

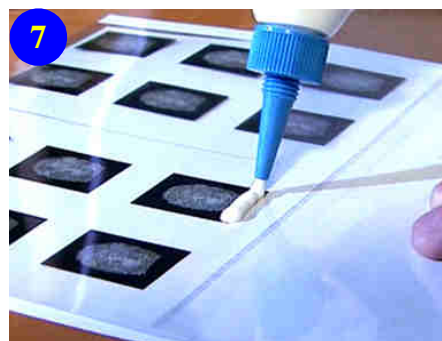
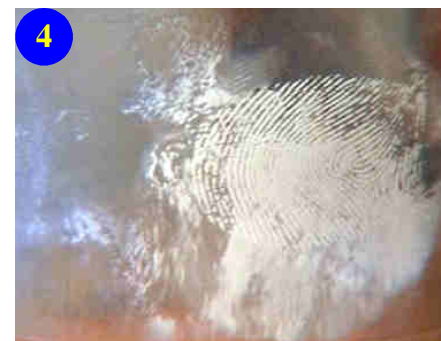
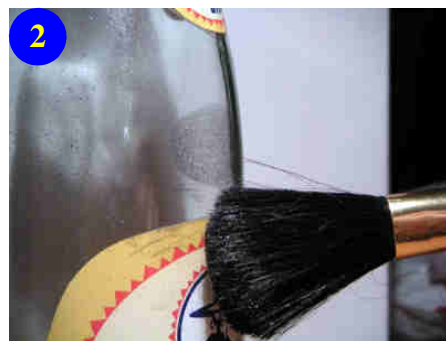
# Multispectral Optical Properties of Human Hands Skin

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# Motivation: Fake fingerprint production (spoofing)





