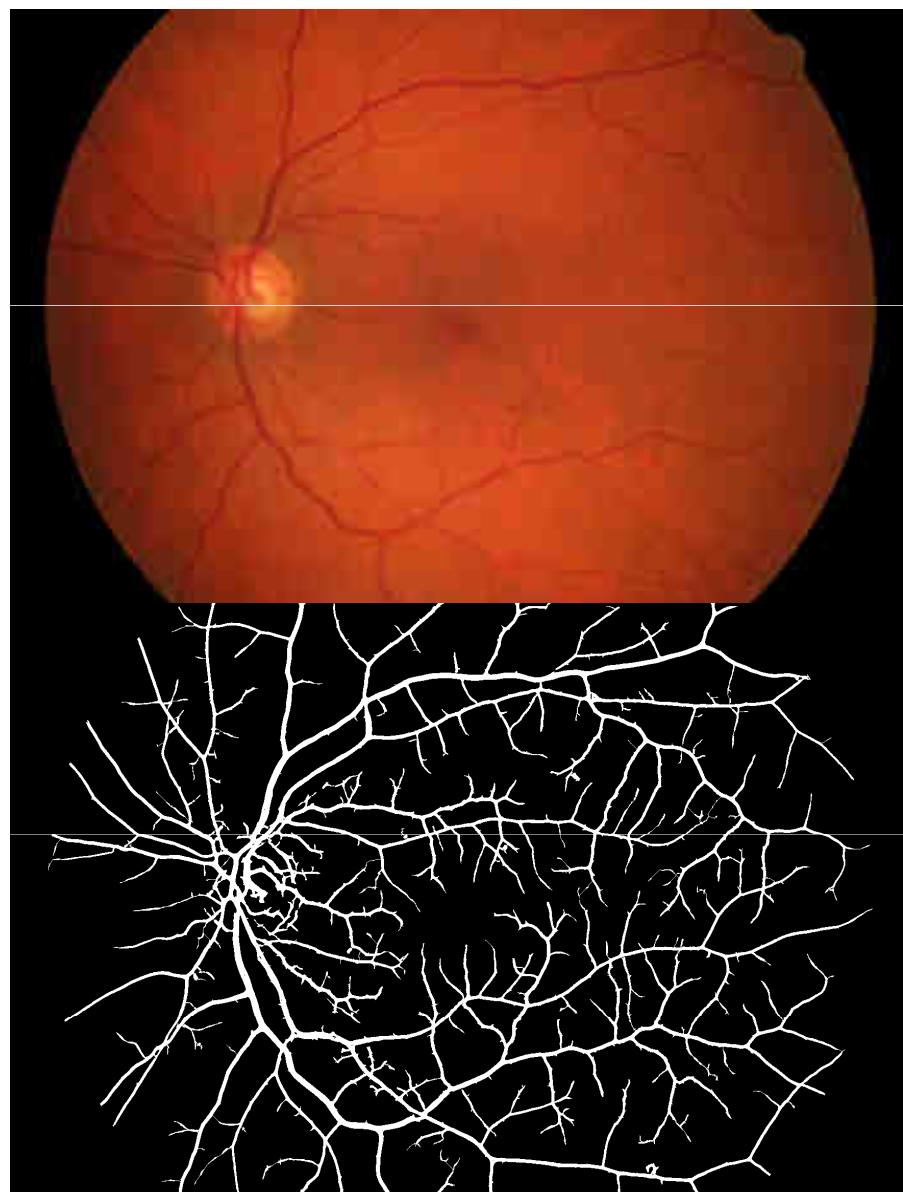
