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**A4Vision**  
**October 2003**

## Leading Identification Technology: 3D Face Recognition

- Automated identification for secure Access Control
  - Buildings & airports (employee access)
  - Borders & immigration (passenger access)
  - PC or IT infrastructures (logical access)
- Based on bone structure of human face (unique code for each individual, unchanging over time)
- Unique Code (*biometric*) can replace access badge, or add another layer of security to link the badge to the individual (just like a PIN number or password)

# A4Vision: Company

APPLICATIONS FOR VISION

Locations: European HQ: Geneva, Switzerland  
Corporate HQ: California, USA  
R&D: Moscow, Russia  
Sales Office: Washington DC.

Investors: myQube, Logitech, Silicon Valley investors

Personnel: 54

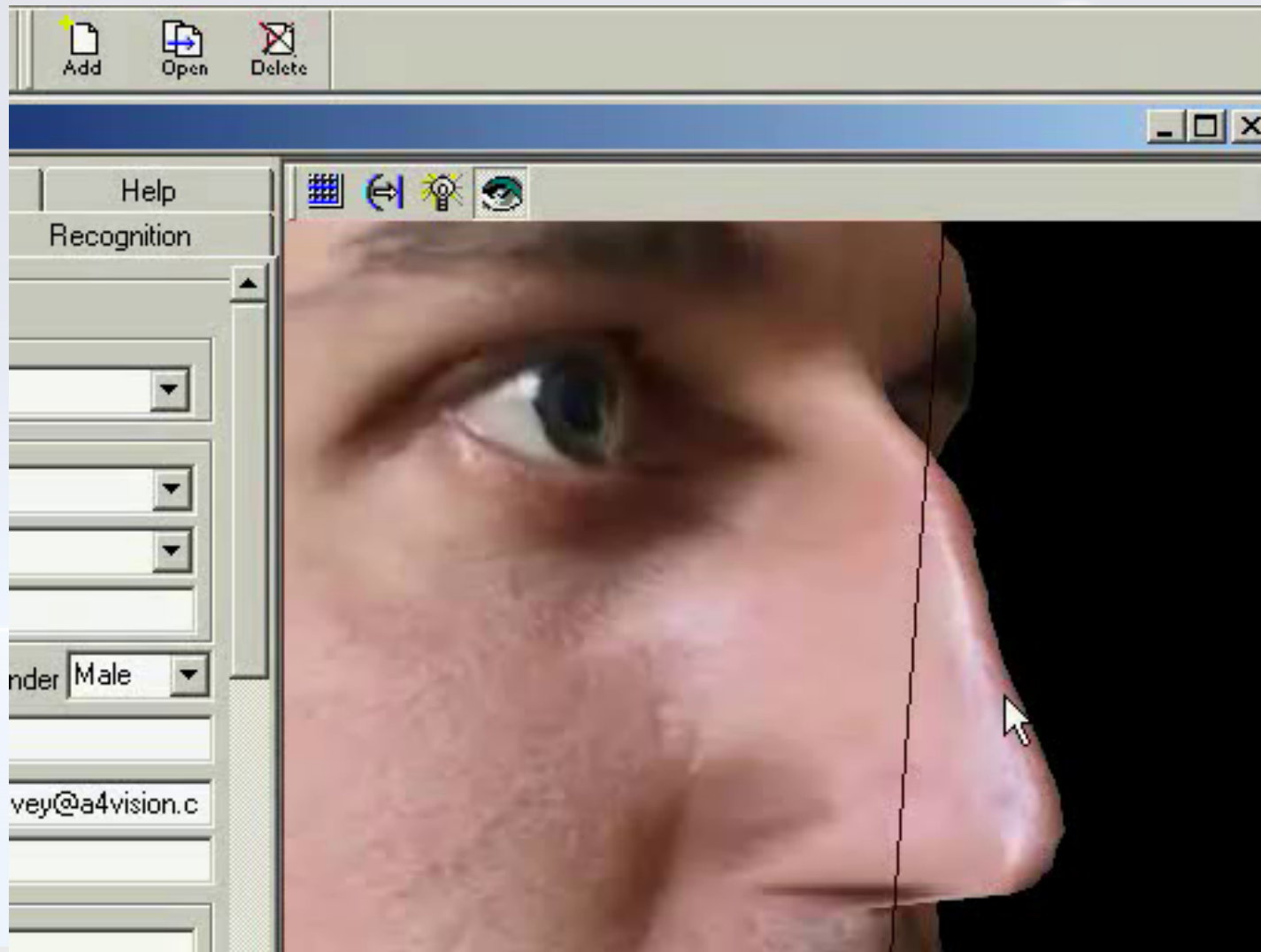
Partners: Siemens, Bell Security, Auselda, Intellitrac,  
GE Interlogix, Logitech, Luxoft, Socket,  
Oracle, Unisys, SITA



