

Face Recognition with Surveillance Video and ISO / IEC 30137

Geoff Whitaker
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'

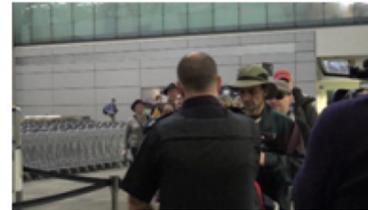
- Part 1 – System Design and Specification
- Part 2 – Performance Testing and Reporting
- ~~Part 3 – Data formats~~
- Part 4 – Ground Truth and Video Annotation Procedure

Use Cases

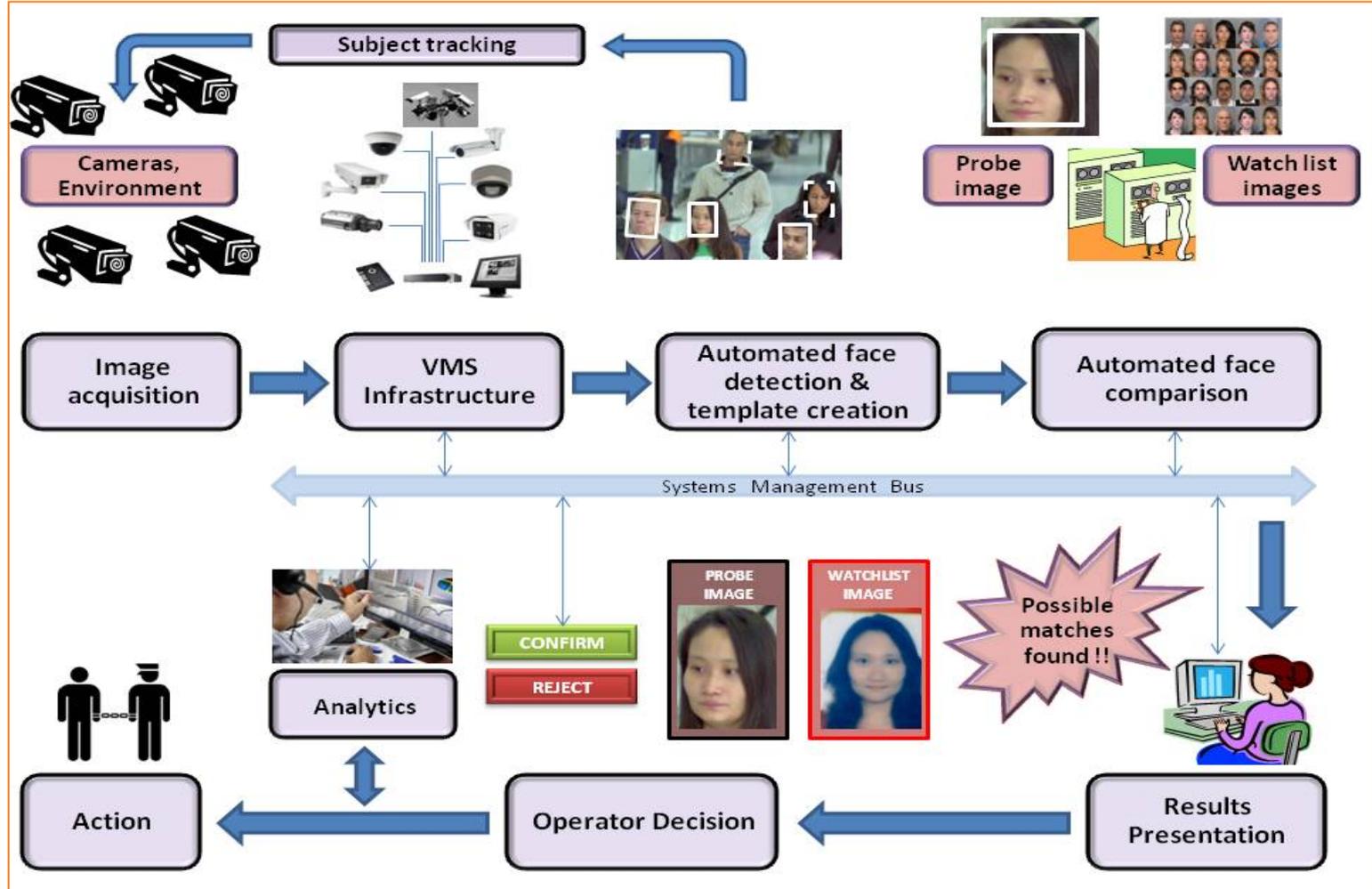
- **Real Time FR:**
 - Alerting (in real or near real time) to the presence of one or more individuals of interest held in a watchlist
 - Real time tracking of an individual of interest across multiple cameras
- **Post Event FR:**
 - Analysis of recorded surveillance video to identify one or more individuals
 - 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

