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Contactless fingerprint identification using mobile phone camera

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Introduction

- Fingerprints are a great biometric modality
- Usually capacitive or optical sensors are used
- We tested possibility of contactless identification
    - Regular fingerprint matcher
    - Mobile phone camera

Fingerprint matching

- SourceAFIS library
- Matching based on minutiae points
- Fingerprints are stored in templates
- Comparing templates produces final matching score


(https://sourceafis.machinezoo.com)
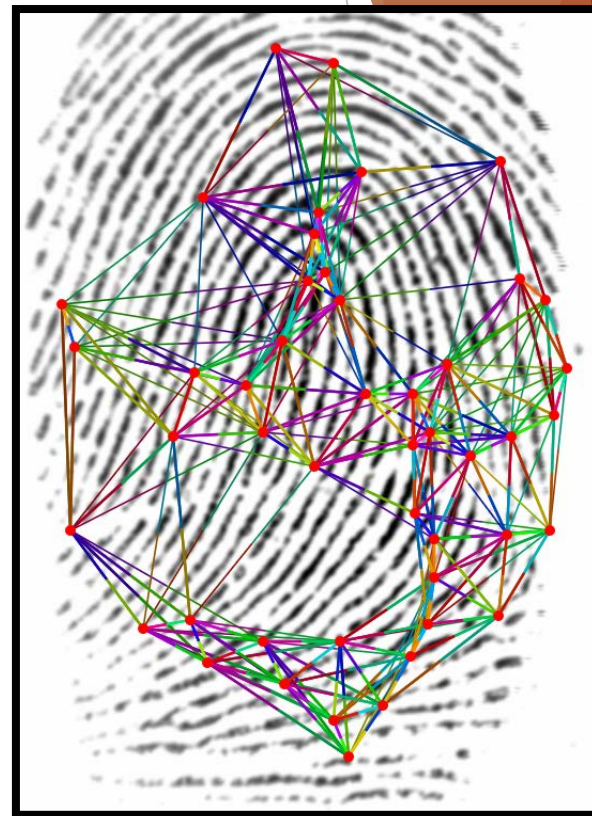
Database

- Our own database of contactless fingerprints
- Images acquired with mobile phone (12MP camera with F/2.2 aperture)
- 8 subjects X 5 fingers X 6 images = 240 fingerprints

Identification evaluation

- ↆ We evaluated performance on our database
- ● All images were manually rotated (finger pointing up) and cropped
- ● Images were preprocessed and enhanced for best results
  - a. Original image
 - b. Cropped and rotated
  - c. Grayscale and histogram equalization
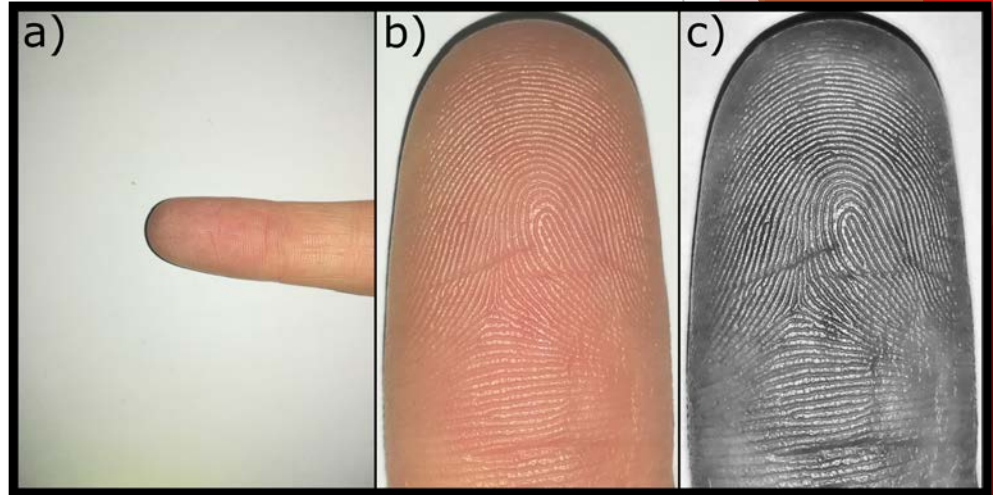
Identification evaluation

