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1901-1937
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GEBOORTEPLAATS: HAARLEM
ADRES: VIERBESLAAN 85
POSTCODE EN WOONPLAATS: 7643 CW DE LIER
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VOORNAMEN: STEVEN JAN
NAAM: VAN LAAR
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BURGERSERVICENUMMER: 1832 06 325
NATIONALITEIT: NEDERLANDSE

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State of the art of Morphing Detection

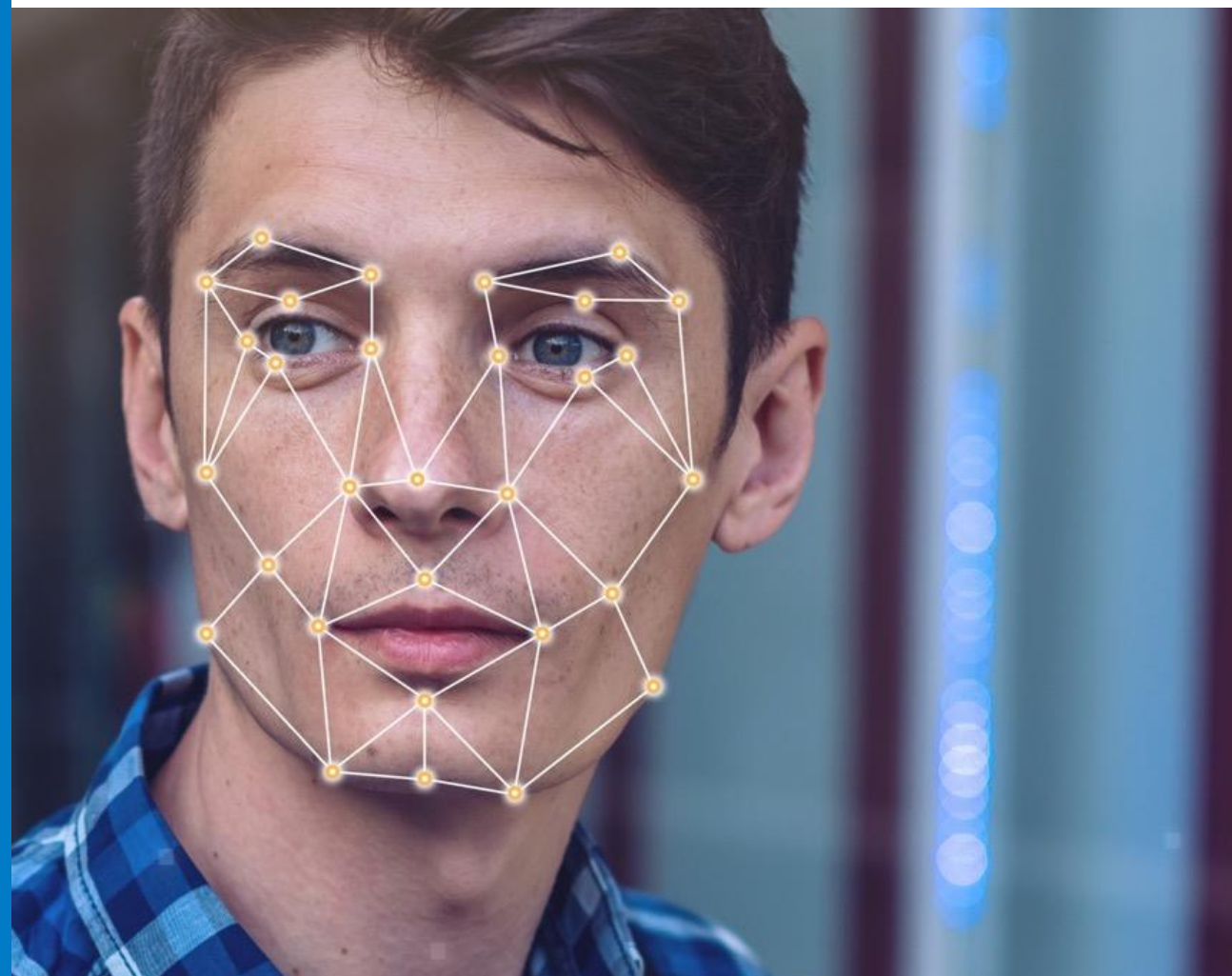
SOTAMD

Fons Knopjes

Senior Research & Development Advisor



National Office for Identity Data
*Ministry of the Interior and
Kingdom Relations*





