TELECOM SudParis

Institut Mines-Télécom

Equipe Intermedia

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équipe TIPIC labo CNRS SAMOVAR

Intermedia

a bi-localised team EVRY-Nano-INNOV, Palaiseau

- **Projet Bio-Identité:**
  - Bernadette Dorizzi
  - Mounim El Yacoubi
  - Sonia Garcia
  - Dijana Petrovska
  - Doctorants: Mouna Selmi, Mohamed Ibn Kheder, Nadia Othman, Janio Canuto, Raida Hentati
- **Projet Geste:**
  - Patrick Horain
  - Doctorants: Maher Mkinini,
- **Projet télévigilance**
  - Jerome Boudy
  - Jean louis Baldinger
  - Doctorants: Pierrick Mihorat, Toufik Guettari, Mohamed Sehili
  - Post doc Paulo Cavalcante

Intermedia : Interactions for Multimedia

7 permanent staff, PhD students, post-doc

- **Application domains:**
  - Biometrics (including iris, 2D-3D face, speech, signature)
  - Crypto-biometrics (revocable biometrics and crypto-biometric key generation from biometric data)
  - Audio Indexation using the speech recognition framework (publicity detection, music,…)
  - Avatars personalisation
  - Action and Activity recognition
  - Home healthcare activity
  - Gesture-based communication in networked virtual environments
  - Person re-identification in videos
  - Video indexing and retrieval through face and silhouette

Biometrics

Bernadette Dorizzi

Mounim El Yacoubi, Sonia Garcia Dijana Petrovska,
Intermedia/TELECOM SudParis

Authentication of persons from their personal characteristics
(physiological, behavioural)

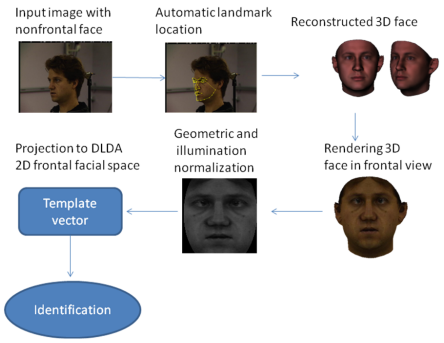
Biometrics and Security

- **Biometrics as a tool for secure person identification**
  - Pattern Recognition
- **Biometrics as a module of an identification system**
  - Resistance to attacks
    - At the sensor level
    - During data transmission
  - Cancellable biometrics
  - Generation of cryptographic keys from biometric patterns

Télécom SudParis Interests

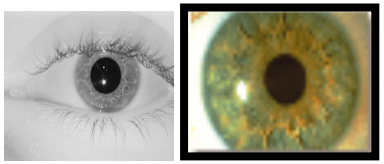
Dynamic Signatures
- Design of models relying on continuous HMMs
  - Tests on different databases (Philips, BIOMET, MYCT, SVC2004)
  - Participation to the international evaluation campaigns SVC 2004, BioSecure 2007, BSEC09

3D morphable model
From side view to frontal view

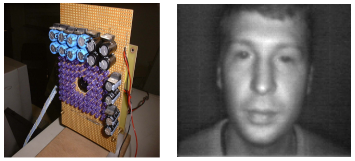


Combining Biometrics and Cryptography
for Secure Authentication

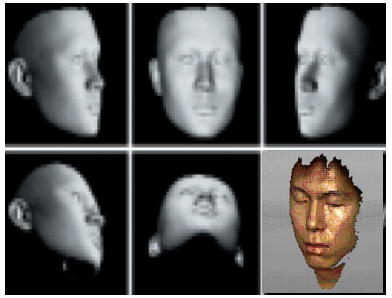
Iris verification from degradated acquisition conditions



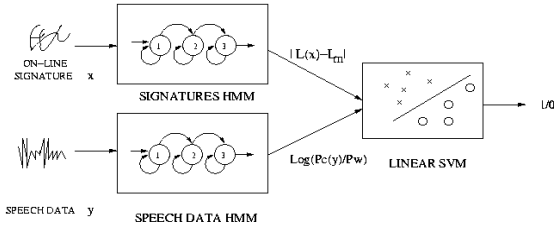
Differential sensors IR for face and hand vein verification



•2D and 3D face recognition

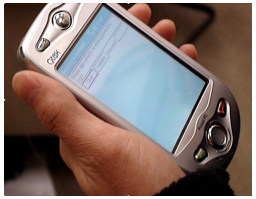


Multimodal fusion
- Scores Fusion with means models, SVM, décision trees
  - Evaluation Protocols on multi-modal databases



GAIT

Usage Tests and field studies in the context of biometric systems deploiement.



