SECURE IRIS RECOGNITION USING LOW RESOLUTION MOBILE CAMERAS

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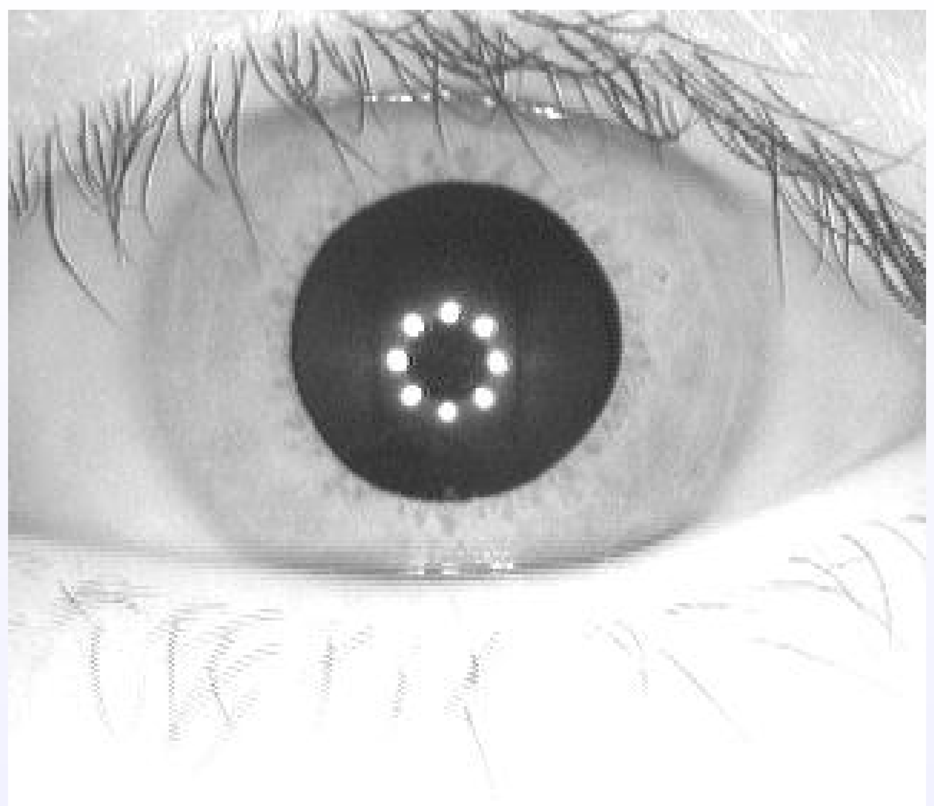


Abstract

A recent delivery of the iris recognition standard by NIST enables reliable personal identity verification for public applications. The need of security in smartphones resulted in biometrical applications like face and fingerprint recognition. We study the potential of iris recognition in the mobile devices and security aspects of used recognition methods. We proposed an efficient feature extraction method for iris recognition based on pseudo-random optimized convolution kernels [1].

Iris detection

Real time iris localisation and tracking in three steps:

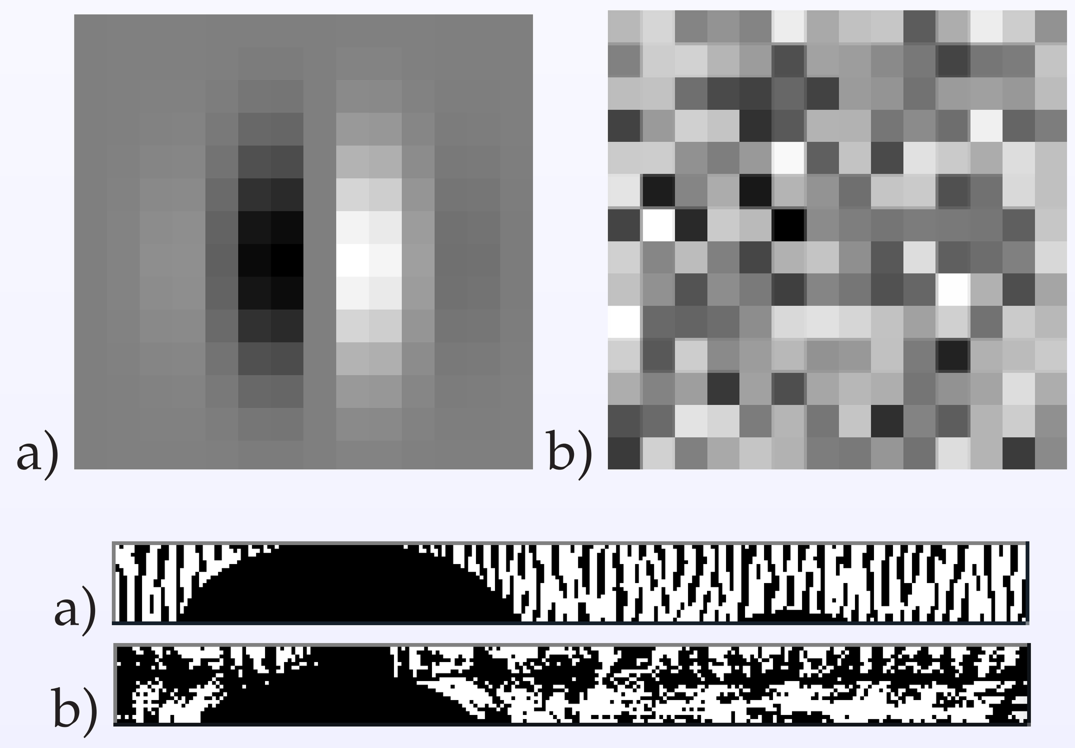
- Eye localisation - a cascade based detector optimized for a real-time use in mobile devices.
- Iris boundary detection - modification of the fast radial symetry transform (FRST) to localize the center and the radius of the pupil and the iris.
- Eyelids and noise detection - adaptation of FRST is used also to detect eyelids, eyelashes and reflexions from the eye.