# 3D Face Capture

APPLICATIONS FOR VISION

Based on real anthropometric geometry of face



# 2D vs 3D Face Recognition?

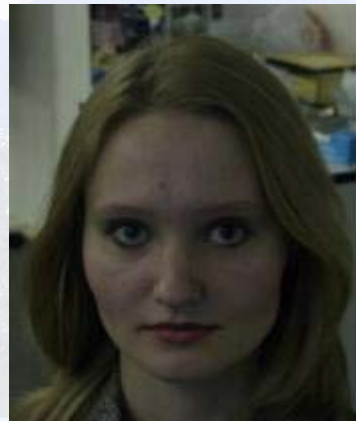
APPLICATIONS FOR VISION

## 2D Face (Photo-texture)

- Accuracy is sensitive to changes in Light & Make-Up
- Sensitive to Angle of Capture

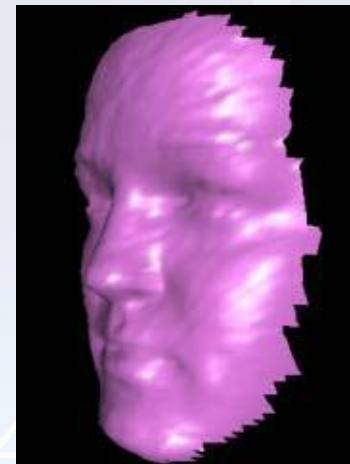


2D System  
 $\alpha[\text{max}] \cong 20^\circ$



## 3D Face (Geometry)

- High performance, robust to changes in Light & Angle