Research problems

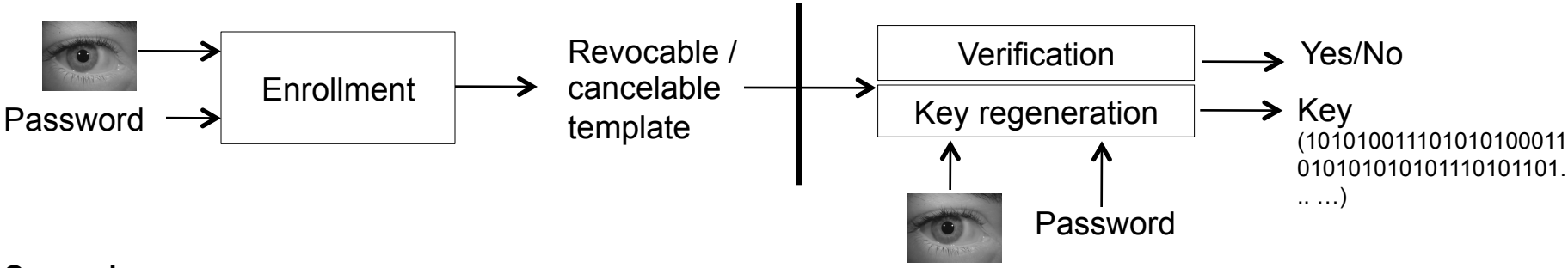
- **Development of new algorithms**
  - On-line signature (patent)
  - Iris verification in degraded mode (patent)
  - Face Verification in 2D and 3D
  - Quality assessment
- **Multimodality : Development and test of score fusion algorithms, independance tests, feature selection and fusion (1 PhD)**
- **Biometrics and Security**
  - Development of new crypto-biometric strategies
- **Coupling sensors/algorithms (collaboration Société NIT, Yang Ni)**
  - Differential image sensor able to decrease illumination effects
- **Assessment protocols for biometric algorithms and multibiometric algorithms (projet BioSecure)**
- **Biometric implementation on embedded systems (PDA, mobile devices) (projets VINSI, SecurePhone, SIC)**
  - Taking into account degradations linked to mobility, Interest of multibiometry
- **Signature verification on iphone, ipad, android platforms**
- Usage tests and field studies in the framework of deploiement of biometric systems.

Combining Biometrics and Cryptography for Secure Authentication

Sanjay Kanade, Dijana Petrovska

Problem: Biometric data is not revocable; cannot replace and reissue the template in case of compromise

Solution: Use biometrics in combination with password; both must be provided at the same time for the system to work; there is no sequential processing



Our work:

- **A shuffling scheme is used which makes the biometric enrollment data (template) revocable**
- **Different templates can be issued for different applications; So user privacy is preserved**
- **Stored data does not reveal information about the biometric enrollment data**
- **Reduce variability in biometric data using error correcting codes [2]; improves biometric performance**
- **Cryptographic keys having 83-bit entropy in single eye mode and 147-bit entropy in two-eye mode can also be obtained; this is the highest reported entropy in literature**

1. Kanade, S.; Camara, D.; Krichen, E.; Petrovska-Delacrétaz, D. & Dorizzi, B. "*Three Factor Scheme for Biometric-Based Cryptographic Key Regeneration Using Iris*", The 6th Biometrics Symposium 2008 (BSYM2008), 2008
2. Kanade, S.; Petrovska-Delacrétaz, D. & Dorizzi, B., "*Cancelable Iris Biometrics and Using Error Correcting Codes to Reduce Variability in Biometric Data",* IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), 2009
3. Kanade, S.; Petrovska-Delacrétaz, D. & Dorizzi, B., "*Multi-biometrics based cryptographic key regeneration scheme*", IEEE Conference on Biometrics: Theory, applications and systems (BTAS), 2009

