Call for cooperation: biometric template ageing

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Template ageing

- **Source of age-related changes**
  - Natural processes of our body or behavior changes
    - Not adequately studied for most of the biometric modalities
  - Indirect due to diseases, injuries and surgeries
- **Ageing sources for selected modalities [Lantinis 2010]**
  - **Iris:** cataract (cloudiness of the eye lens), increase of blood pressure within the eyeball (often associated with glaucoma)
  - **Fingerprints:** low skin elasticity = problems with fingerprint capture; wear and tear
  - **Face:** bone movement and growth (childhood, puberty), skin deformations (old age) due to lowering the skin elasticity and wrinkles
  - **Voice:** loss of lungs elasticity, vocal muscle atrophy, anatomical changes in larynx, epithelium thickening

Template ageing

- **Typical solutions**
  - Template frequent (and forced) update
  - Simulation of the ageing effects
    - Based on „age progression" methods
    - Investigated for face biometrics [Giraldi 2009, Ramanathan 2006] (used when searching for missing persons), voice biometrics [Gurbuz 2000] and fingerprints [Ryu 2007]
    - No adequate attention in the literature for other modalities
  - Usage of age invariant biometric features
- **Lack of ample data bases**
  - Biometrics: relatively young technology
  - Technological problems: equipment and measurement protocols must be kept for long time periods
  - Availability of volunteers during the database collection
  - Sociological resistance (e.g. creation and usage of templates for children)

Ageing databases

- **MORPH**
  (Craniofacial Longitudinal Morphological Face Database)
  [Ricanek 2006, www.faceaginggroup.com]
  - Biometric type: **face**
  - Two sets
    - Album 1: scanned photographs; population: 515 subjects; time intervals from a few months up to 29 years;
    - Album 2: digital images; population: 4000 subjects; time intervals: several years
    - Metadata available: race, date of birth, date of acquisition, gender, eye coordinates
  - Seems to be the largest publicly available ageing database (yet for only one modality)
  - Dedicated for use with standard face recognition algorithms
  - Research (ready) and commercial (planned) use

Ageing databases

- **FG-NET [www.fgnet.rsunit.com]**
  - Biometric type: **face**
  - Population: 82, 6-18 images per subject
  - Auxiliary data available
    - Preprocessing data:
      - Face localization (68 landmarks)
      - Existance of occluions (beard, moustache, hat, glasses)
      - Face vertical and horizontal pose
    - Demographic data: age, gender
  - Research use only

FG-NET database sample

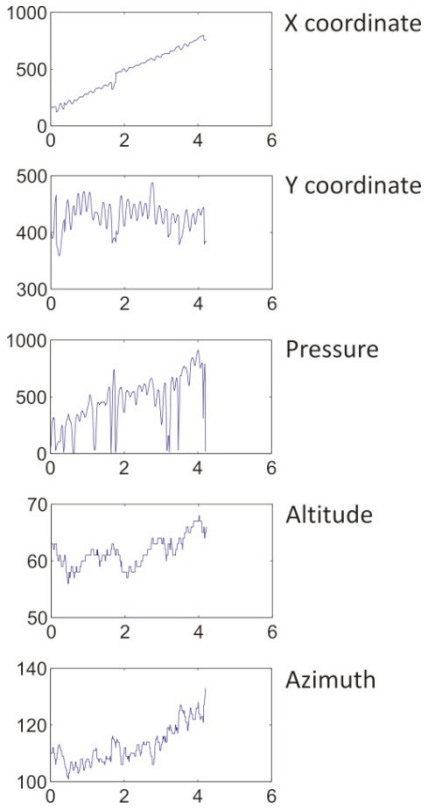
Ageing databases

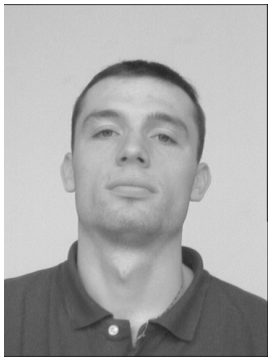
- **KFRIA Ageing DB**
  (Korea Fingerprint Recognition Interoperability Alliance)
  [Ryu 2007]
  - Biometric type: **fingerprints**
  - Time interval: 1 year
  - Population: 100 subjects, three sensors used
  - Demographic data available: age, gender, occupation

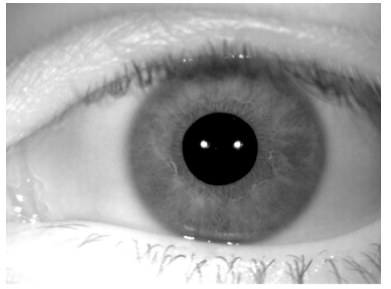
Ageing databases

BioBase (www.BiometricLabs.pl)

- Multimodal set: **iris, face, handwritten on-line signatures, fingerprints, hand** (2D geometry)
- Time interval: 7 years
- Equipment and capture protocols kept the same
- Population: 50 subjects
- Extension (planned for mid of 2010) co-sponsored by the Polish Ministry of Science and Higher Education







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Cooperation aspects

- **Identification/development of cooperation rules**
  - Partners and end users, recognition technology suppliers
  - Project financing/coordination
- **Identification of the existing databases gathering biometric measurements a few years apart**
- **Development of testing methodology and tools**
  - Analysis of the work already done (especially for face and fingerprints)
  - Analysis of the end users requirements

References

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