**Suprema SFM 3020  
(fake – rubber stamp)**



**Synthetic fingerprints (SFinGe)**



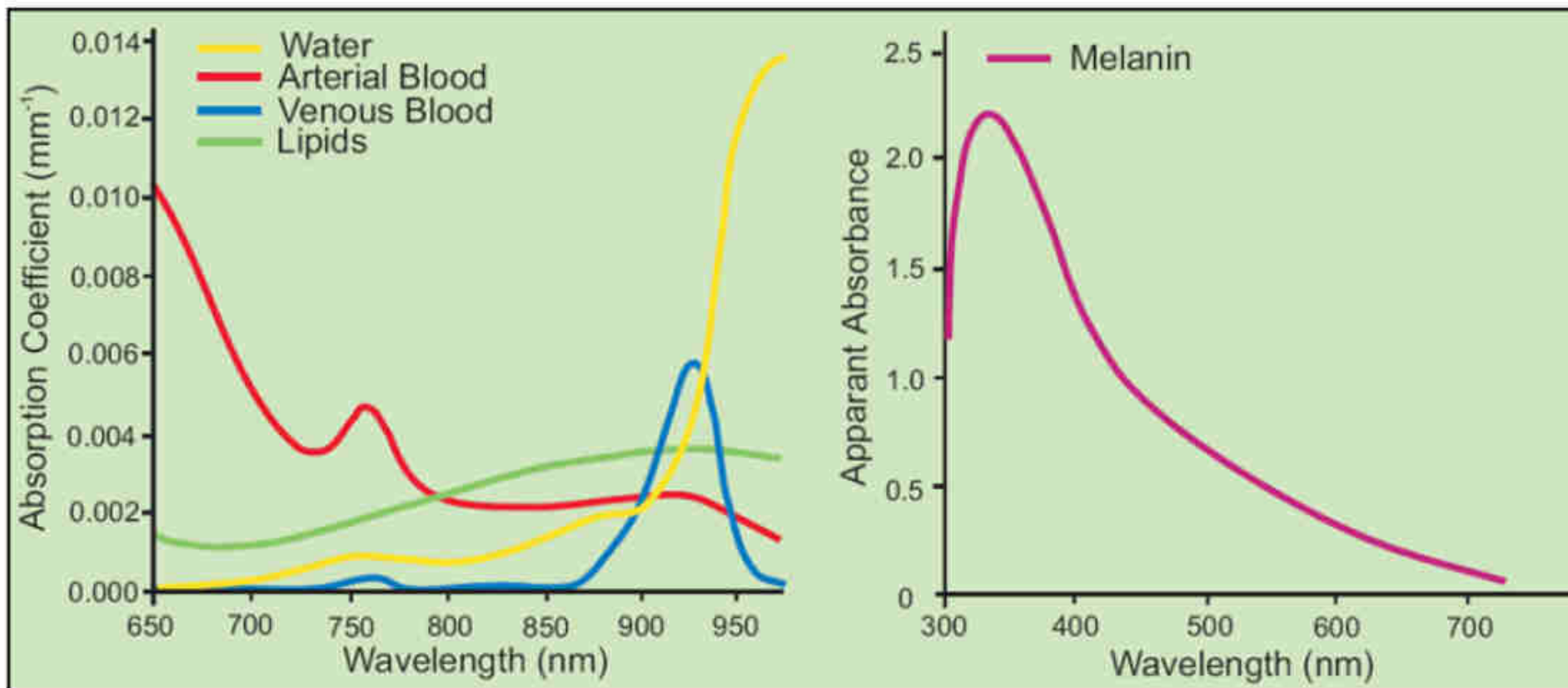