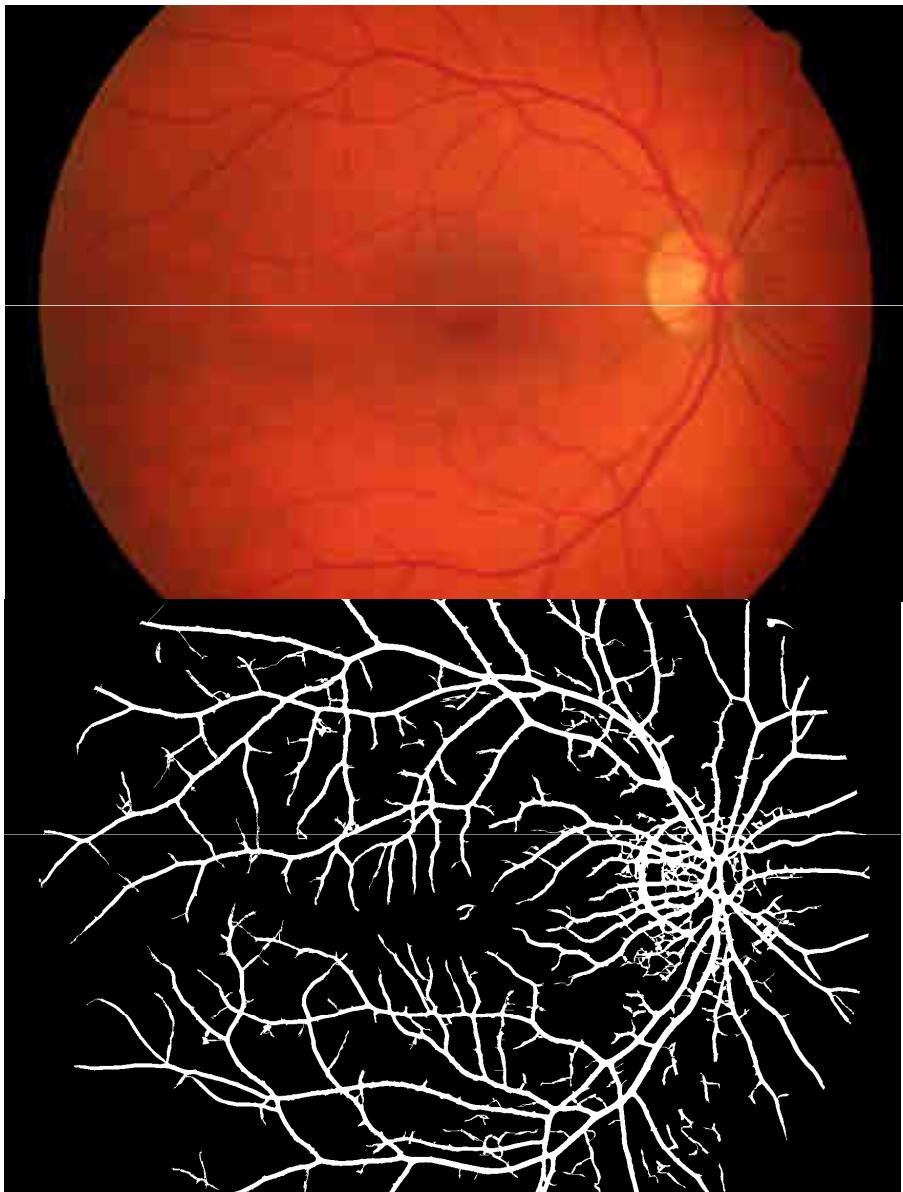
# | Eye iris recognition