- 28,680 comparisons
- Equal error rate as performance measure
- 3 test runs on different preprocessed images
  - Grayscale 42.31%
  - Cropped, rotated 27.50%
  - **Histogram equalization 13.81%**
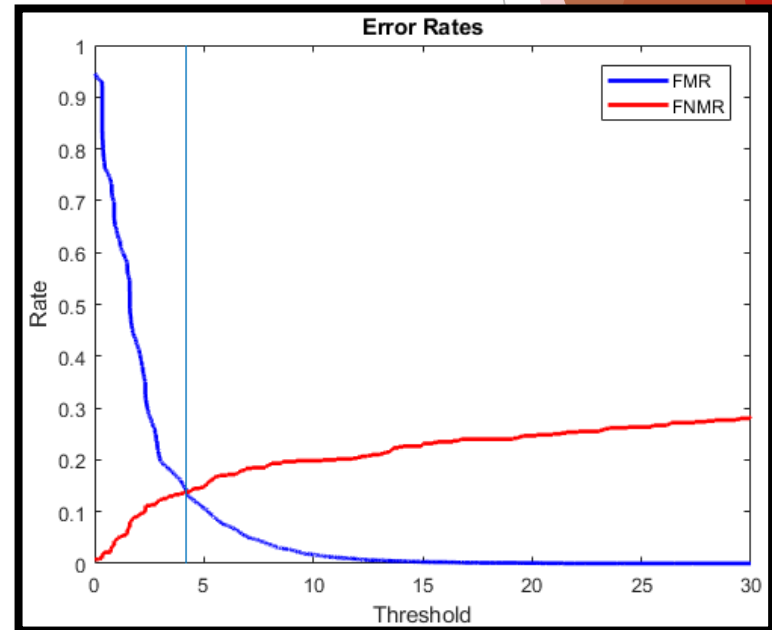
Mobile application

- Android port of SourceAFIS was used
- Images acquired with camera
- Auto focus and flash always on
- Image is cropped to marked region
- Fingerprint templates are stored on device
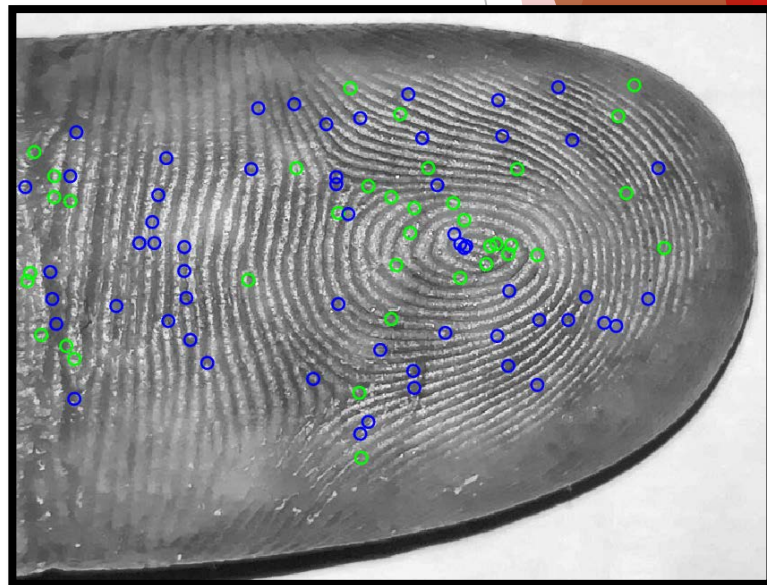
Mobile application

- Enrollment and authentication mode
- Test with 5 templates of finger enrolled
  - 100 attempts, 50 genuine 50 imposter
  - 20% false rejection, 0% false acceptance

	Genuine	Imposter
Accepted	40	0
Rejected	10	50
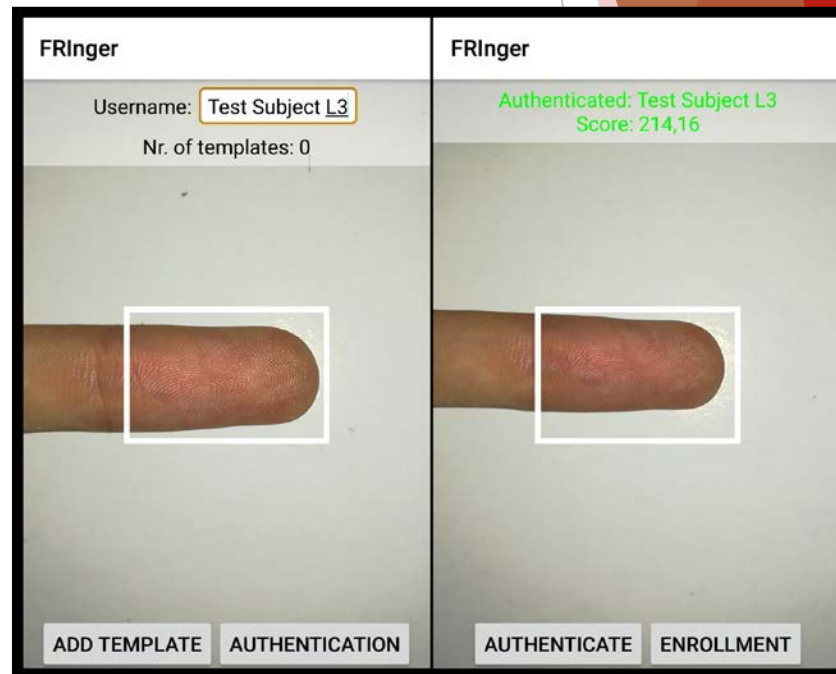
Conclusion

- Proved that mobile phone can be used for contactless identification
- EER of 13.81% with regular matcher
- Further work
  - Test on larger database with low quality images
  - Improve result with specific matcher
  - Implement check for template quality in enrollment
  - Image enhancement in mobile application
  - Acquisition at longer distances