Face Recognition with Surveillance Video and ISO / IEC 30137

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DSTL
Background on CAST and DSTL

HO Centre for Applied Science and Technology (CAST)

• Provision of sensitive and specialist science and technology services for UK Home Office and Policing

MOD Defence Science and Technology Laboratories (DSTL)

• Provision of sensitive and specialist science and technology services for MOD and wider UK government.

In April 2018 HO CAST merged with DSTL to create a single agency providing specialist science and technology support across all UK Govt.
Background on CAST and DSTL

Counter Terrorism and Security Division (CTSD) - Policing and Security Group (PSG)

Contraband and threat detection
Forensics and Identity
Frontline Equipment

Secure Infrastructure
Technical Intelligence and Investigations
FR with Compliant Still Images

- Early FR systems focussed on matching good quality, compliant images:
  - Passports images
  - Police custody images
  - Drivers’ licence photos

- Standards development has concentrated on these applications and has mandated:
  - Neutral expression
  - Controlled lighting
  - Full frontal face
  - Plain background
FR with CCTV

• Use of FR with CCTV is especially challenging because:

  • Camera resolution and frame rate, multiple subjects per frame
    • Can generate large amounts of data which often needs to be processed in real time
  • Positioning of cameras
    • Typically not installed for FR use
    • Off-angle images
  • Moving subjects
    • Risk of motion blur
    • Occluded faces
    • Uncontrolled and variable lighting
  • Potentially high false alert rates
    • Risk of operator fatigue
ISO / IEC 30137 Multi-part Standard

‘Use of Biometrics with Video Surveillance Systems’

• Part 1 – System Design and Specification

• Part 2 – Performance Testing and Reporting

• Part 3 – Data formats

• Part 4 – Ground Truth and Video Annotation Procedure
Use Cases

• **Real Time FR:**
  • Alerting (in real or near real time) to the presence of one or more individuals of interest held in a watchlist
  • Real time tracking of an individual of interest across multiple cameras

• **Post Event FR:**
  • Analysis of recorded surveillance video to identify one or more individuals
  • Tracking of one or more individuals forwards or backwards in time
  • Clustering multiple instances of the same individual(s)

• **Enrolment:**
  • Enrolment into a watchlist of individuals who repeatedly enter a restricted area
  • ‘Time-clocking’ individuals – e.g. to monitor queue lengths
Capture Scenarios

- **Stationary** - as at passport control or biometric kiosk;
- **Portal** - as in a one-way corridor or choke-point portal;
- **Corridor** - as in a two-way corridor with more than one individual at time;
- **Halls** - as in airport halls, shopping malls;
- **Outdoors** - all other scenarios.
Architecture and Factors Affecting Performance
The Zone of Recognition

- Subjects in focus
- Subjects out of focus
- Zone of Recognition
- Image resolution too low
Maximum Capture Width

A typical IED in adults is around 0.063 metres (63 millimetres)

A full HD camera has a resolution of 1920 by 1080 pixels

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<tr>
<th>IED</th>
<th>Maximum horizontal capture width</th>
<th>Reference</th>
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<td>20 pixels</td>
<td>6,04m = 0,063*1920/20</td>
<td>Minimum value examined in FIVE study</td>
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ISO / IEC 30137 – Part 1

- Terminology
- Architecture
- Use Cases
- Cameras – Selection and Placement
- Biometric Software
  - Detection, Comparison, Computational Requirements
- Reference Image Datasets
- Guidance for Operators
- System Design Considerations
- Annexes
  - Related (non-biometric applications)
  - Societal Considerations and Governance Processes
FISWG and OSAC Facial ID Subcommittee

FISWG – Facial Identification Scientific Working Group

- Established in 2009 to develop guidance regarding the proper application of manual Facial Identification and Automated Facial Recognition technologies

Organisation of Scientific Area Committees (OSAC)

- Established in 2014 following the NAS report ‘Strengthening Forensic Science in the United States – a Path Forward’
- 5 Scientific Area Committees and 25 discipline specific subcommittees, including Facial Identification within the Digital and Multimedia SAC

Many FISWG documents are now being re-drafted by the OSAC FI subcommittee and will be published as ASTM standards.
FISWG Documents

Examples of FISWG standards / best practice documents, both published and in development:

• Facial Comparison Overview
• Guidelines for Facial Comparison Methods
• Facial Image Comparison Feature List for Morphological Analysis
• Guidelines for Post Mortem Facial Image Capture
• Face Recognition Systems: Image Capture and Equipment Specification
• Guidelines for developing a training programme to competency
• Physical stability of facial features
• Facial imaging conditions
• FR systems: Metadata usage for improved search accuracy
• FR systems: Methods and techniques
• FR systems: Guidelines for bulk data transfer
• FR systems: Specification, Procurement, Deployment and Operation
• FR systems: DMV Use Cases
OSAC Facial Identification Standards

Two standards published to date:

ASTM E3148-18 Standard Guide to Post-mortem Facial Image Capture

• Provides guidelines for capturing post-mortem facial images in controlled and semi-controlled settings to facilitate both AFR searches and manual comparison.


• Provides guidance to practitioners in choosing, setting up and operating photographic equipment designed to capture facial images for use with AFR or for manual comparison.
• In controlled, semi-controlled and uncontrolled environments.
Questions?

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