



Biometric Sensor and Match-On-Card Evaluation platform

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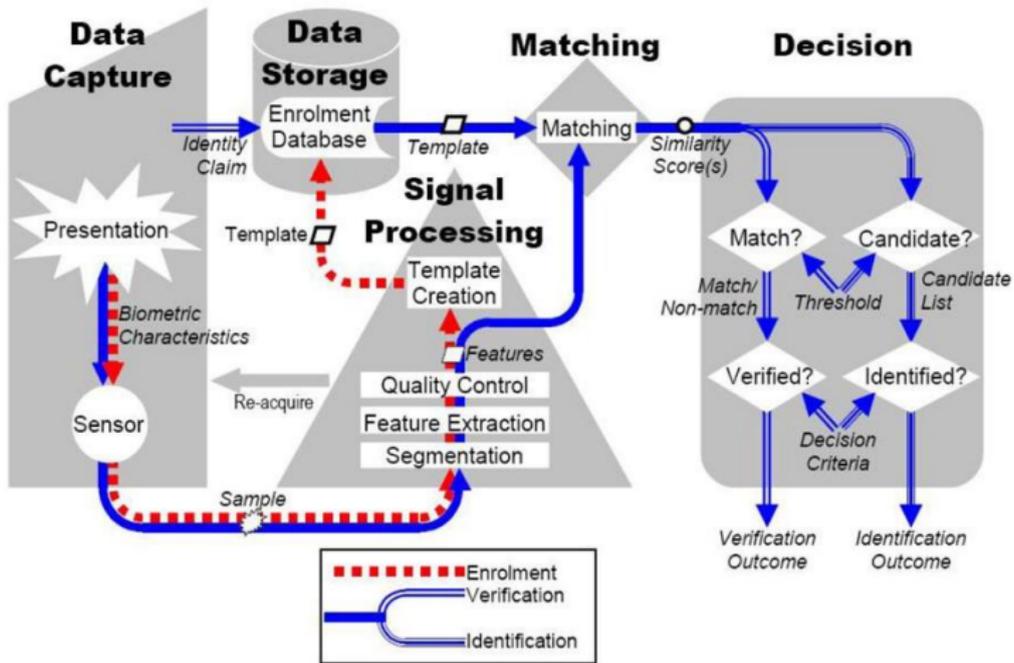
NIST International Biometric Performance Testing Conference 2014



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ISO /IEC JTC1 SC37 SD11





Open questions

How to choose a sensor or a MOC algorithm ?

Many criteria need to be considered :

- Performance ;
- Security ;
- Usability ;
- Cost.



Evaluation Platform

- NIST Platform (**NBIS** ...);
- FVC-OnGoing (**FVC-OnGoing**);
- BEAT European Project(www.beat-eu.org);

Standards

- ISO/IEC 24745 (Security techniques, Biometric information protection);
- ISO/IEC 19794-1 (Conformance testing methodology);
- ISO/IEC TR 29794-4 (Biometric sample quality : Finger image data);
- ...



Objectives

Define an evaluation platform for different purposes.

Industrial

- Help them to choose a MOC or a Sensor ;
- Acquire specific biometric databases.