Disclaimer

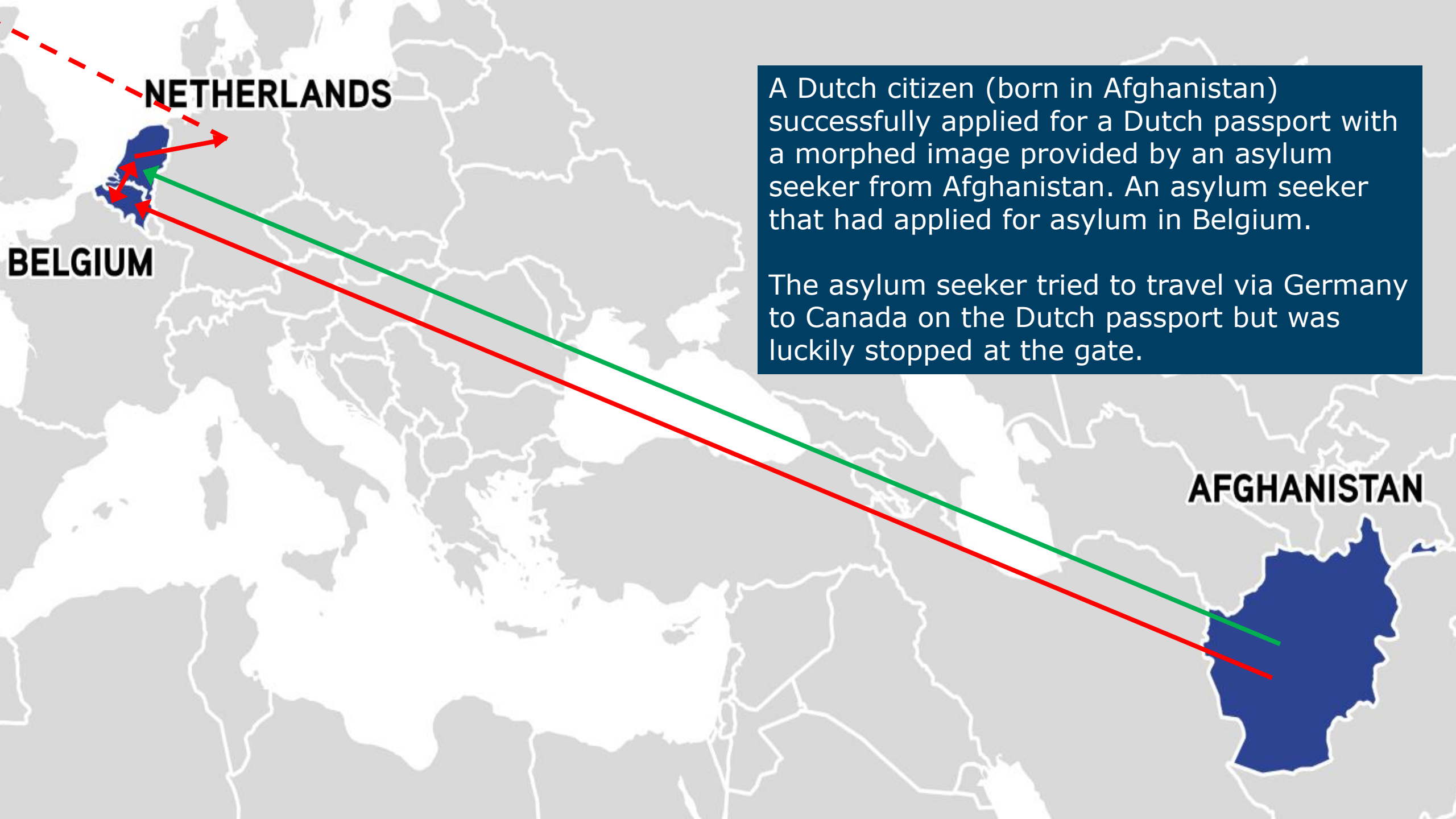
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Authoritative and trusted source for identity data

- › ePassport and identity card
- › Civil registry (BRP)
- › Unique Identity Number (BSN)
- › Prevention Identity fraud
- › Quality programs (e.g. address quality)
- › Innovation programs (e.g. digital identity)





NETHERLANDS

BELGIUM

AFGHANISTAN

A Dutch citizen (born in Afghanistan) successfully applied for a Dutch passport with a morphed image provided by an asylum seeker from Afghanistan. An asylum seeker that had applied for asylum in Belgium.

The asylum seeker tried to travel via Germany to Canada on the Dutch passport but was luckily stopped at the gate.



