

Equipe GSM



CMC Imaging

## PS 29

# Acquisition d'images pour la reconnaissance d'Iris Études de nouvelles méthodes d'identification

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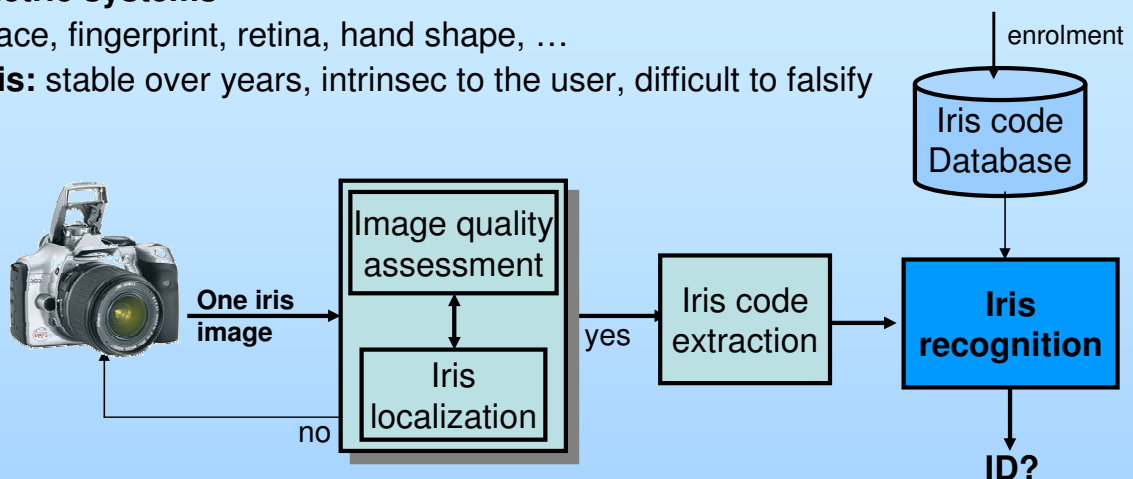
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1

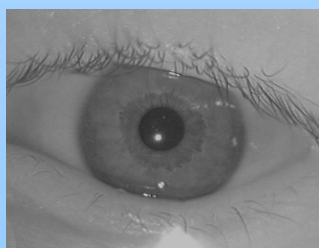
## Single-image iris identification

### • Biometric systems

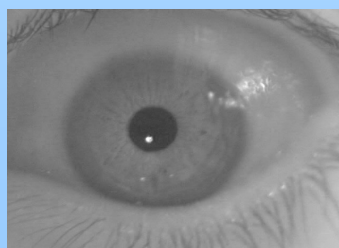
- Face, fingerprint, retina, hand shape, ...
- **Iris**: stable over years, intrinsic to the user, difficult to falsify



