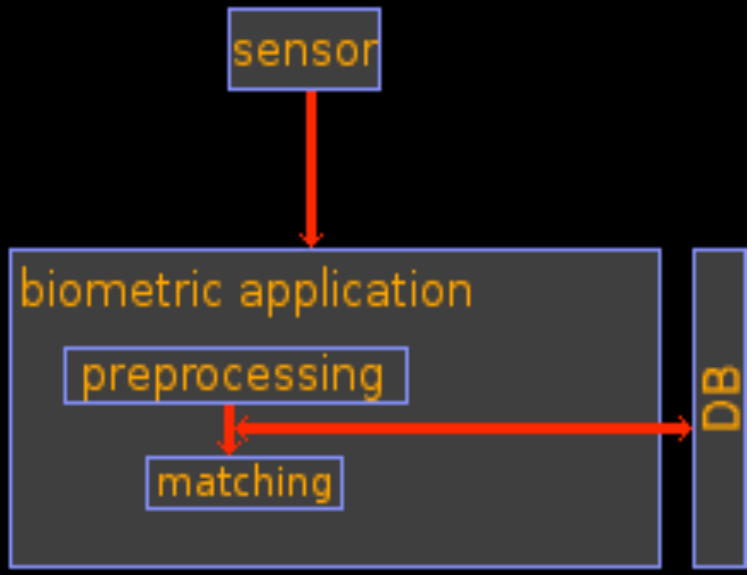

hacking biometric systems
starbug@ccc.de

outline

- biometric systems
- attacking the data
  - the communication
  - the templates
- attacks using the sensor
  - fingerprint recognition
  - face recognition
  - iris recognition

biometric systems

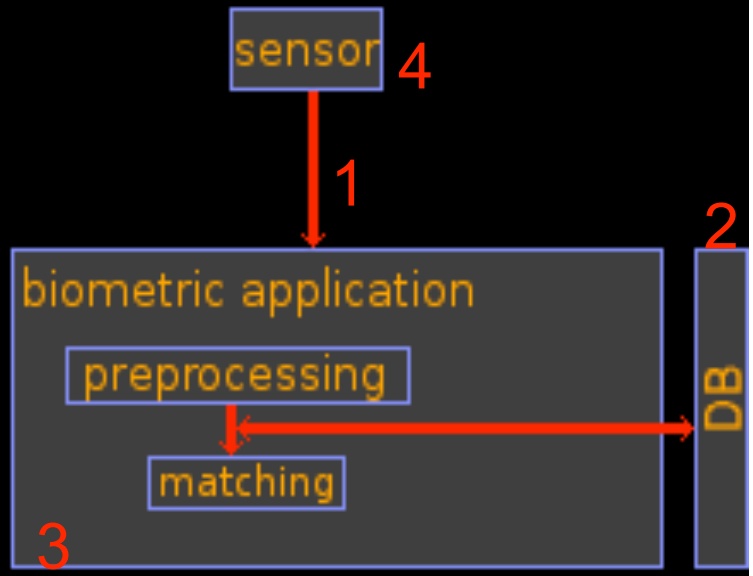
- access control
  - rooms
  - computers
  - mobiles
  - cars
- payment
  - stores
  - governmental
  - ATMs
- border control



parts of biometric systems

biometric systems - types of attacks

- attacking the data
  - communication data (1)
  - reference data (2)
- attacking the software (3)
  - matcher
  - threshold
- attacks using the sensor (4)