Importance

- › Scale of the problem is potentially large
- › Problem is relatively new and undocumented
- › Need to evaluate possible countermeasures to the current vulnerabilities of face recognition technology
- › Numerous electronic passports are potentially vulnerable



Context

- › Research into the application process has shown that civil servants:
 - are not aware of the image morphing phenomenon, and that photographs used for the application of identity documents may be morphed;
 - can easily be deceived by morphed face images;
 - would accept morphed face images, which comply with the requirements of photographs for identity documents, as genuine ones.
- › Applications by look-a-likes were also accepted.
- › Expected rise in passengers
- › Expected rise in deployment of biometric systems
- › Existing vulnerability of biometric systems
- › Existing morphed face image attacks

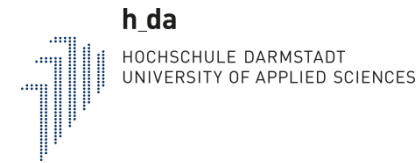


SOTAMD

- › Funding: European Commission Direct Award
- › Timeframe: February 2019 – February 2020
- › Coordinator: National Office for Identity Data

› Partners

- Bundeskriminalamt
- University of Bologna
- Hochschule Darmstadt
- The University of Twente
- Norwegian University of Science and Technology



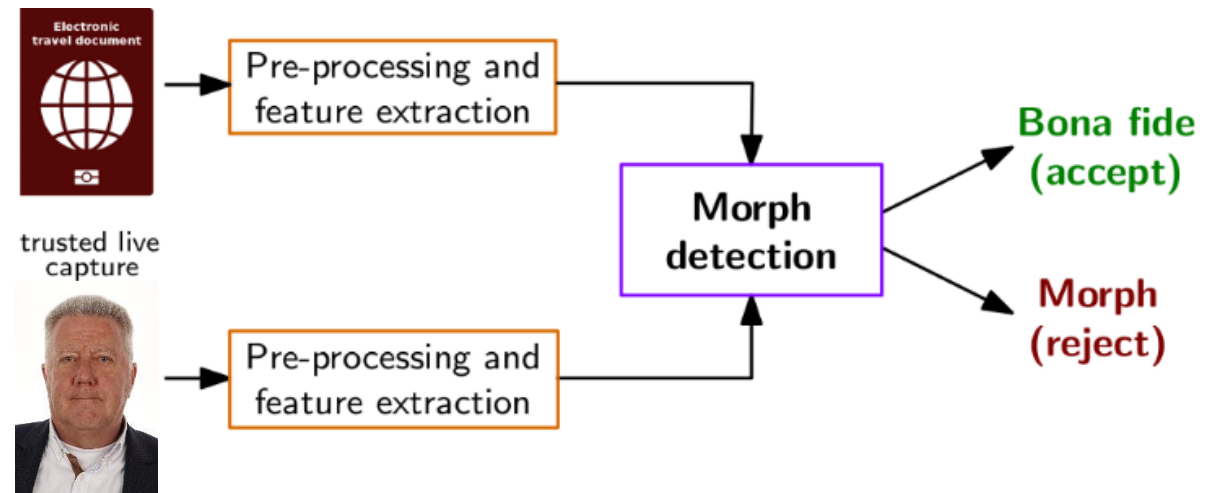
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General objectives

- > Focus on automated border control scenario, where a bona fide face image, taken at the border control gate, is compared against the image in the passport.