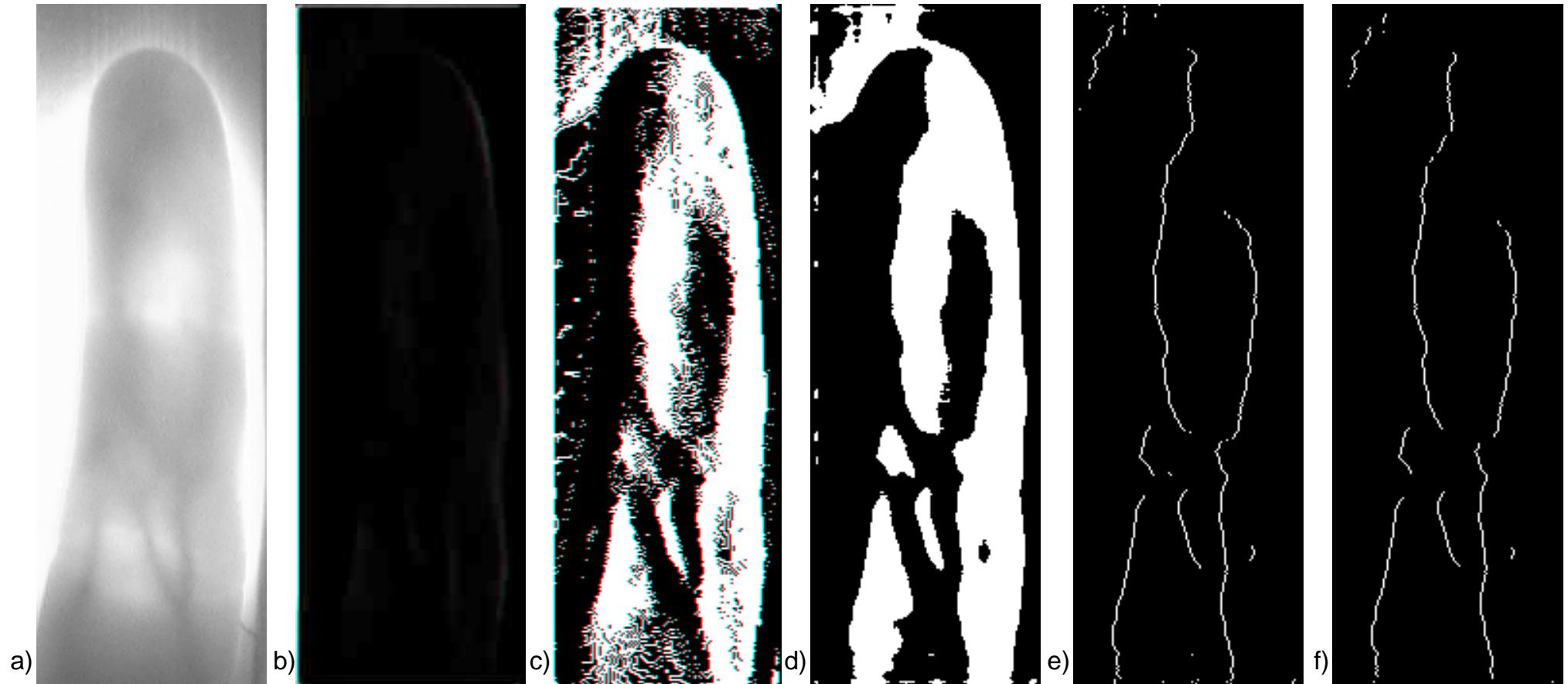
# Daugman's algorithm



# | Eye retina recognition



# Finger veins recognition

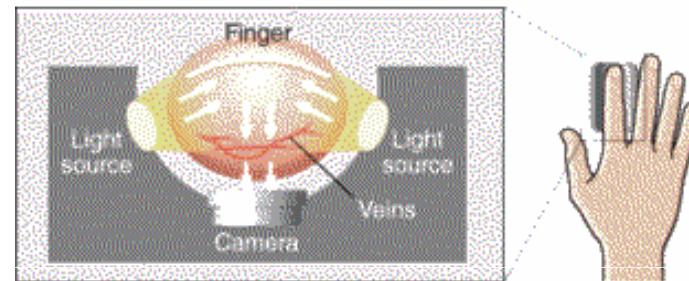
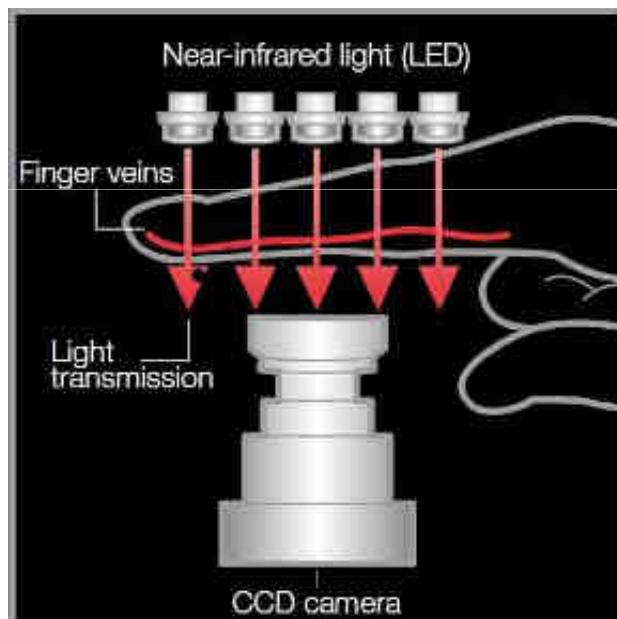