parts of biometric systems

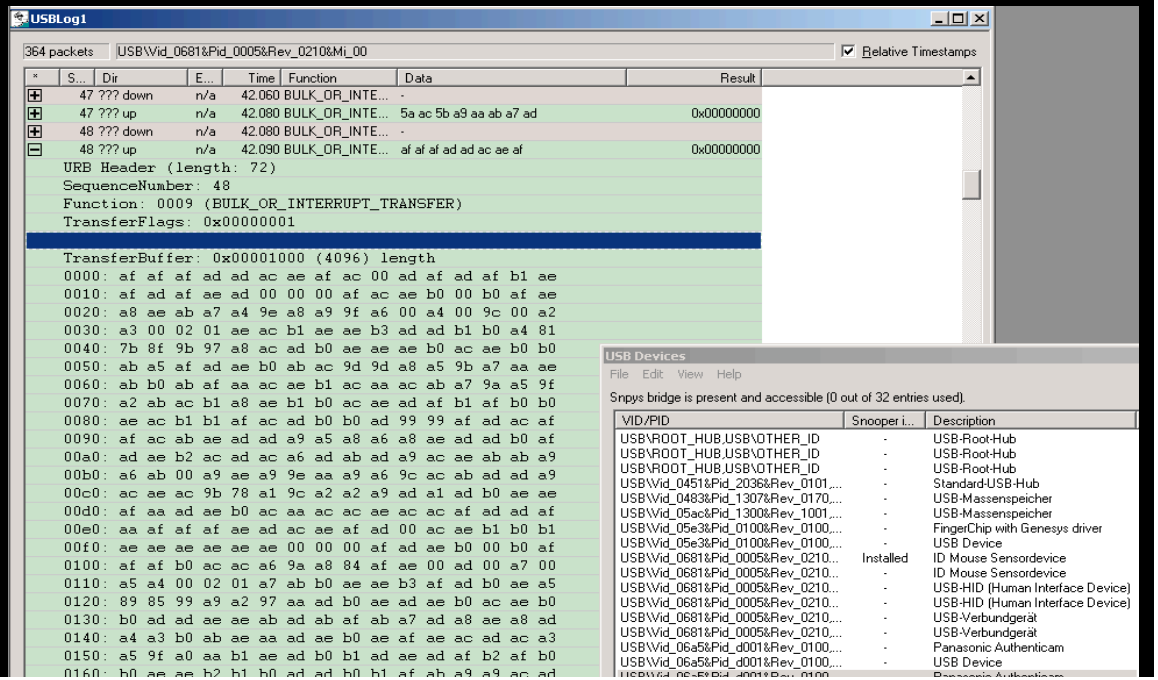
attacking the communication

sniffing the communication

- Hardware
  - USB-Agent / USB Tracker
  - GNU-Radio (van Eck)

USB-Agen
www.hitex.com

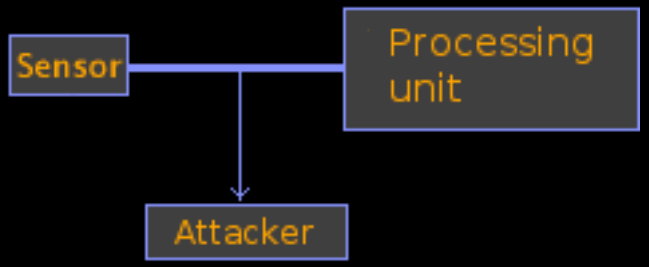
- Software
  - usbsnoop
  - sniffusb
  - usbmon