**Artificial fingers**



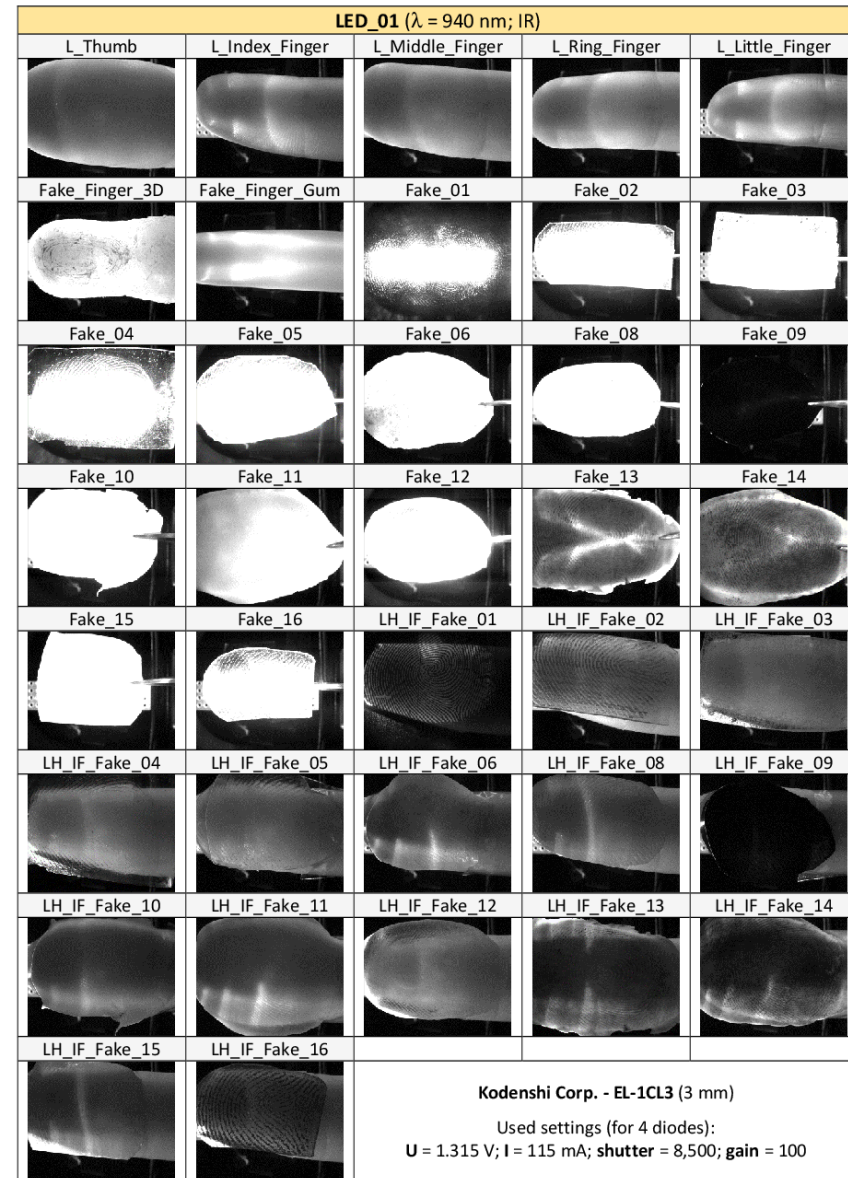
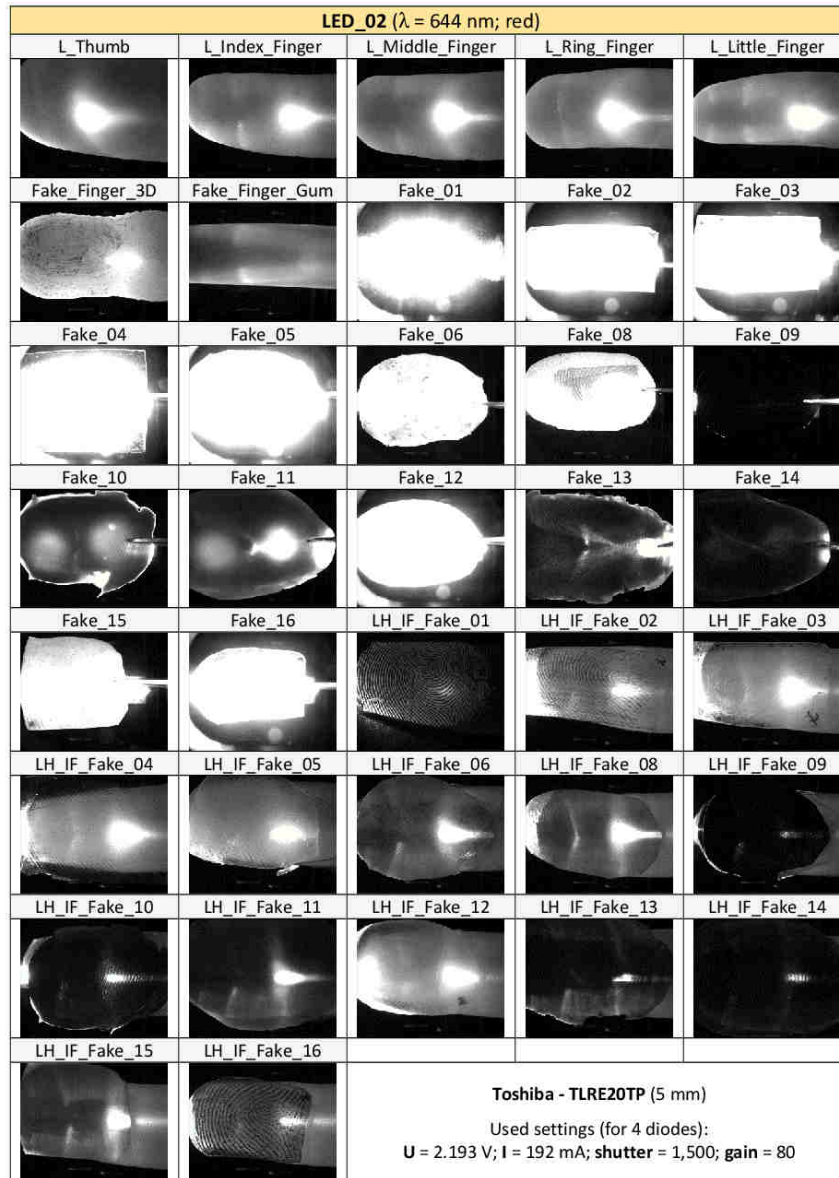
**Fake fingerprints of various materials**