A4Vision (3D)  
 $\alpha[\text{max}] \cong 90^\circ$





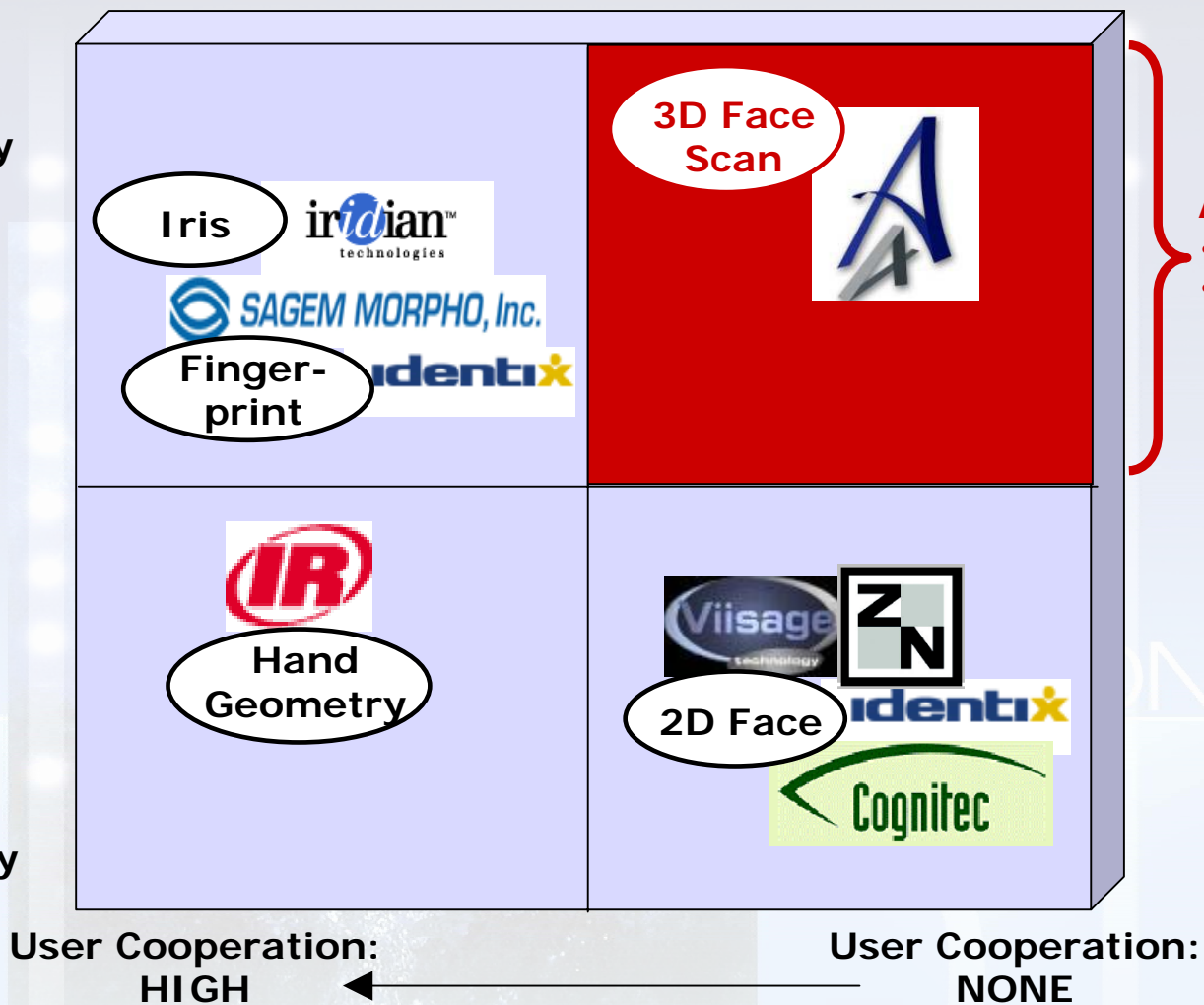
# Why 3D Face Recognition?

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High Accuracy



Low Accuracy



**A4Vision's Space:**

- High Accuracy
- No User Cooperation



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## **A4 VISION PRODUCTS**

# Access Control Product

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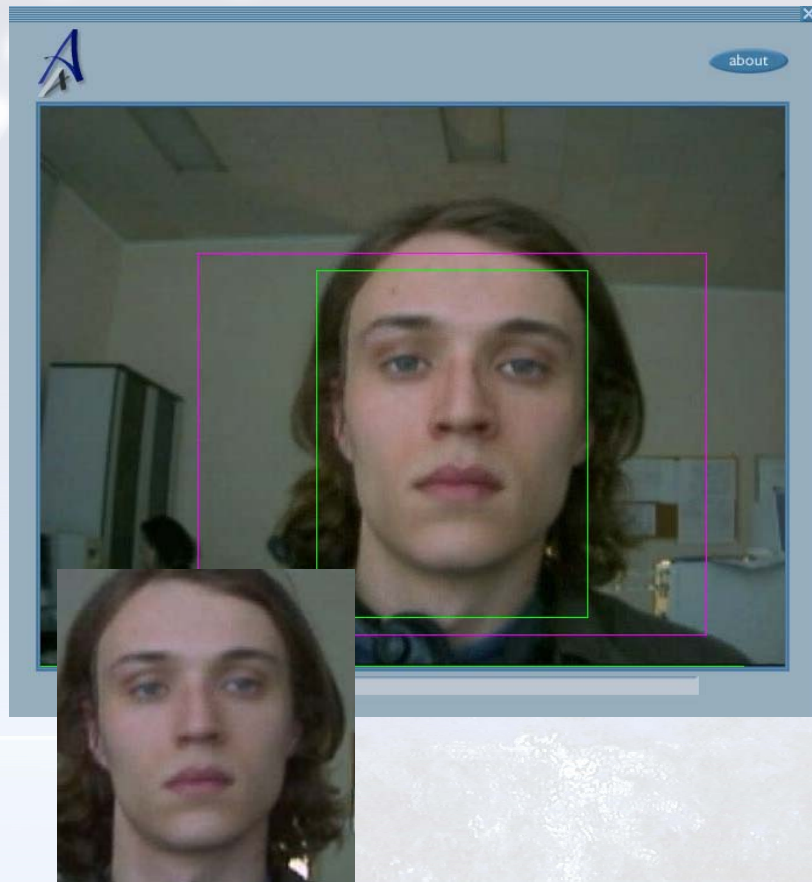