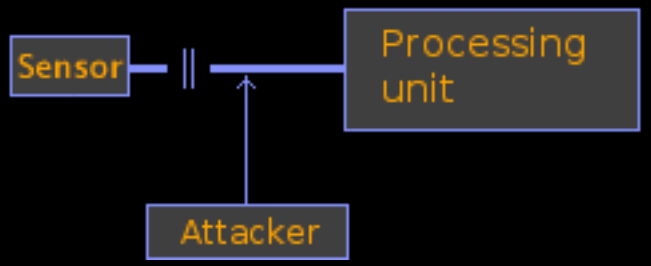
attacking the communication

- directly replaying sniffed packages

sniffing



replaying



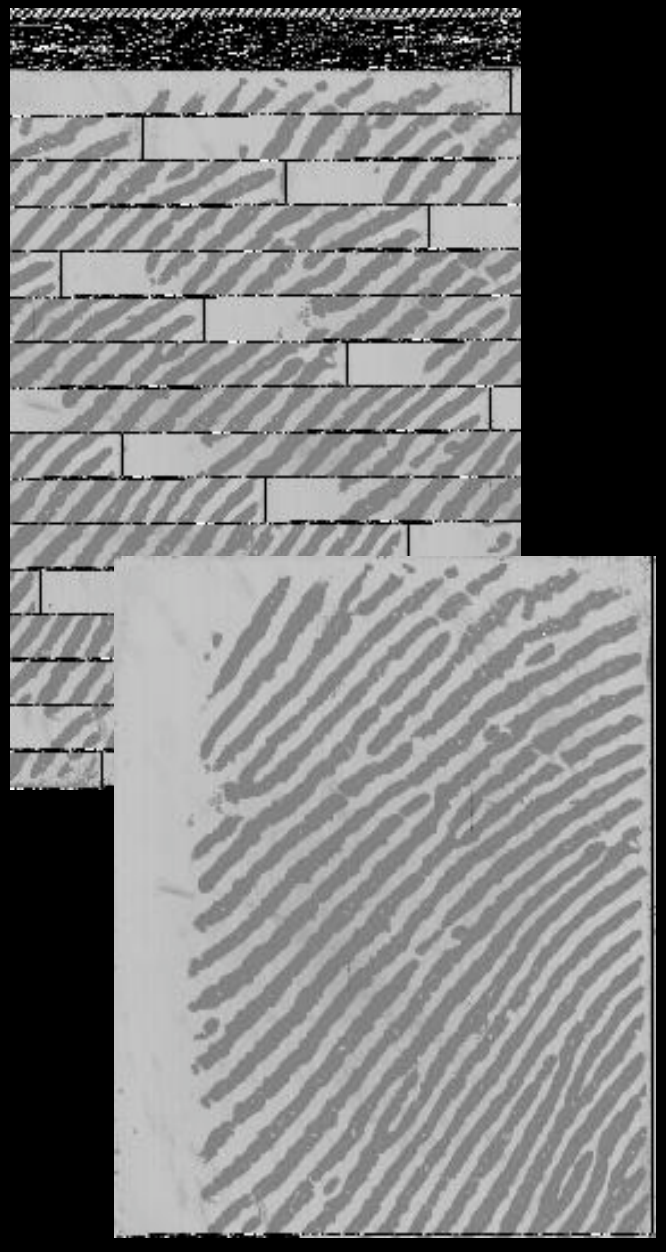
replay attack

by Lisa Thalheim

- attacking the software by manipulated stream data

extracting images

- analysing stream data
- extracting images for dummies
- inserting own payload
  - data of allowed users
  - brute force
  - analysing template data



attacking the templates

templates

- localisation
  - in the filesystem (filemon)
  - in the registry (regmon)

ctlcntr.exe:4068	QueryValue	HKLM\SOFTWARE\Protector Suite QL\1.0\DeviceBio
ctlcntr.exe:4068	QueryValue	HKLM\SOFTWARE\policies\fingerprint\convinientMode
winlogon.exe:684	QueryValue	HKLM\SYSTEM\ControlSet001\Control\Nls\Locale\00000407
winlogon.exe:684	QueryValue	HKLM\SYSTEM\ControlSet001\Control\Nls\Language Groups\1
winlogon.exe:684	OpenKey	HKLM\SOFTWARE\Virtual Token\Passport\2.0\LocalPassport
winlogon.exe:684	QueryKey	HKLM\SOFTWARE\Virtual Token\Passport\2.0\LocalPassport
winlogon.exe:684	Enumerate...	HKLM\SOFTWARE\Virtual Token\Passport\2.0\LocalPassport
winlogon.exe:684	CloseKey	HKLM\SOFTWARE\Virtual Token\Passport\2.0\LocalPassport
winlogon.exe:684	OpenKey	HKLM\System\CurrentControlSet\Control\ComputerName