Iris recognition

Traditional iris recognition methods use 2D extensions of Gabor wavelets and their implementation through band-pass filters a.k.a. 2D Gabor filters [3]. Is there any better solution or are Gabor filters the best for iris encoding?

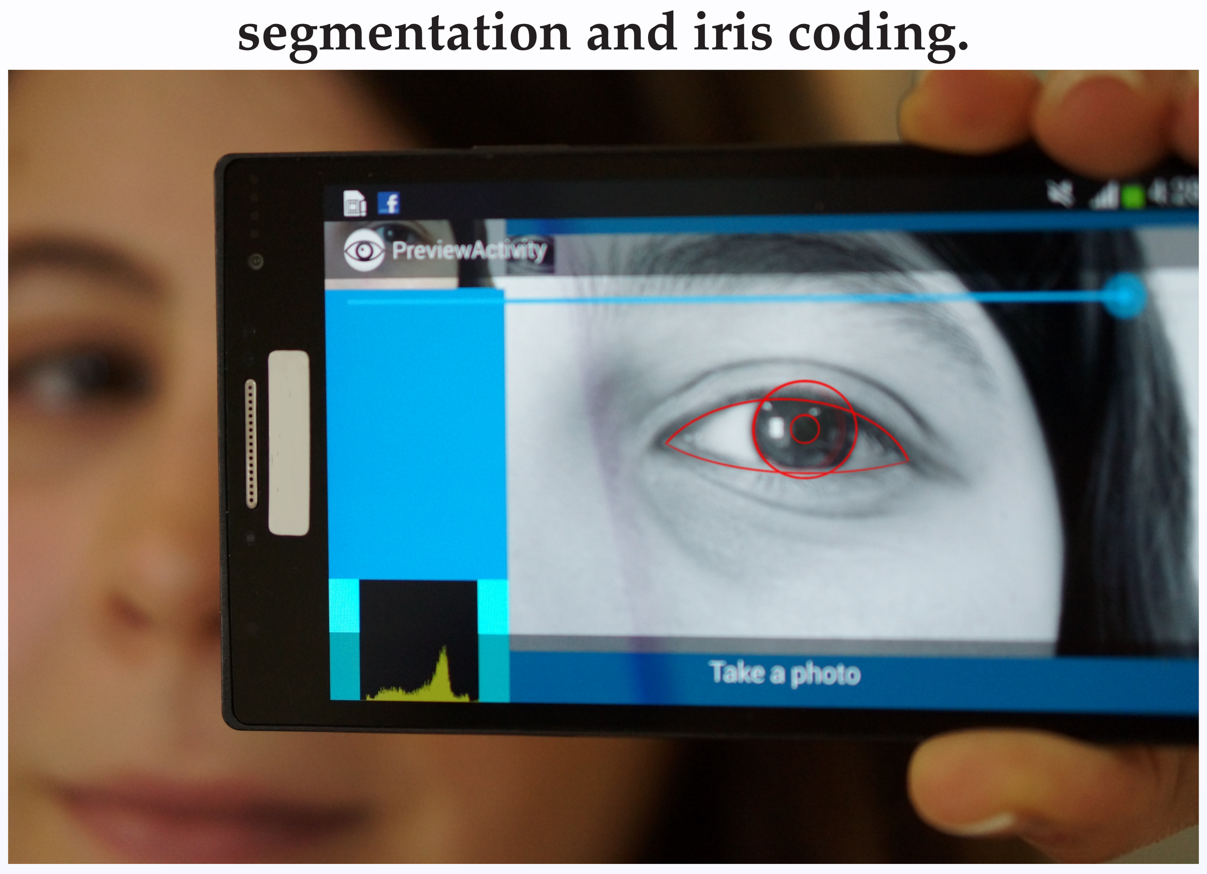
Security aspects

Our experiments show the existence of a class of a stochastically generated convolution kernels that can reach the same results as 2D Gabor filters when used for iris encoding. The result of each optimization is a convolution kernel with unknown analytical definition and pseudo-random values. In contrast to 2D Gabor wavelets [2], coding with pseudo-random kernels cannot be easily reverted thus can prevent from spoofing the iris code.