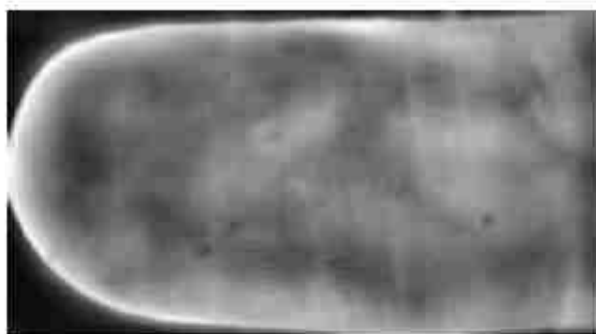
# Motivation: Finger(print) spoofs II.





# Optical properties – example from our DB





(a) 680 nm



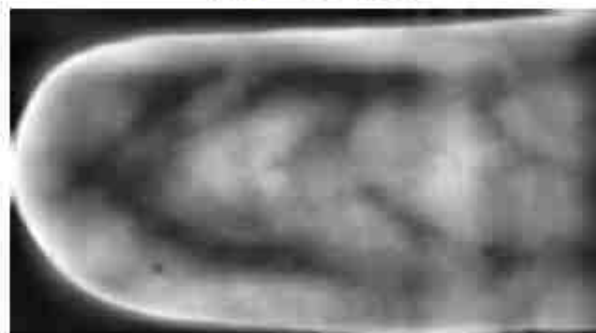
(b) 740 nm



(c) 770 nm



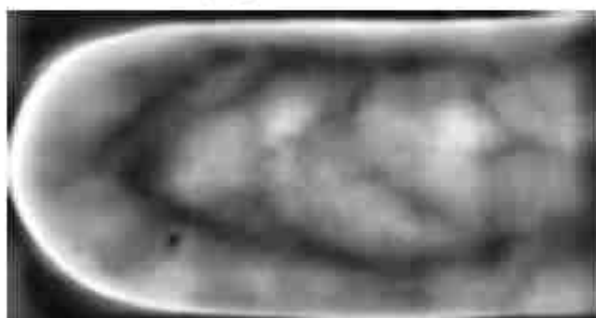
(d) 810 nm



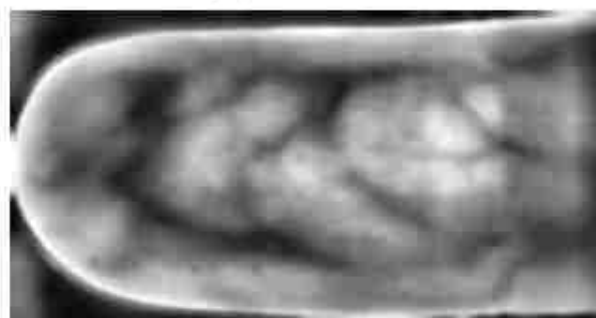
(e) 830 nm



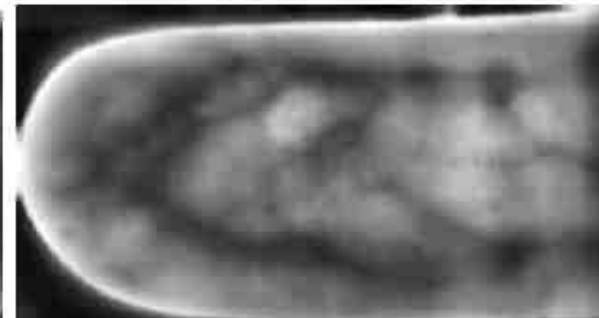
(f) 850 nm



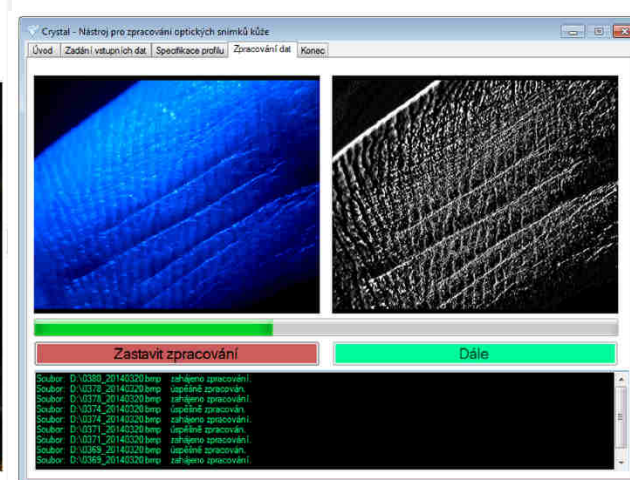
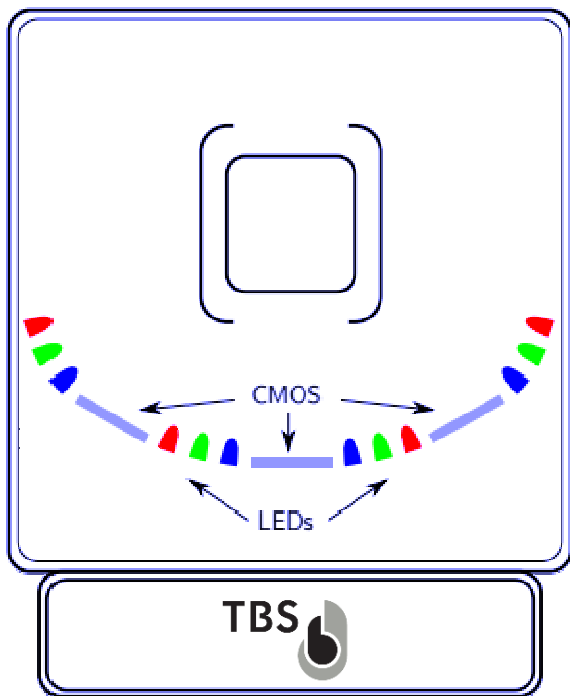
(g) 880 nm