- analysing
  - template to user correlation
  - used algorithms
  - checksums
  - raw images (making dummies)

attacking the templates

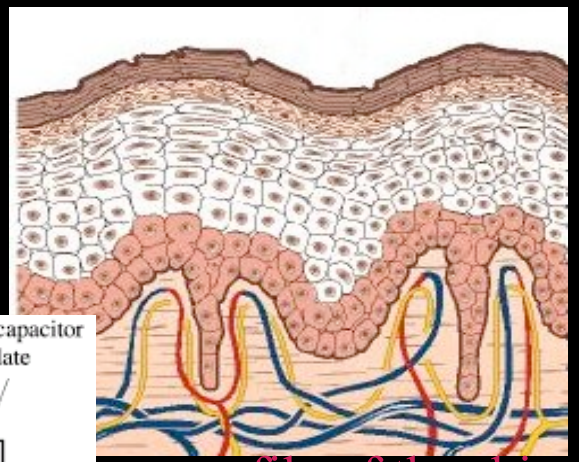
- extracting data for making dummies
- adding or deleting a template
- two people matching one template

attacks using the sensor

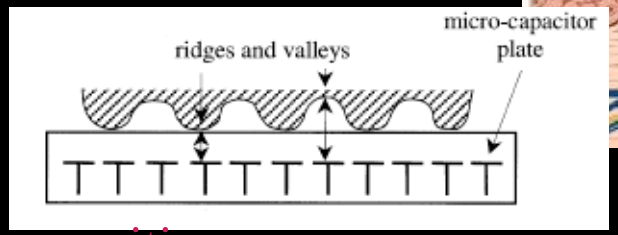
fingerprint recognition

fingerprint recognition

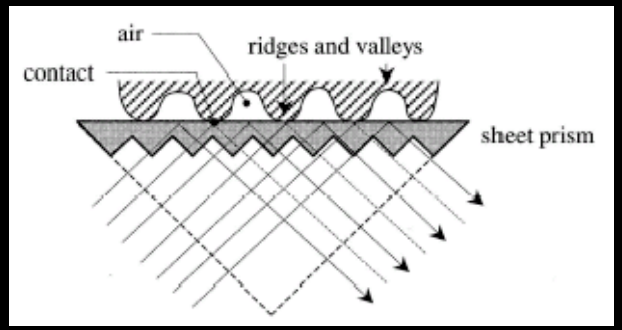
- convolution of the skin
- sensortypes
  - capacitive
  - optical
  - thermal
  - pressure
- minutia based recognition



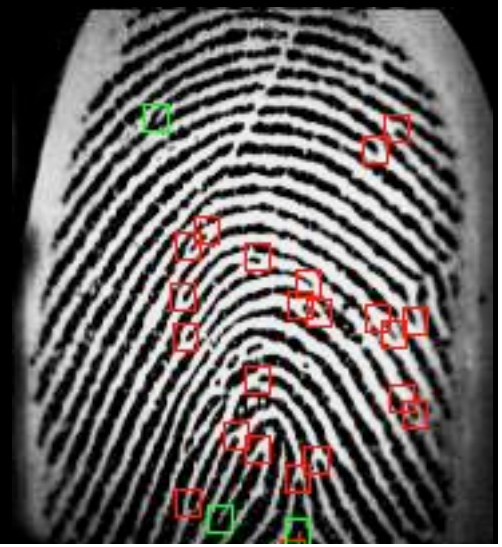
profile of the skin



capacitive sensor



optical sensor



reactivating latent prints

- reactivating latent prints on touch sensors
  - capacitive: aspirate, graphite
  - optical: coloured powder
  - graphite or coloured powder on adhesive tape