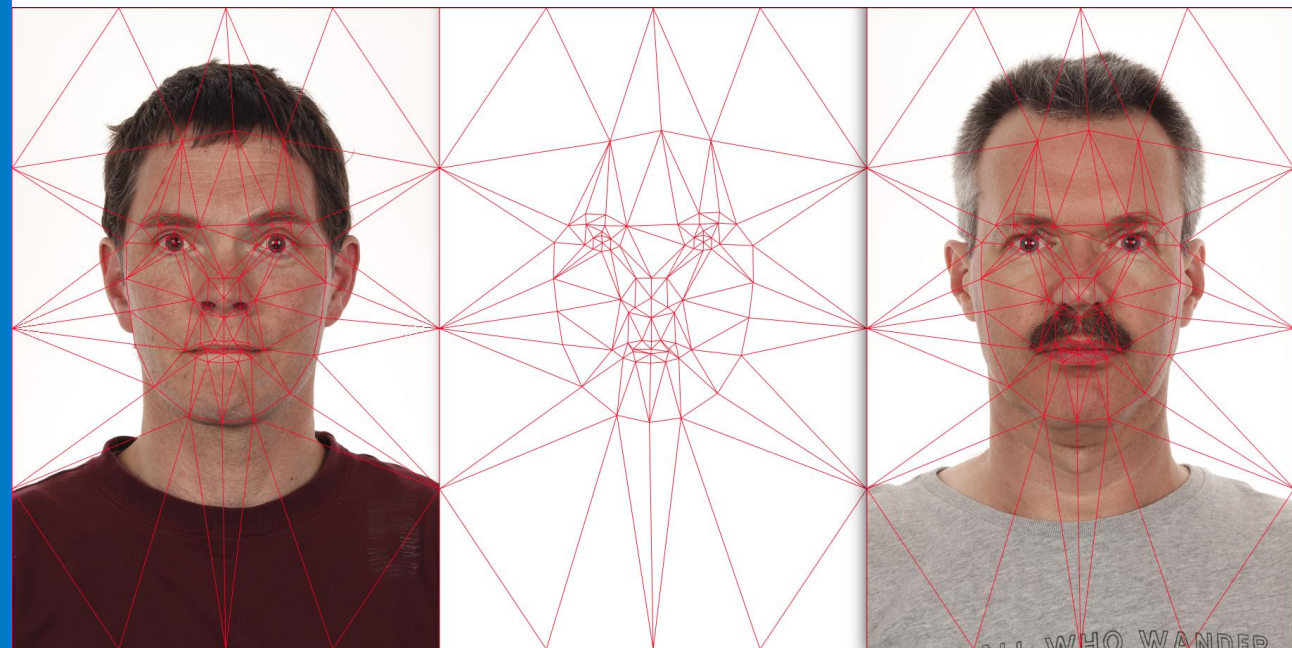
General objectives

- › Select mechanisms (algorithms), especially designed to detect morphed face images so-called Morphing Attack Detection (MAD) mechanisms, and adapt and integrate these mechanisms in a to be developed MAD evaluation platform.
- › Identify the state-of-the-art of these MAD mechanisms and analyse their detection accuracy on a dataset of morphed face images and bona fide face images.



Specific objectives

- › Capture 150 face images with passport photo enrolment and automated border control gates
- › Generate morphed face images with at least 3 algorithms
- › Post-process automatically and manually
- › Print and scan all morphed face images
- › Adapt and integrate at least 3 MAD mechanisms
- › Test the MAD mechanisms





So far...

- › Database acquisition protocol
- › Evaluation protocol
- › Preselection of facial images

Currently working on...

- › Database acquisition
- › Morphing
- › Evaluation platform



What is in it for you?

- > An open access evaluation platform to test and compare MAD mechanisms and determine whether and when a solution is mature for deployment at border gates

<https://biolab.csr.unibo.it/fvcongoing>

- > Possible to submit as .so



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Benchmark area: Differential Morph Attack Detection



This benchmark area contains face morphing detection benchmarks. Morphing detection consists in analyzing an ISO compliant face image to determine whether it is the result of a morphing process (mixing faces of two subjects) or not. Algorithms submitted to these benchmarks are required to compare a bona fide (not morphed) image to a suspected image and produce a score representing the probability of the suspected image to be morphed.

Benchmarks

Currently, this benchmark area contains the following benchmarks:

- **DMAD-TEST:** A simple dataset useful to test algorithm compliancy with the testing protocol (results obtained on this benchmark are only visible in the participant private area and cannot be published).
- **DMAD-BIOLAB-1.0:** A dataset containing high-resolution face images with neutral expressions and good illumination. The morphed images have been generated from manually selected landmarks, and finally manually retouched. The dataset contains the genuine and morphed images described in [1].
- **DMAD-MORPHDB_D-1.0:** A dataset of high-quality images, with natural expression and good illumination. The morphed images have been generated from automatically detected landmarks, and finally manually retouched. The dataset is described in [2].
- **DMAD-MORPHDB_P&S-1.0:** The dataset contains the same images of DMAD-MORPHDB_D-1.0, printed on high quality photographic paper by a professional photographer and scanned at 300 DPI. The dataset is described in [2].

The table below reports the main characteristics of each benchmark:

Benchmark	Format	Morphing Factor	Minimum Eye Distance	Maximum Eye Distance	Bona Fide Attempts	Morphing Attempts
DMAD-TEST	Digital	~[0.4;0.5]	70	160	10	10
DMAD-BIOLAB-1.0	Digital	~[0.4;0.5]	65	240	526	160
DMAD-MORPHDB_D-1.0	Digital	~[0.3;0.4]	85	335	756	396
DMAD-MORPHDB_P&S-1.0	Printed&Scanned	~[0.3;0.4]	85	335	756	396

The following sections report the testing protocol and the performance indicators common to all benchmarks in this area.

Protocol

Each participant is required to submit, for each algorithm, an executable in the form of Win32 console application.

- The executable (**detectMorphDifferentially.exe**) will take the input from command-line arguments and will append the output to a text file. It evaluates two face images and produces a morph score; the command-line syntax is:
`detectMorphDifferentially.exe <suspectedmorphfile> <label> <probefacefile> <outputfile>`



Contact

Fons Knopjes

fons.knopjes@rvig.nl

+31629396638



Funded by the
European Union

This presentation was funded by the
European Union's Internal Security Fund —
Borders and Visa.