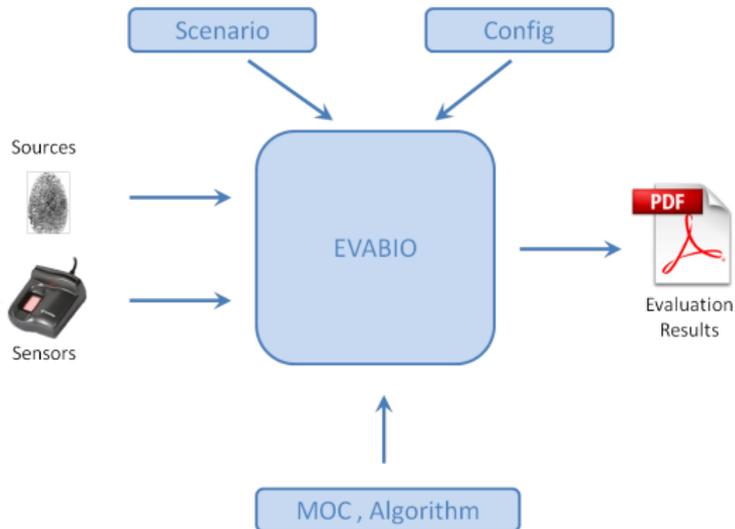
Research

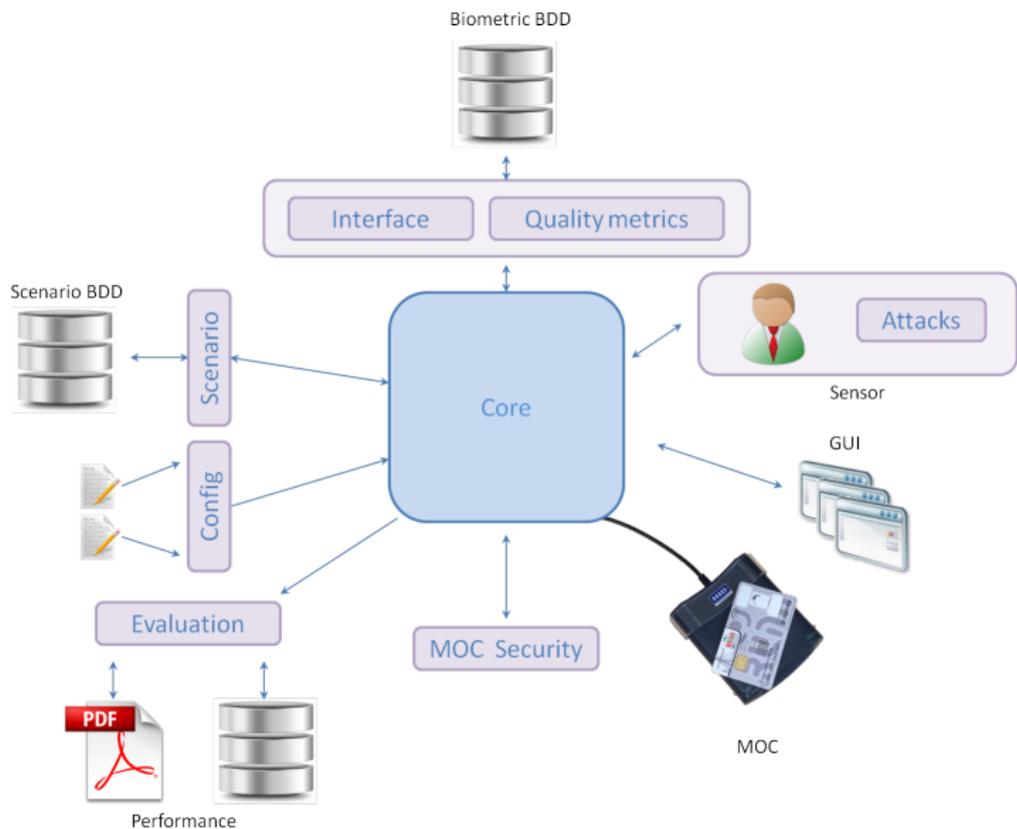
- Propose new attacks on MOC (**Fuzzing** ; **HillClimbing**) ;
- Impact on quality metrics to the enrolment ;
- Qualifying own MOC algorithm ;



Goals

- Evaluating Sensors and MOC ;
- Reproducible research results.







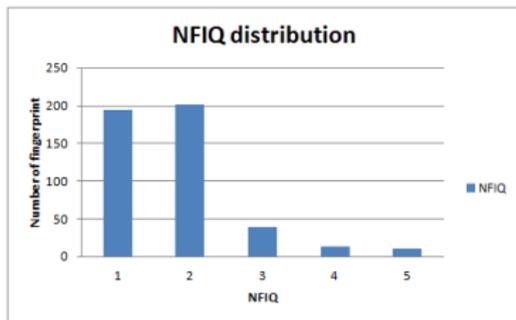
Evaluation module

- Automated generated report ;
- Generation of Metrics graphics (ISO 19795) :
 - FTA : Failure To Acquire ;
 - FTE : Failure To Enrol ;
 - FNMR : False Non Match Rate ;
 - FMR : False Match Rate ;
 - Time ;
 - ROC Curve ;

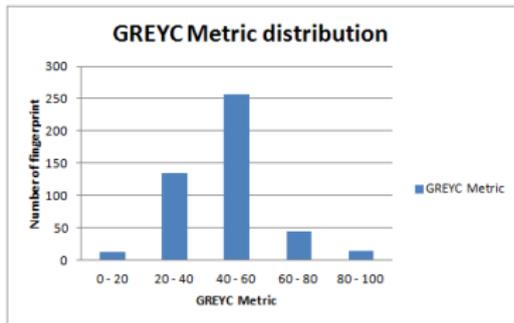


Quality metrics

- NFIQ (Most Used by Industrial) ;
- Q by GREYC (Yao & al. 2014) ;