- Secure employee access
  - Link workers to access cards
  - Audit Trail
- Time & Attendance
- Financial Verification
  - “Bankomat” machines
- Border Control
  - Passport or Visa verification
  - Frequent Flier expedited entry
- Identity Management
  - ID card issuance
  - Social Security cards
  - Asylum Seekers



# A4 Face Tracker Product

APPLICATIONS FOR VISION



- SW solution
  - Finds & tracks moving face
  - Optional Zoom
  - Add-On for any 2D camera
- Entertainment
  - Instant Messaging
  - Home Video

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Available with all new-generation Logitech webcams



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**ADDITIONAL  
PRODUCT  
PIPELINE**

# A4 Secure Gate

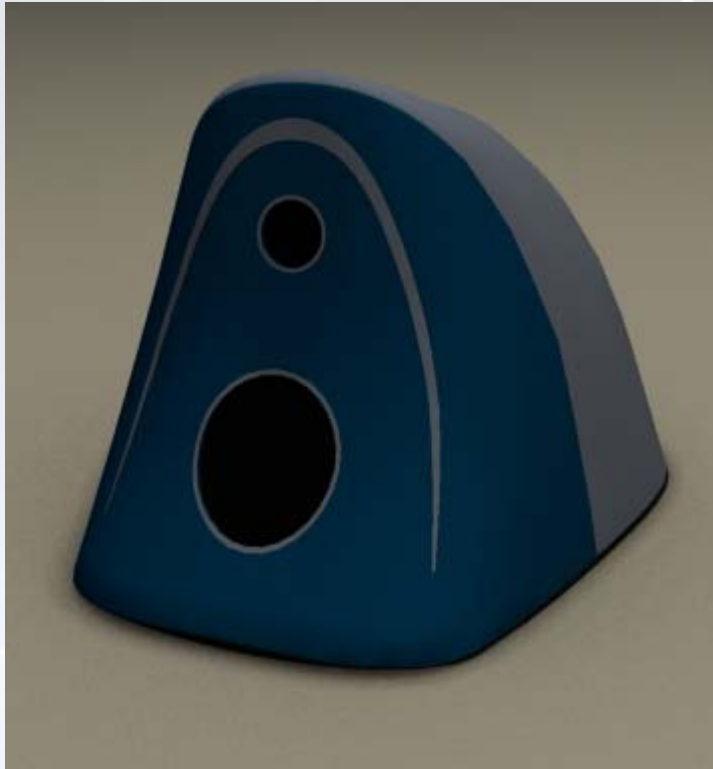
APPLICATIONS FOR VISION



- Identification of user in motion
- No collaboration required
- High volume throughput
- Markets:
  - Airport Passenger screening
  - Passenger Boarding pass verification
  - Automated Border Control of Visas & passports
  - Secured Access to Banks, Hospitals, Embassies, etc
  - Entrance to Football Stadiums etc.