Spoofing detection via OCT approaches

Projet PARADE; Collaboration Yanneck Gottesman TSP/EPH

2 pending patents, August 2012

Context: fingerprint recognition

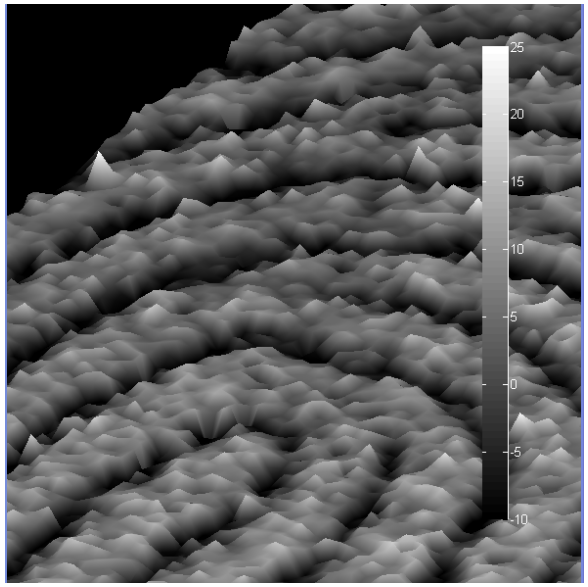
- Actual fingerprint systems: due to the 2D surface acquisition modes, detection of spoofing is very difficult (death finger, false finger, overlay)
- The quality of the recorded image presents a significant variability due to external parameters (temperature, humidity, pressure)

Our proposal:

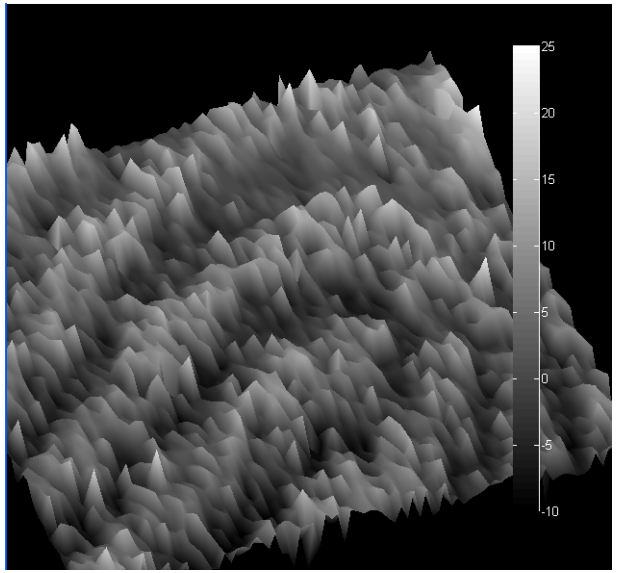
- **Development of a new type of sensor (3D OCT imaging sub-cutaneous) to test the living character of the biological tissue presented to the sensor**
- **Signal processing / 3D volumes to allow biometric recognition and detect attempted identity theft**

Finger with an overlay

- **Overlay depth < dimensions groove (sillon)**



Without overlay



With overlay

Difficult because the overlay depth is inferior to the OCT resolution
Detection is possible as we use the phase image

Recent Projects

- **BioSecure : Biometric Secure Authentication**
  - Coordination of the NoE, 2004-2007, 30 partners, 3 M€
  - Framework for test of biometric algorithms
- **Biotyful : BIOmetrics and crypTographY for Fair aUthentication Licensing (2007-2010)**
  - ANR telecom, ATMEL, FRANCE TELECOM, GET/INT, GREYC
  - Cryptobiométrie
- **Vidéo-ID : Identification via face and Iris in video-surveillance**
  - ANR CSOSG (2008-2011)
- **Kivaou : Face identification in video-surveillance**
  - ANR CSOSG (2008-2009)
- **Xvision: Special vision sensors for outdoor applications**
  - System@tic (2008-2010)
- **METHODEO:**
  - ANR CSOSG (2011-2013)
- **Juliette: FEDER 2010, Action Recognition**

Recent Projects

- **ITEA2 PRIBIOSEC**
  - crypto-biométrie, coordinateur français CASSIDIAN et PME Secure-IC
- **PME E-Closing**
  - Sur la signature électronique avec biométrie
- **SurfOnHertz avec YACAST:**
  - indexation audio
- **PW Consultants:**
  - securing banking on-line transactions by speech recognition, speech crypto-biometrics
- **ITEA2: IDEA4SWIFT**
  - Border control for frequent travelers via biometrics
- **IRISEM:**
  - ANR CSOSG; correction of eye movements in iris recognition