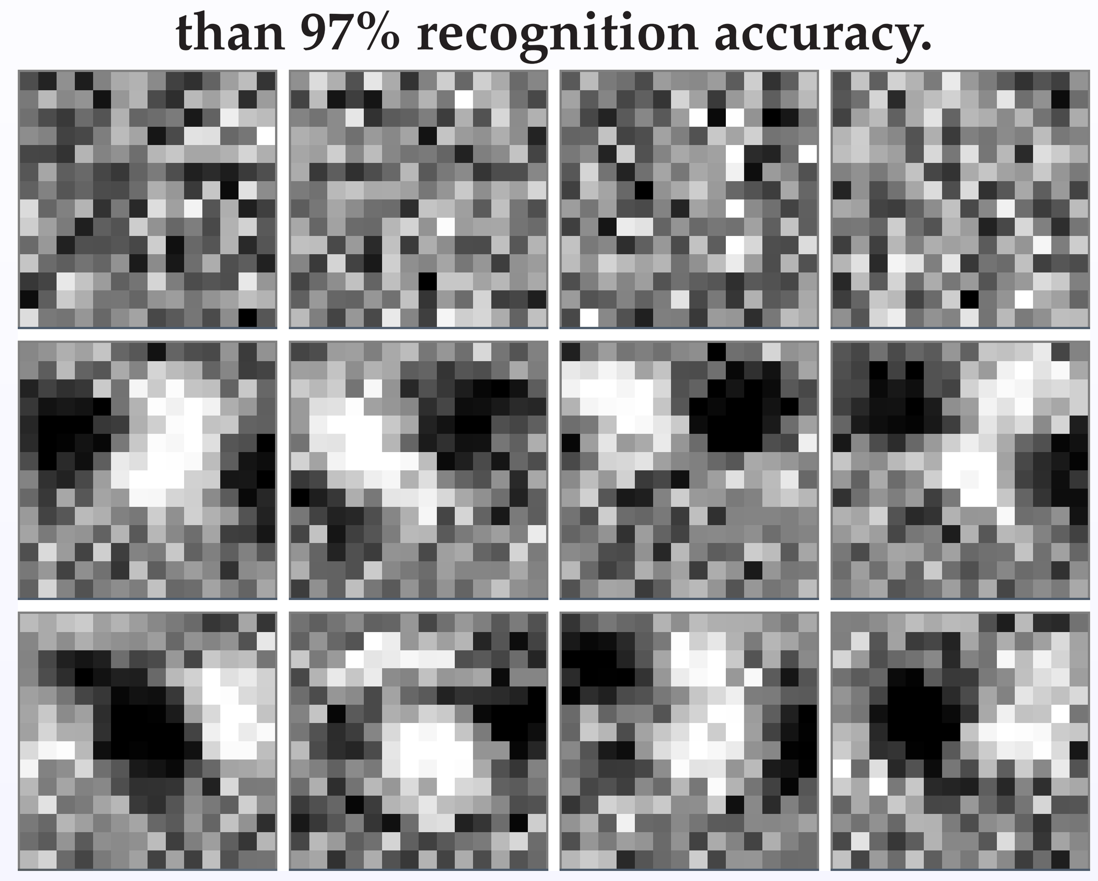
Results

We have developed a prototype of a mobile application containing the real-time iris segmentation and iris coding.



The proposed feature extraction algorithm was tested on the Casia v1.0 iris database. We optimized the kernels with 3 slightly different energy functions (E1, E2 and E3 [1]). We do the repeated random sub-sampling cross-validation for each energy function.

Visualization of 4 different optimized convolution kernels for each energy function, top row - E1, middle row - E2, bottom row - E3. All of these convolution kernels reached more than 97% recognition accuracy.



Recognition accuracy computed for different energy functions.

		Optimized kernels		
	Best Gabor kernel	E1	E2	E3
Recognition Accuracy (%)*	99,058	98,798 ($\pm$ 0,645)	99,922 ($\pm$ 0,158)	99,57 ($\pm$ 0,404)

* Results for optimized kernels are average of 10 experiments

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References

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