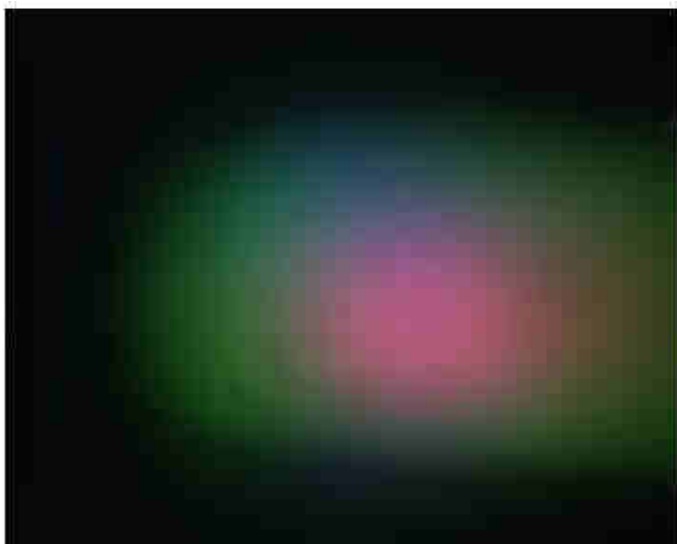
(h) 890 nm



(i) 950 nm







(a) Average genuine finger sample



(b) Average fake finger sample



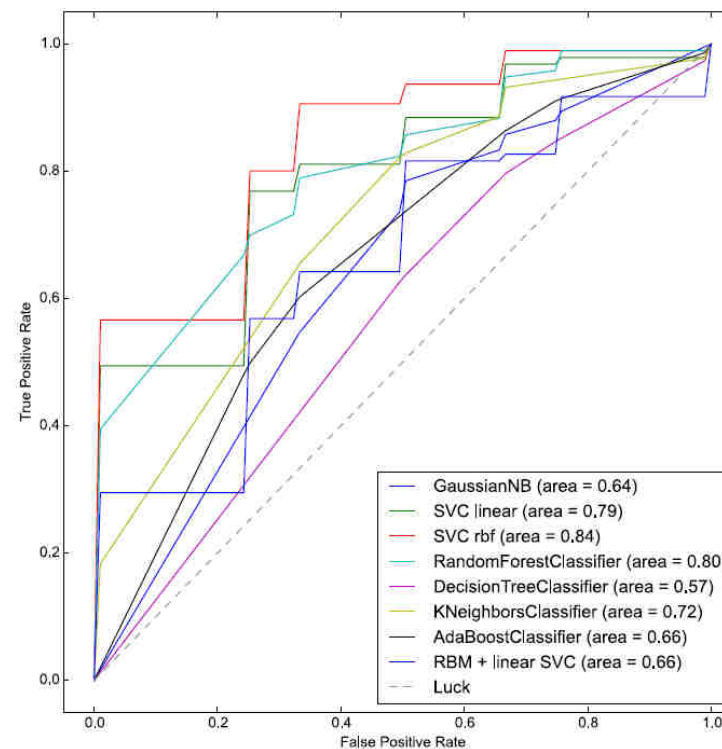
(a) Dry finger

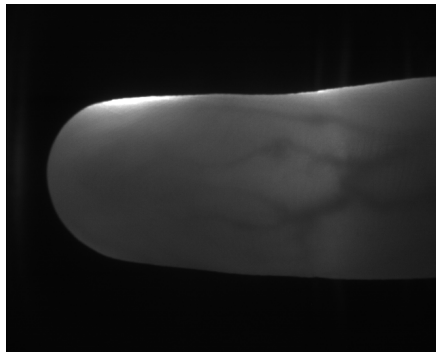


(b) Wet finger

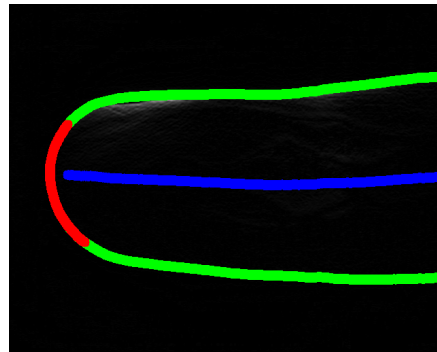


(c) Strangulated finger