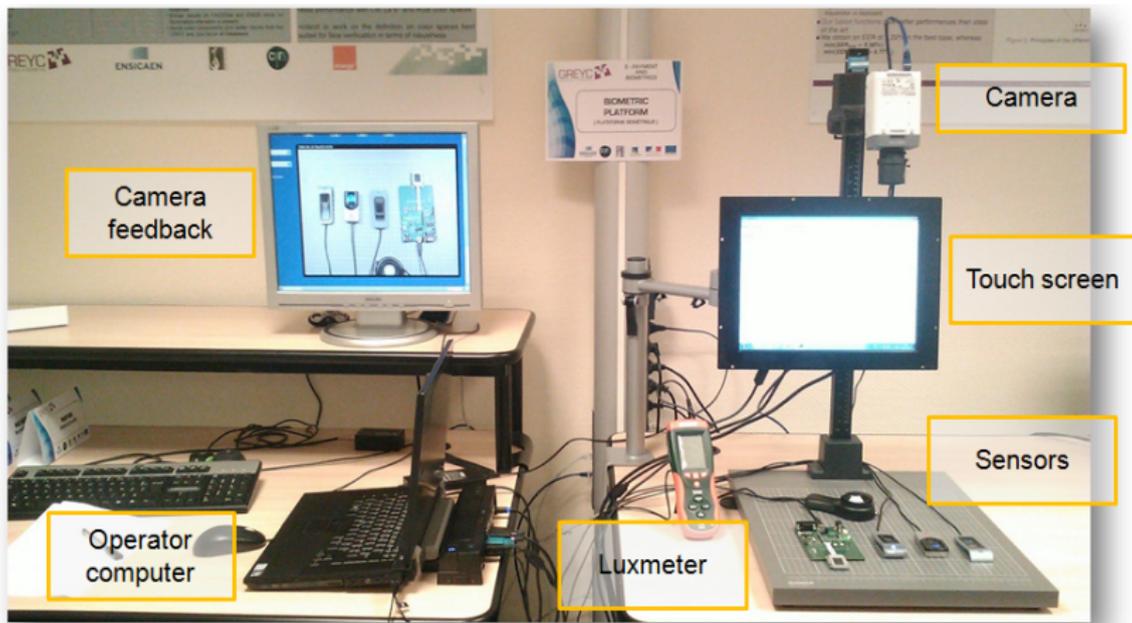


(a) NFIQ distribution



(b) Q distribution

FIGURE 1: metrics distribution



Camera feedback

Camera

Touch screen

Sensors

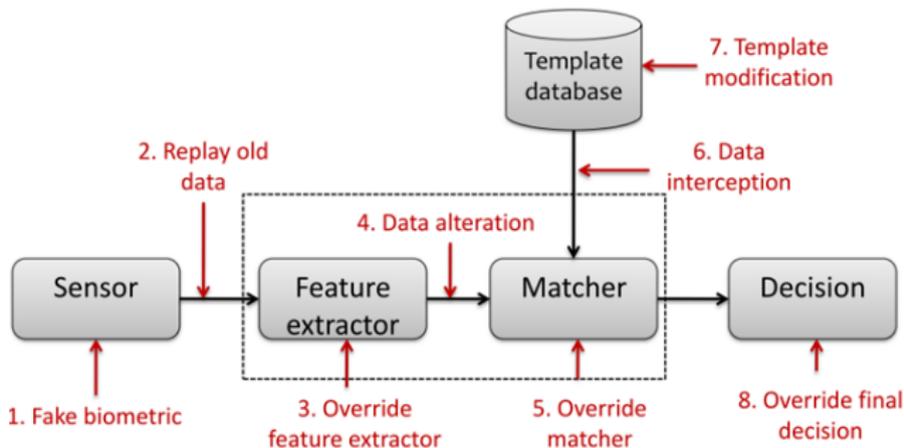
Operator computer

Luxmeter



Attacks on Biometric system (Ratha)

- Fake biometric (Point 1)
- Replay old data (Point 2)





Illustration

- Create fake fingerprint database with real fingers and fingerprints
- Used Wax & Gelatin (materials not thick)

Results

- Sensor 1,3 and 4 : FTAR = 0%
 - 96 tests have been performed :
 - 65% led to a negative verification
 - 35% to a positive
- Sensor 2 : FTAR = 100%





Illustration

- Create dead fingerprint database with dead fingers on 4 people
 - 3 sensors
 - 4 fingers (except thumb)
 - 2 hands (left & right)
 - 6 captures / individual / finger/ sensor (144 images and ISO Compact Card II template)
- 576 samples in total
- FTAR = 36.11% ($1 - (368/576)$)



Results



(a) Acquisition

Metric Q results				
	Sensor 1	Sensor 2	Sensor 3	Sensor 4
Mortuary	38.3	81.9	72.3	68.3
Senior database	32.1	84	78.6	73.7

(b) Average Q metric value for fingerprint coming from a senior database and the dead fingers one

FIGURE 2: Acquisition and Results



Conclusion

- Proposed a platform for the evaluation of biometric sensors and Match-On-Card algorithm.
- Illustrate two attacks on sensors with the platform
 - Fake Fingerprint : spoofing, FTAR
 - Dead Fingerprint : Lower quality for the data

Perspectives

- Improve the Q metric for fingerprint quality assessment
- Make a new database, more dead and alive fingers



Thanks for Your Attention



<http://www.epaymentbiometrics.ensicaen.fr/>