- **Difficulty** : Iris acquisition needs a strict cooperation of the user



Clear



Defocused

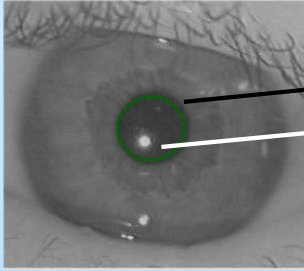


Blur / partial occlusion

2



# 1- Pupil tracking system (overview)

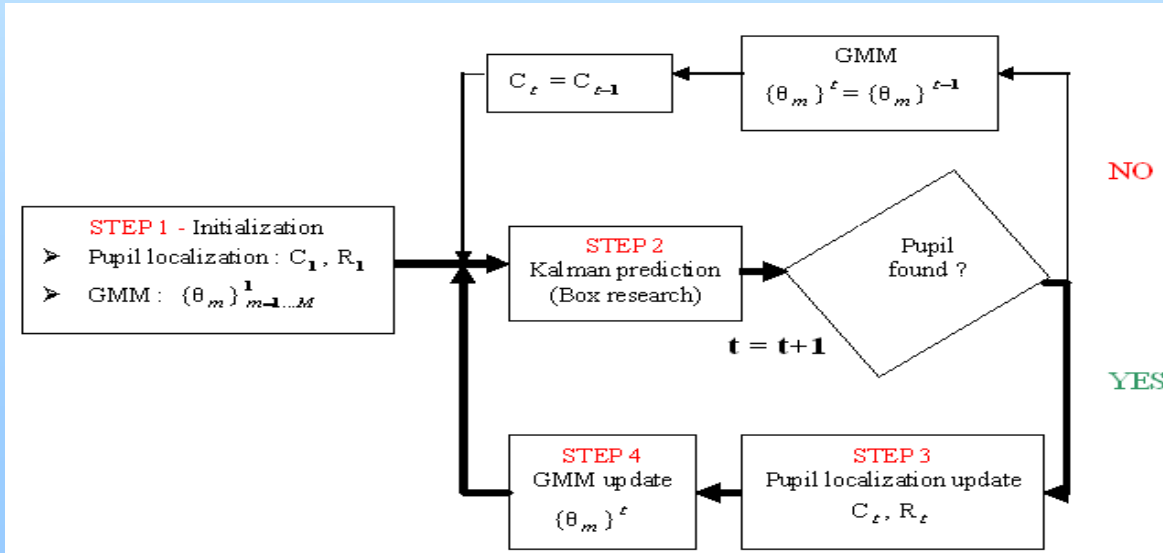


**Pupil** = Gaussian mixture model (GMM) with 2 classes

- **Dark region** Gaussian  $\theta_1=(\mu_1, \sigma_1)$
- **White Spot** Gaussian  $\theta_2=(\mu_2, \sigma_2)$

**Tracker** = Kalman prediction of pupil

- **Center** ( $C_t$ )
- **Radius** ( $R_t$ )



# 1- Pupil tracking system (example)



- **Rejection of Iris image that show**
  - A partial occlusion of the iris;
  - Blur (relative velocity criterion) :

$$V(t/t-1) = \frac{\|C_t C_{t-1}\|_2}{\Delta T}$$

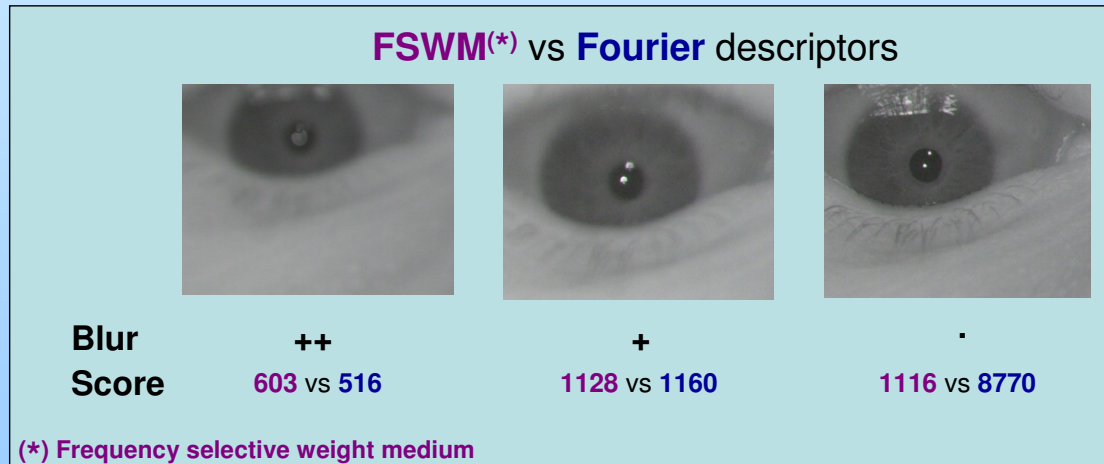
- **Tracking results**

- **Strength** : robust to **partial and total** pupil occlusion;
- **Weakness** : robustness to **quick** pupil motions and to **abrupt** illumination variations;
- **Next** : Tests on a big number of sequences to measure the performances<sub>6</sub>

## 2- Iris quality assessment (results)

- **Iris images selection**

- **Iris quality** is tested only on images that have passed the tracking velocity criterion (high blurred images have been already rejected);
- The quality assessment is based on a measure of contrast inside the iris. The decision threshold must be independent of the user.



- **Results**

- The Fourier-based quality criterion has been tested on a high number of images and seems to be a good indicator of image clearness.

7

## Conclusion and perspectives

- **Strength of our tracking model**

- Robust to slow perturbation of pupil data (size, illumination, ...).
- Robust to slow motion → keep iris images less blurred.
- Authorized user movements → flexibility of the identification system.
- Any kind of objects can be tracked if the shape is known (see demo).

- **Further works**

- Integrate the tracking module in the iris identification system and measure its new performances.
- Integrate the tracking module in an embedded systems of identification.
- Construct a big iris database (100–200 peoples) to validate the identification system.

8

# Color image face tracking

## Face Tracking for

- Identification, and
- auto-focus of camera by measuring the relative distance.