# A4 Secure WebCam

APPLICATIONS FOR VISION



## SECURE NETWORKS

- Miniaturised 3D camera
- Secure Log-On to PC & IT infrastructure
- Automatic Log-Off
  - User monitoring
  - Prevents "Over the Shoulder" viewing of secure documents



# The Future: Secure Web Communications

APPLICATIONS FOR VISION



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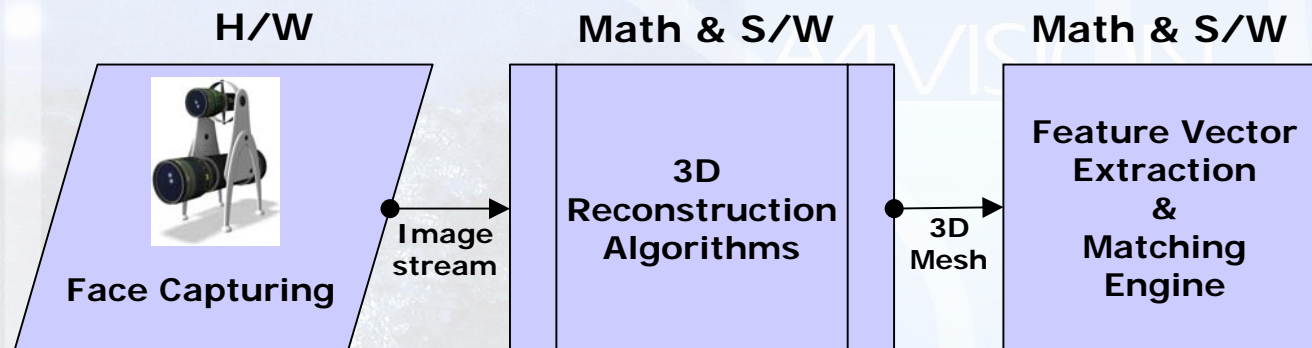
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## **TECHNOLOGY OVERVIEW**

A4Vision technology allows the creation of an end-to-end biometric system.

Key modules are:

- Face Capturing sensor
- 3D Reconstruction Algorithms
- Feature Vector Extraction & Matching Engine



# 3D Face Capture

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Proprietary 3D video camera based on structured light



- Real-time 3D capturing
- Invisible Infra-Red light
- Non-invasive, hidden

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# 3D Reconstruction Algorithms

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## Real-Time Reconstruction of the 3D facial surface



- Reconstructed face geometry in sub-millimeters
- Ground-based measure
- Currently 15 surfaces reconstructed per second
- 3D surface not stored