# | Other solutions – Finger veins recognition

MIT



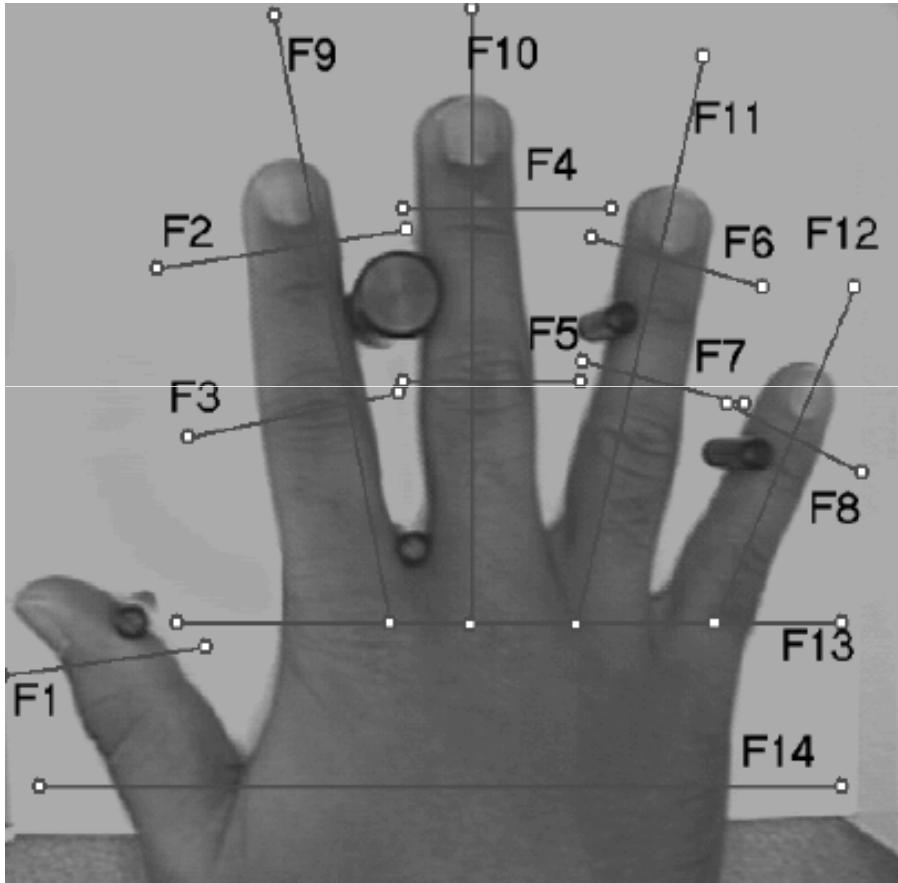
Hitachi



Bioaccez

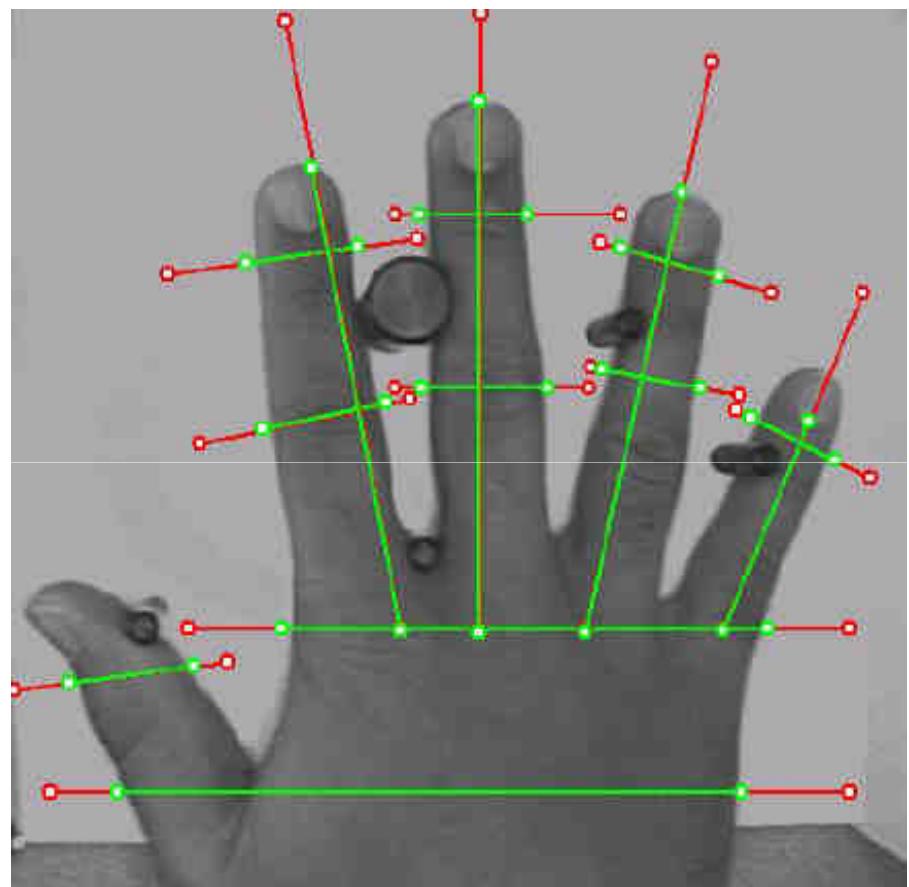