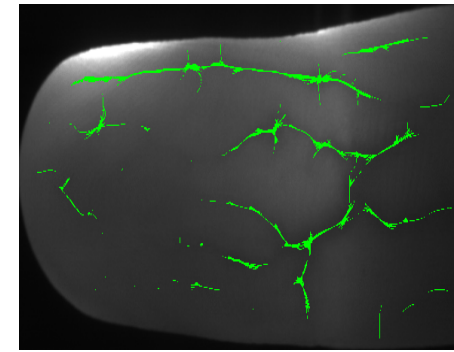
(1) acquired image



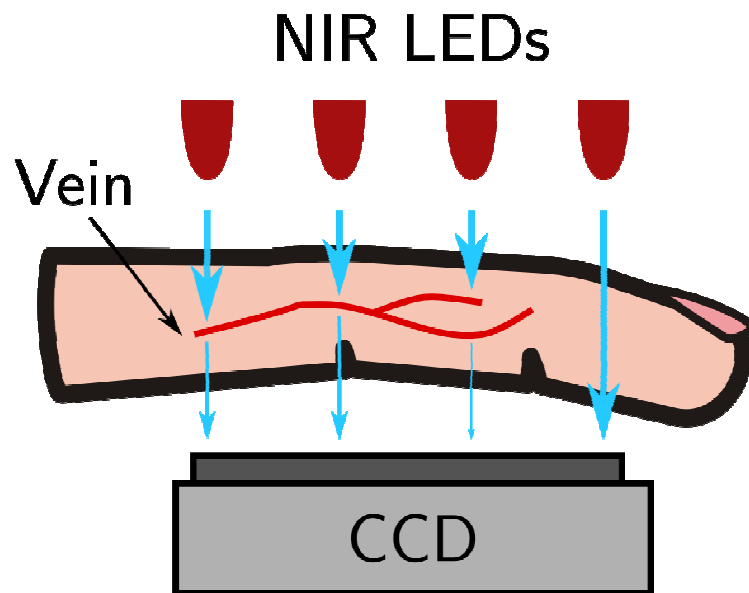
(2) contours and rotation estimation



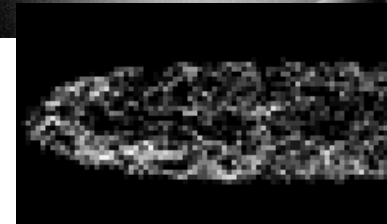
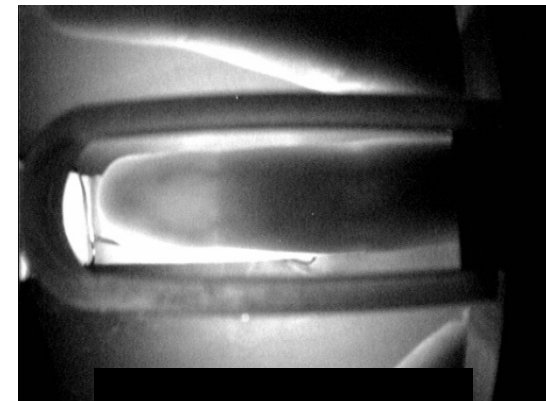
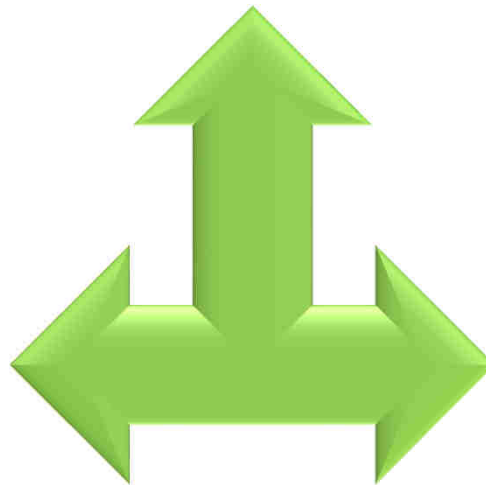
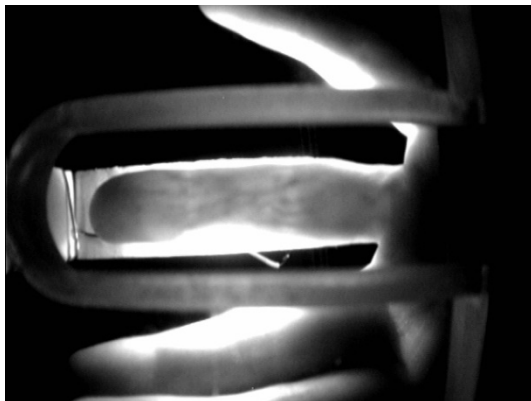
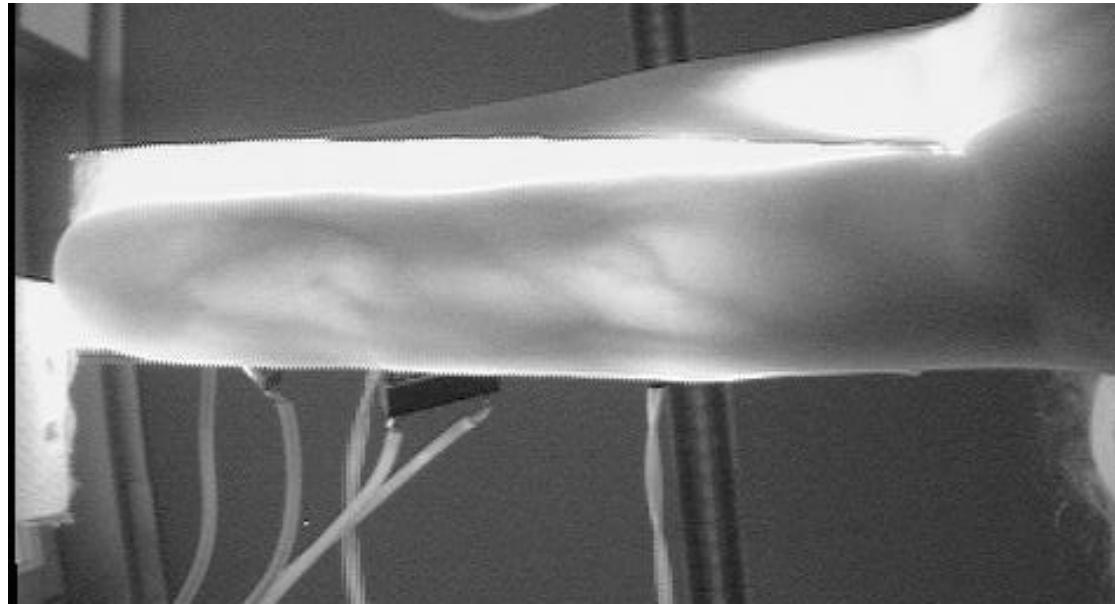
(3) enhanced ROI