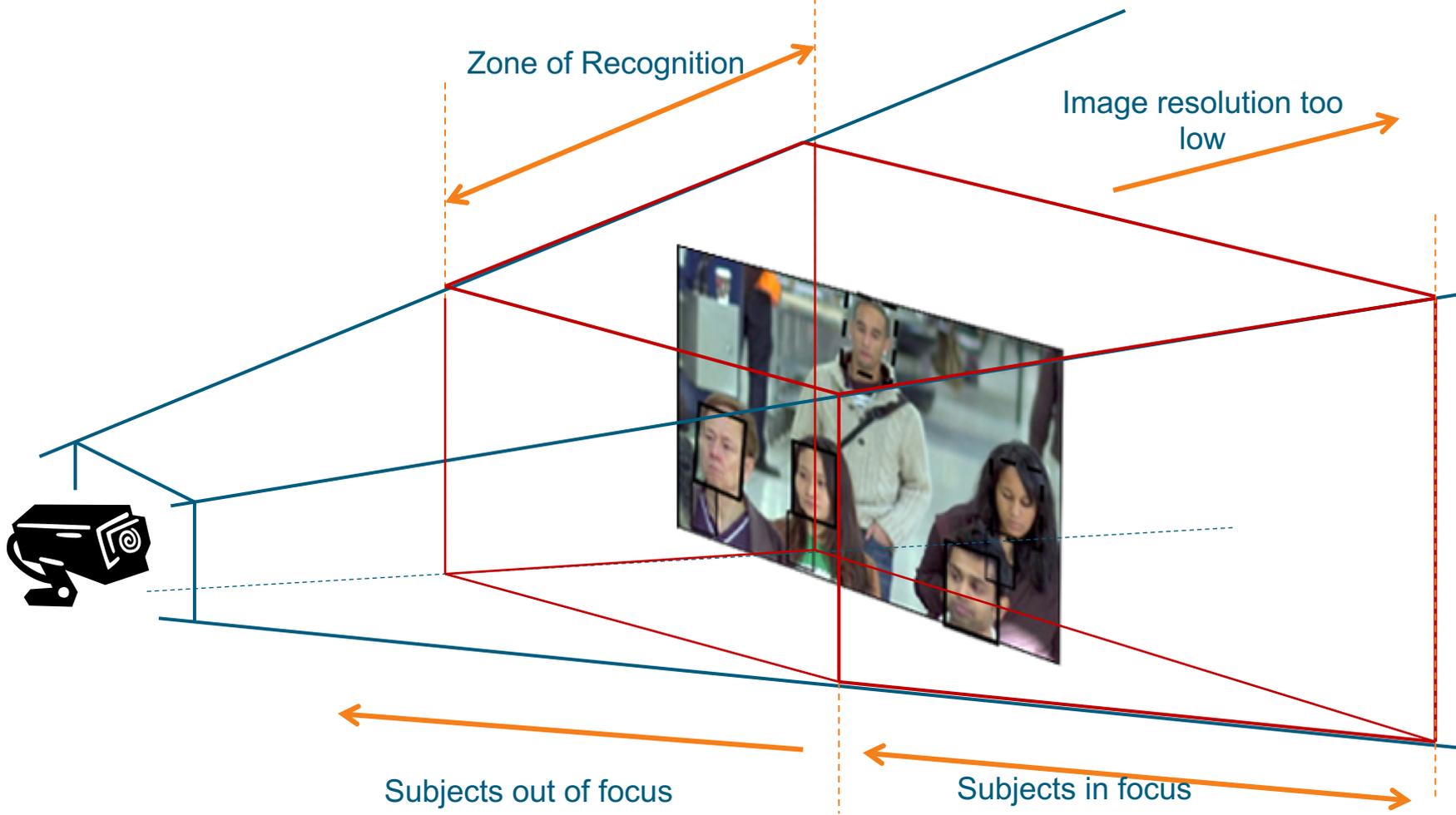
- **Stationary** - as at passport control or biometric kiosk;
- **Portal** - as in a one-way corridor or choke-point portal;
- **Corridor** - as in a two-way corridor with more than one individual at time;
- **Halls** - as in airport halls, shopping malls;
- **Outdoors** - all other scenarios.



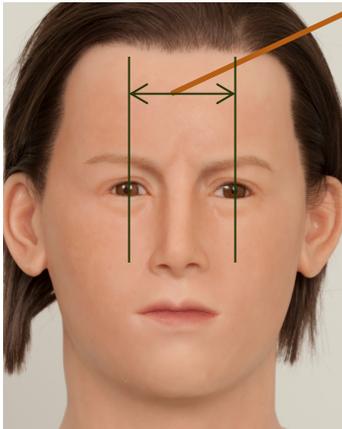
Architecture and Factors Affecting Performance



The Zone of Recognition



Maximum Capture Width



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

[6] Dodgeson N,A (2004) - Variation and Extrema of Human Interpupillary Distance. SPIE, Proceedings Vol 5291.

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

IED	Maximum horizontal capture width	Reference
20 pixels	$6,04\text{m} = 0,063 * 1920 / 20$	Minimum value examined in FIVE study
50 pixels	$2,41\text{m} = 0,063 * 1920 / 50$	Minimum value recommended in 8.5.1
80 pixels	$1,51\text{m} = 0,063 * 1920 / 80$	Maximum value examined in FIVE study
95 pixels	$1,27\text{m} = 0,063 * 1920 / 95$	Maximum value recommended in 8.5.2.1

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

ASTM E3115-18 Standard Guide for Capturing Facial Images for use with Facial Recognition Systems

- 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?

Geoff Whitaker
UK Defence Science and Technology Laboratories
Email: gwhitaker1@dstl.gov.uk

[dstl]

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