# 2D hand recognition

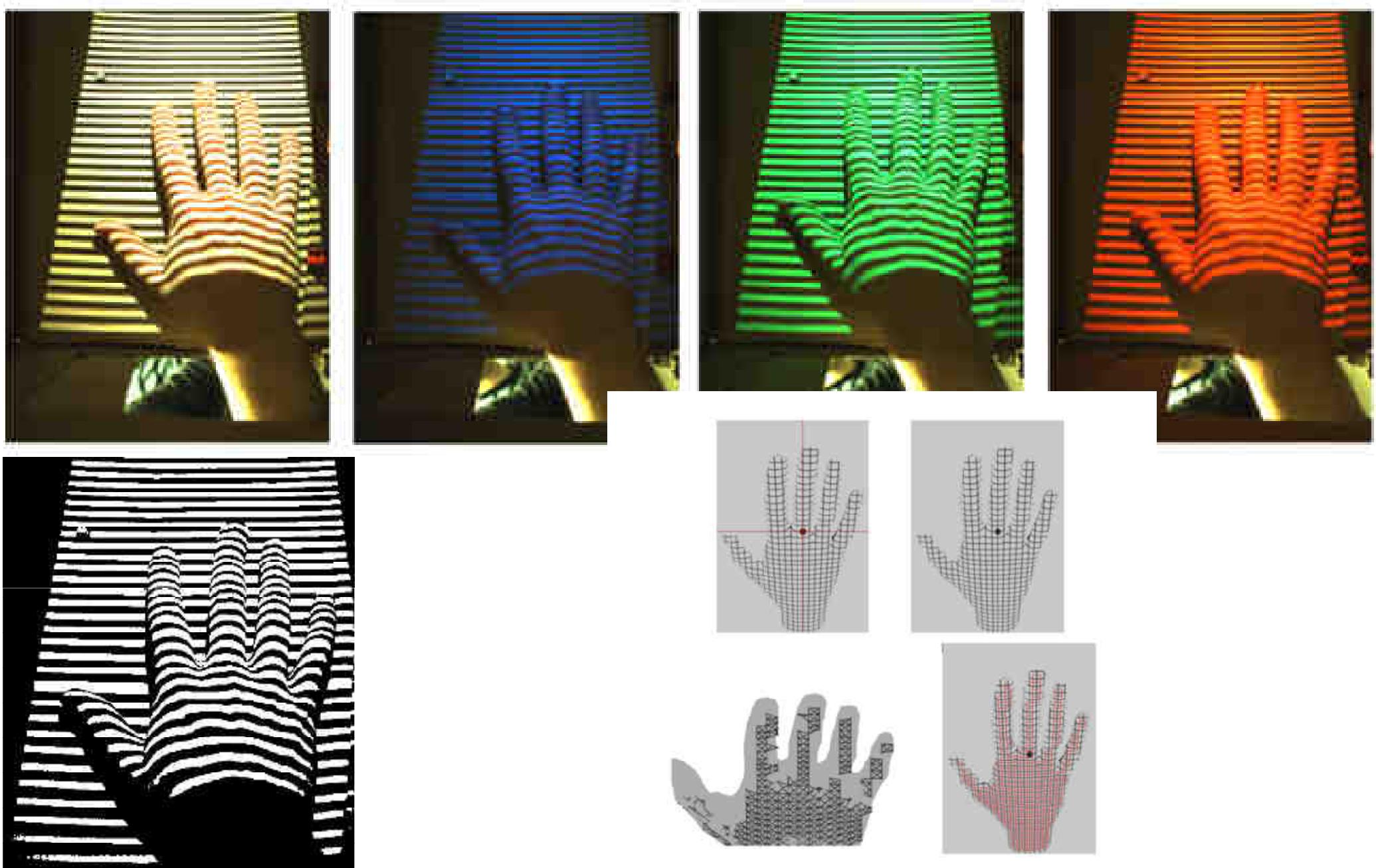


Positions of measurements

Extracted Features