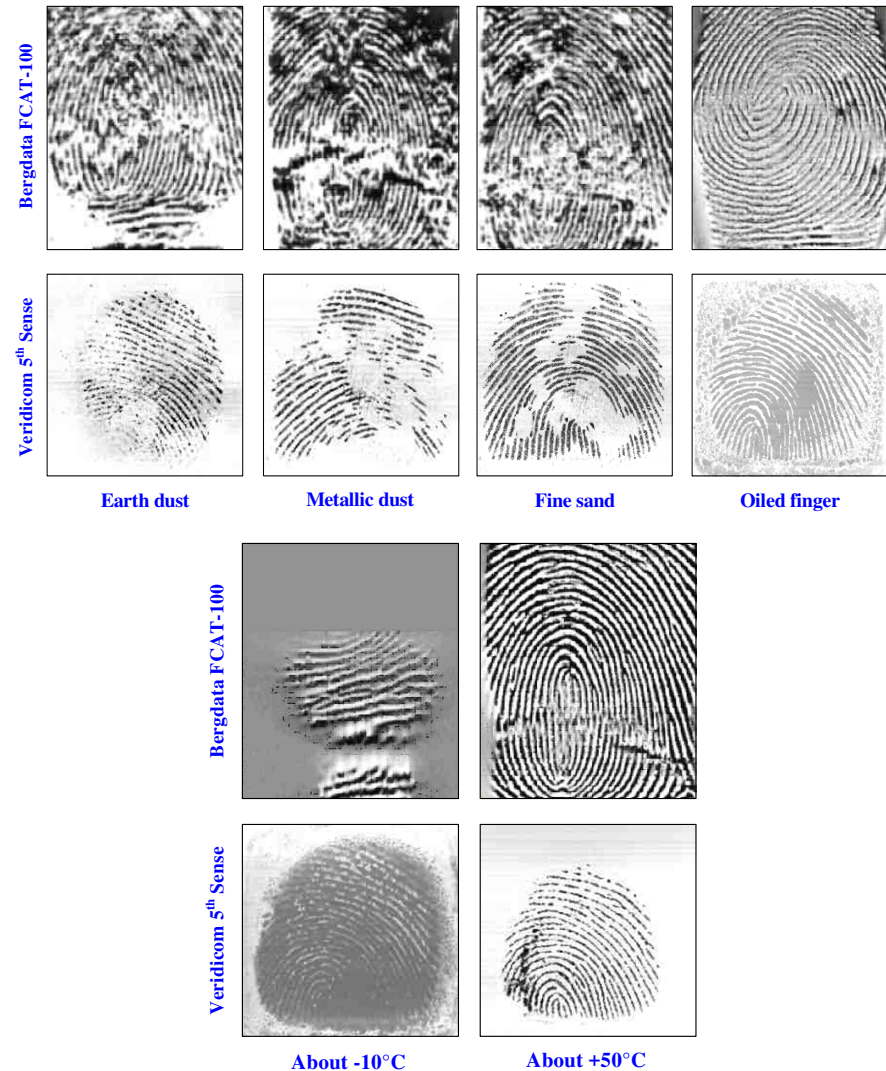
(4) detected veins



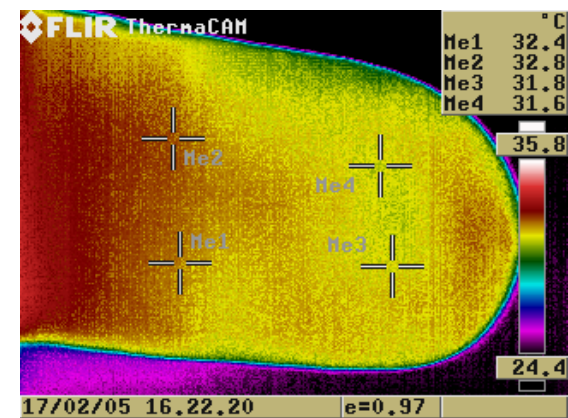
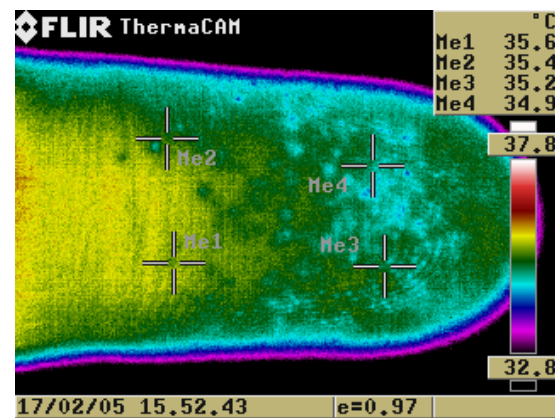
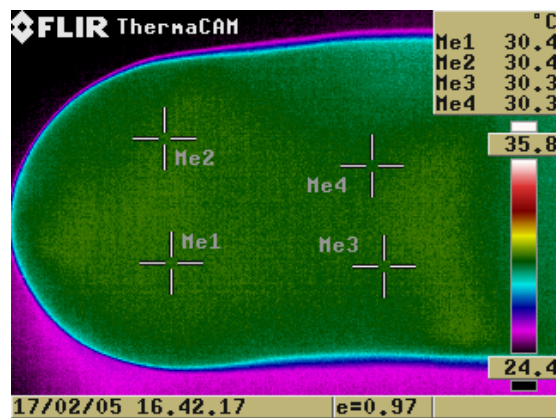
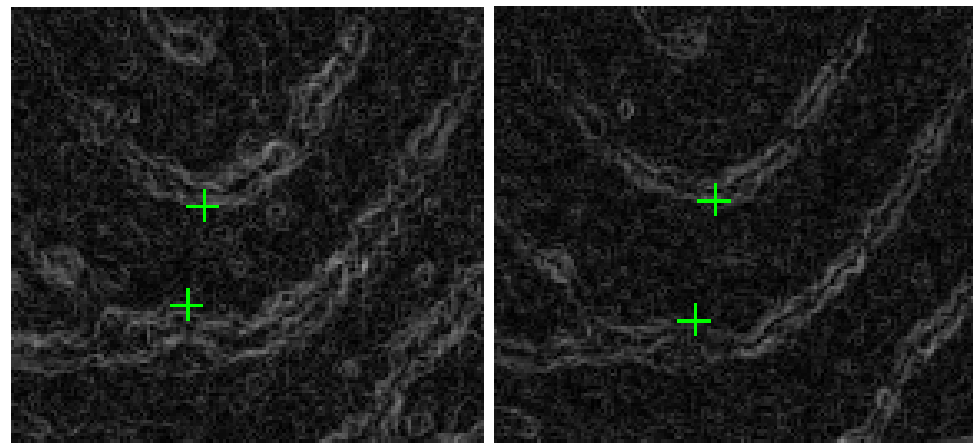
- Cheap infrared LEDs and camera
- Same or better performance than fingerprint recognition
- Suited as a multibiometric characteristic



- Change of temperature and/or humidity
- Dry or wet fingers
- Dirt on sensor area
- Dirt on fingertip surface
- Blurred images
- Change of pressure
- Latent fingerprints etc.