reactivating latent prints

graphite on adhesive tape

visualisation of latent prints on glossy surfaces

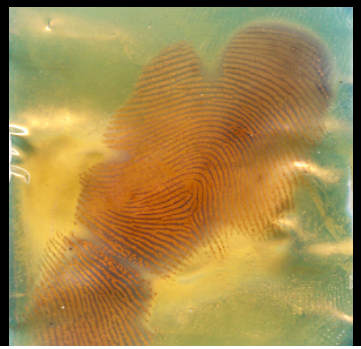
- coloured or magnetic powder

visualisation with coloured powder

- cyanoacrylate

visualisation with cyanoacrylate

- vacuum metal deposition



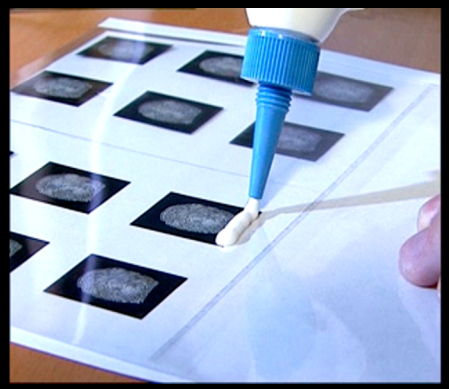
visualisation of latent prints on paper

- amino acid indicator
  - Ninhydrin
  - Iodide

visualisation with Ninhydrin

- thermal decomposition of grease

making a dummy finger




making a dummy finger

- gelatine
- silicone, wood glue
  - enhancing with graphite or gold
- aluminium foil on PCBs


fingerprint recognition :: life check

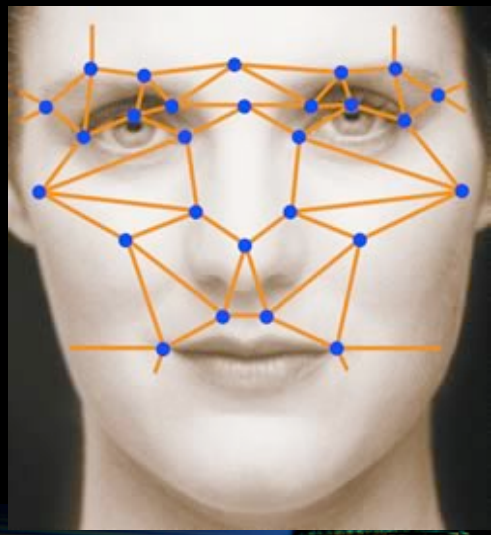
- pulse
  - IR illuminated bloodstream
  - deformation of the ridges
- property of the skin
  - electrical and thermal conductivity
  - colour
- absorption of the blood
- sweat

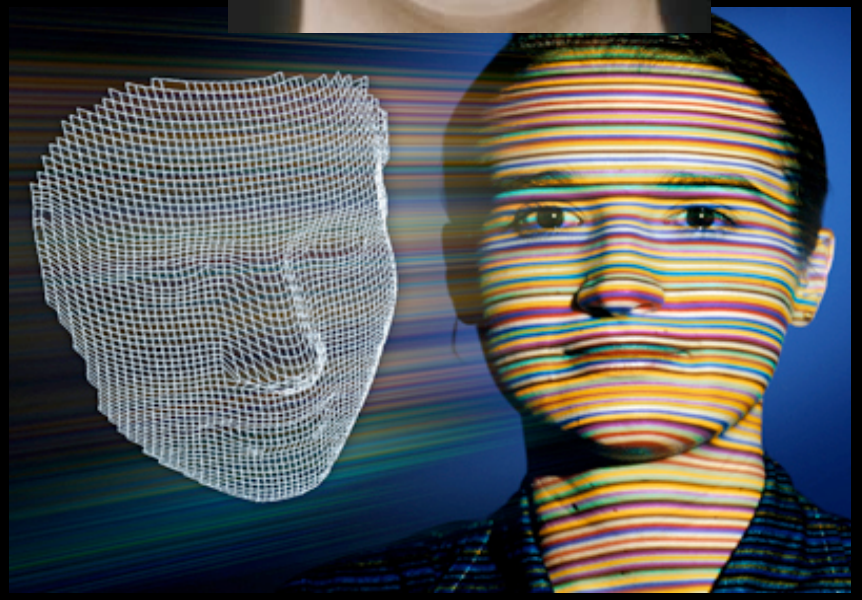
face recognition

face recognition

- 2 dimensional
- 3 dimensional
- infrared

- feature points
- eigenface
- template matching





face recognition :: defeatment

- 2D
  - adapting the face (make up
  - pictures or video
  - latex mask
- 3D
  - latex mask
  - modeling the whole head