# 3D hand recognition



# | 3D face recognition

fit

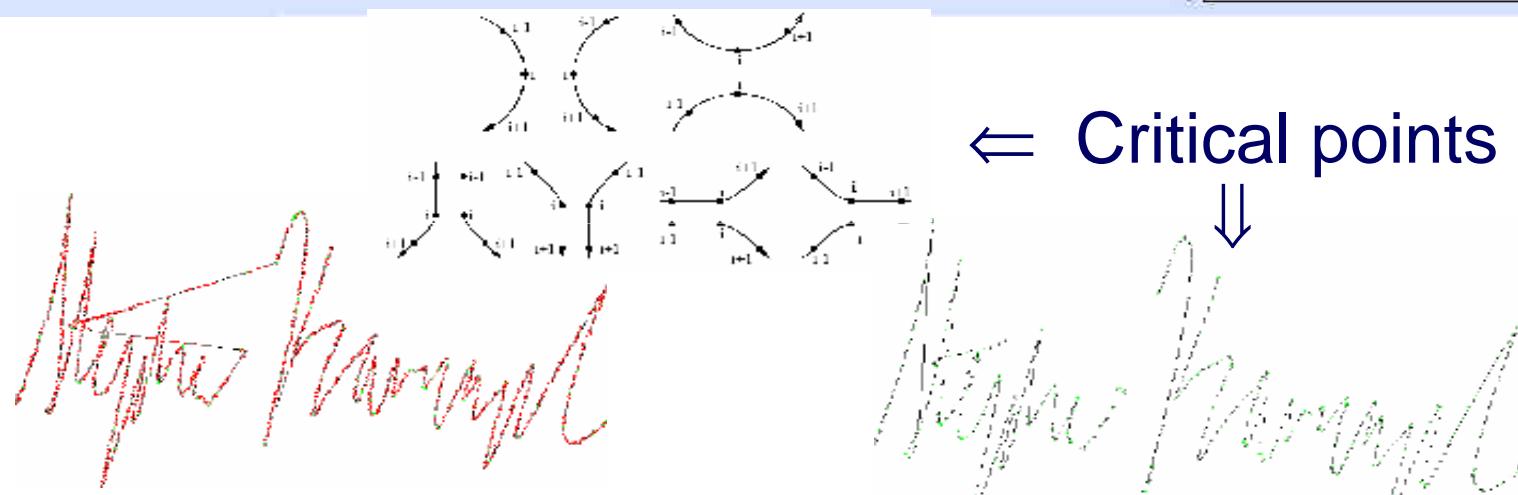
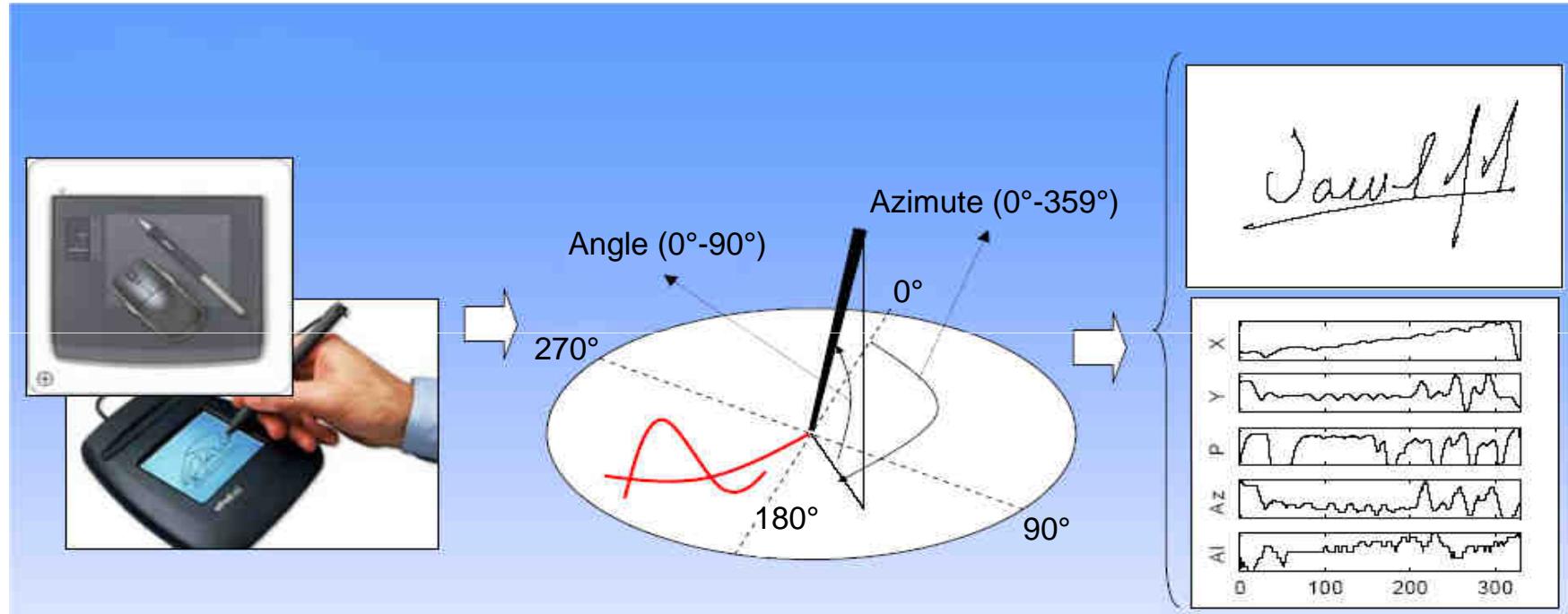