# Distortion: Pressure stimulus + temperature



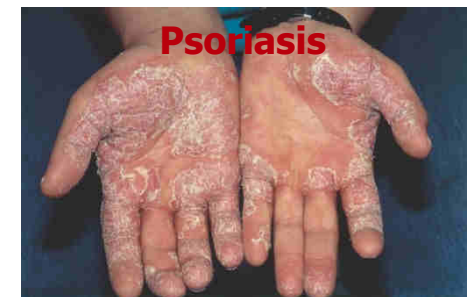
- Histopathological changes



- Changes of skin color



- Histopathological and skin color changes



# Distortion: Influence of skin diseases on fingerprints II.



a) CRD

b) CRD



c) E500



d) EII



e) MSO



f) DIN

Psoriasis – a partial seizure.



a) MSO

b) MSO



c) E500

d) EII



e) CRD

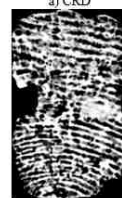
f) DIN  
Fingertip eczema – a light form.



a) CRD



b) CRD



c) E500



d) EII



e) MSO

Dyshidrosis.



f) DIN



a) MSO



b) CRD



c) E500



d) EII

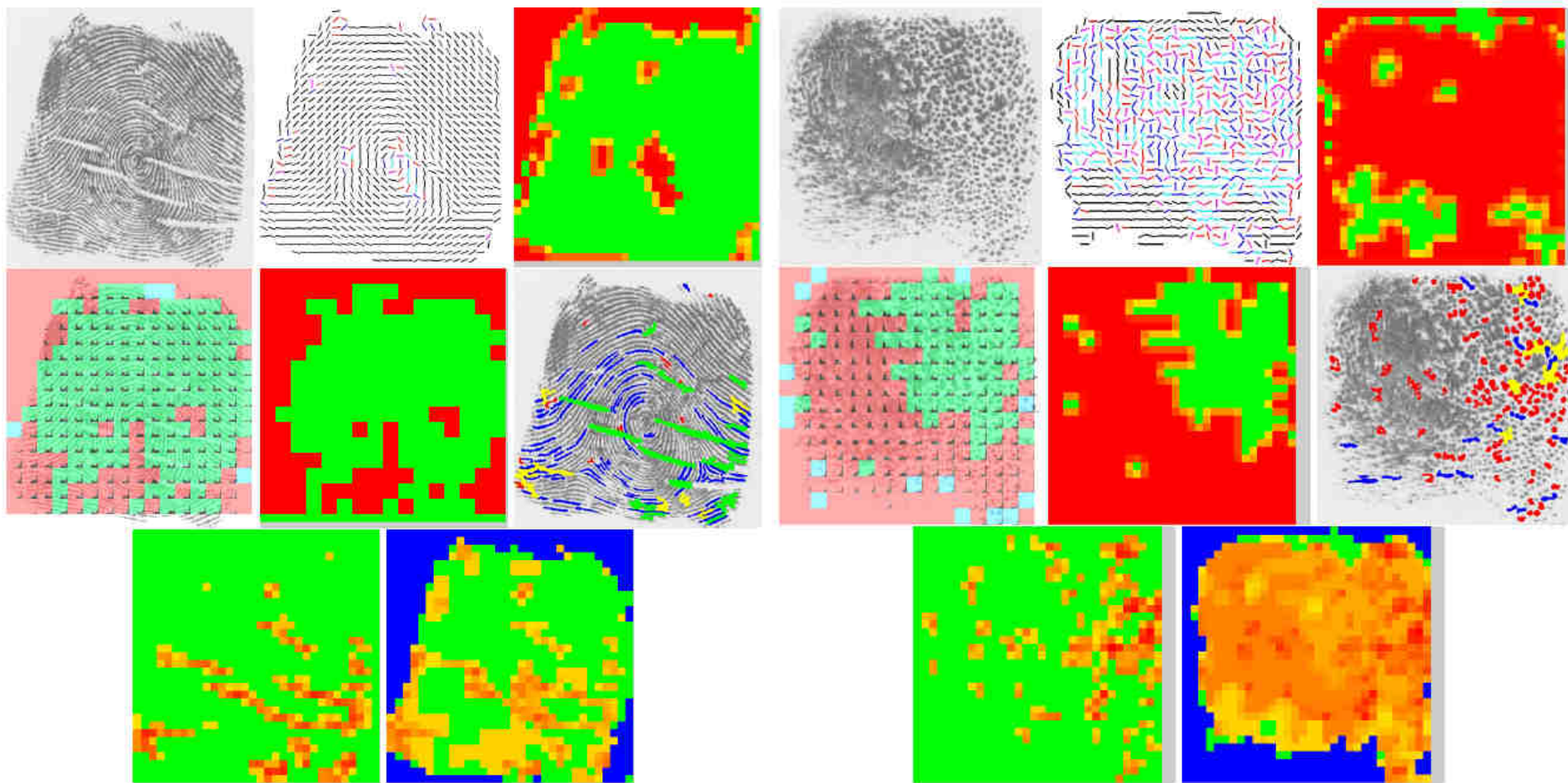


e) MSO

Verruca vulgaris.



f) DIN



**Atopic eczema**

**Acrodermatitis**



# Distortion: Hematoma



Thank you for your attention