http://www.heise.de/ct/english/02/11/114/

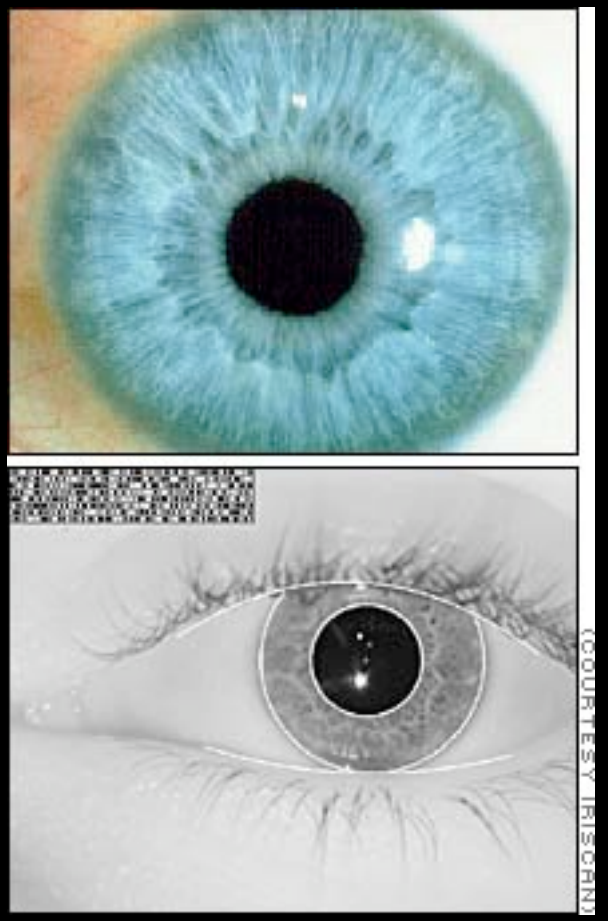
face recognition :: life check

- moving of the head
- moving of the face
  - blinking
  - speaking
- reflection of the skin

iris recognition

iris recognition

- taking picture
  - near infrared spectrum for better contrast
- extracting the iris
- calculating iris code

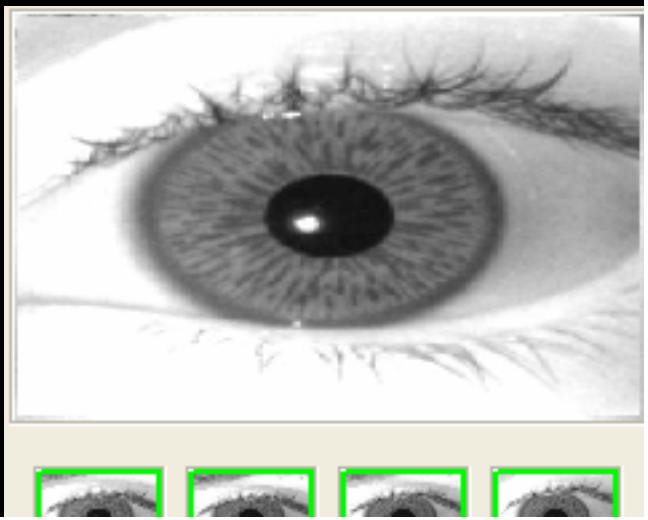


iris recognition :: defeatment

- picture or video

http://www.heise.de/ct/english/02/11/114/

- contact lense
  - printed or painted iris
  - iris hologram



iris recognition :: life check

- moving the eye
- reflections of the eyes
- contracting pupil if illuminated
- flatness of the iris

conclusion

- most of the biometric systems are easy to fool
- fooling needs only a small amount of time and money

- **Don't use biometric systems for security relevant applications!**

Thank you.

starbug@biometrische-systeme.org

preventing the recognition

- superglue
- hard work :)
- etching
- scorching
- remove with emery paper
- transplantation