# | Thermo-face recognition

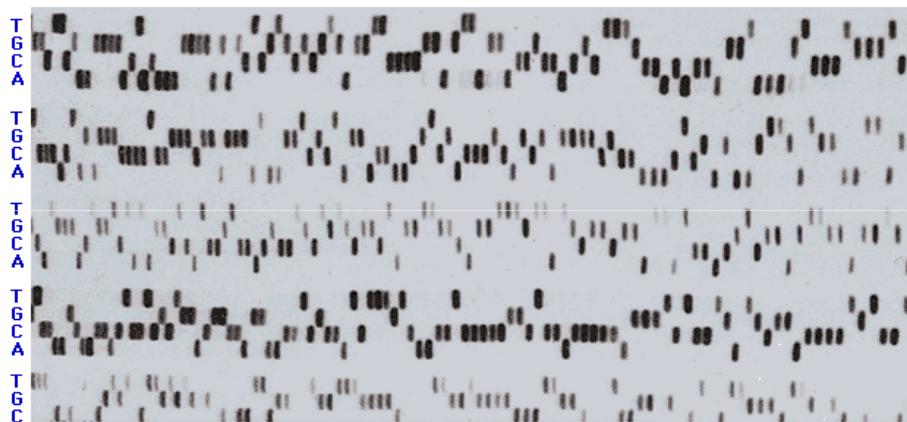
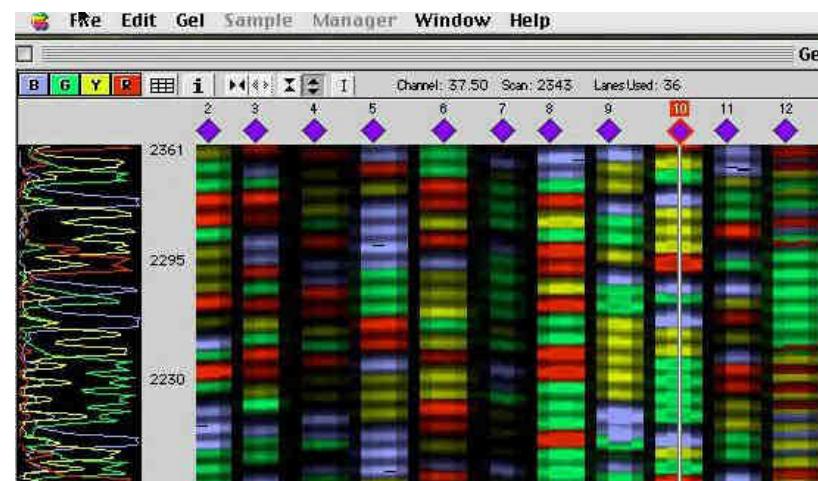
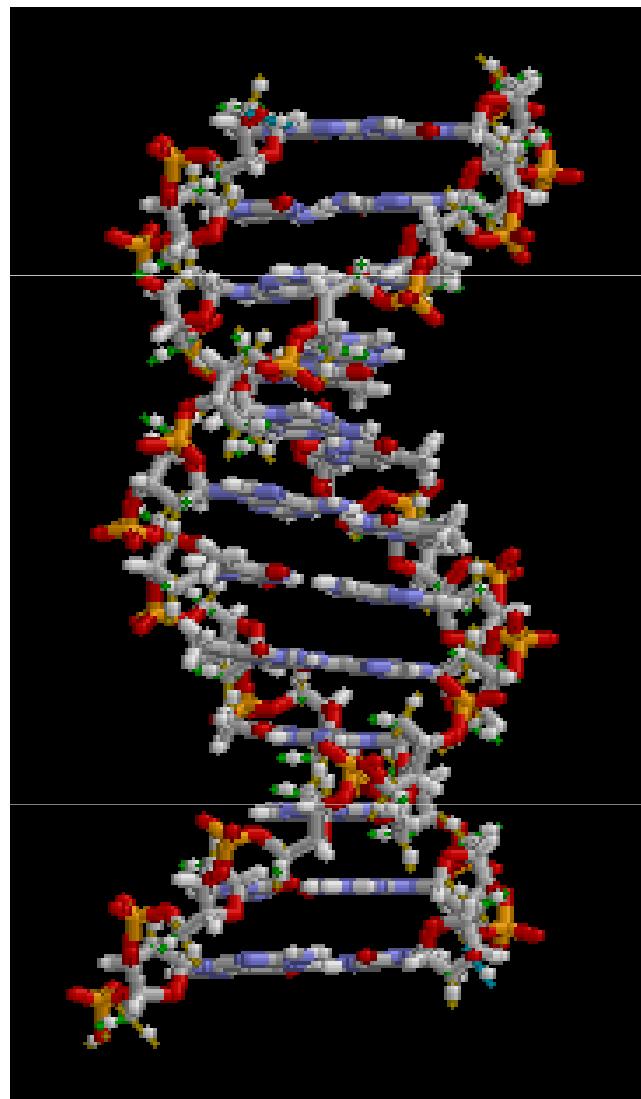


[http://astro.swarthmore.edu/ir/ir\\_basics.html](http://astro.swarthmore.edu/ir/ir_basics.html)

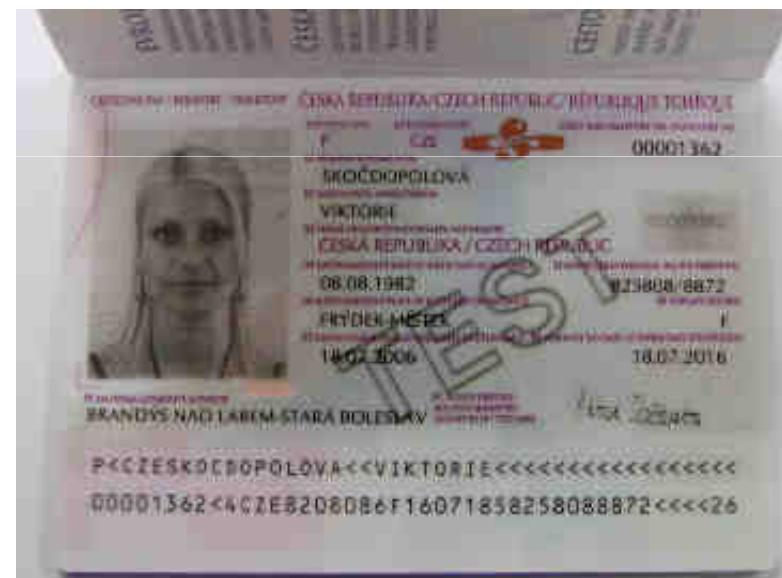
# Signature recognition



Stroke  
concatenation



- Project with electronic (biometric) passports started on September 1, 2006 in the following two phases:
  - Face: September 1, 2006
  - Fingerprint: April 1, 2009
- Amount of issued electronic passports from September 1, 2006 till February 13, 2012: **2,458,258** (included 1,296,230 with fingerprint information)
- Producer of electronic passports: **Státní tiskárna cenin** (State printing company)



Thank you for your attention.