# 3D Reconstruction Algorithms

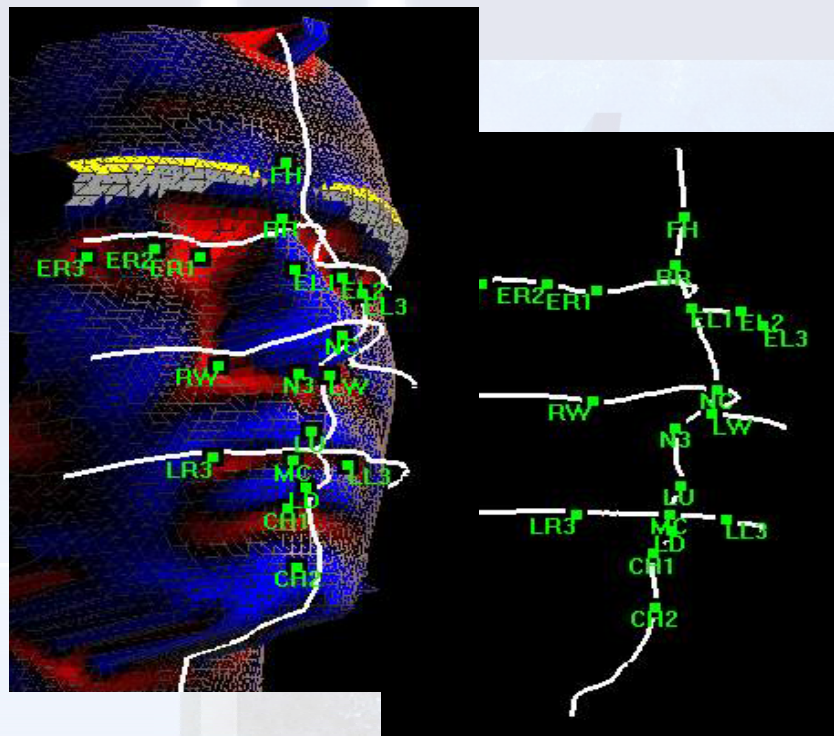
APPLICATIONS FOR VISION



# Feature Extraction & Matching

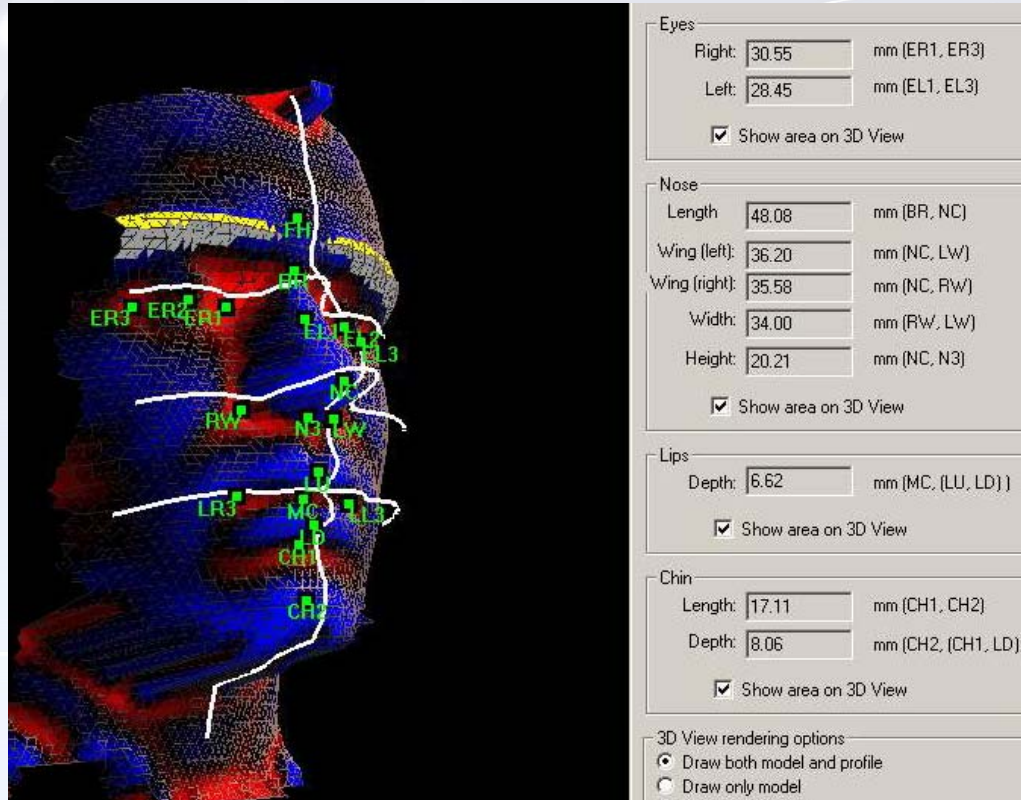
APPLICATIONS FOR VISION

## 3D Data: creating a unique anthropometric code



- 3D face geometry formed by rigid tissues (skull)
- Unique identifier
- Compact precise biometric template (feature vector) extracted – 5KB
- Matching against enrolment database or card
- Recognition time: ¼ second





## ARREST & BOOKING

- Law Enforcement Database
  - 2D colour JPEG image
  - 3D face biometric template
- Automated Mugshot Search & Classification
- Investigative & Case Management

IDENTIFICATION: Available mid 2003

# 3D-2D Engine

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2D

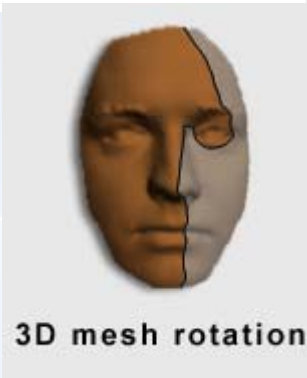


2D recognition  
**IMPOSSIBLE**

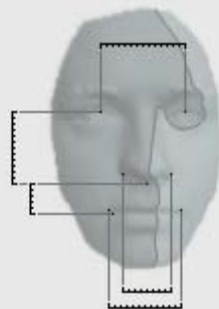
3D



3D capture



3D mesh rotation



Extract  
measurements  
for 2D



2D recognition  
**S U C C E S S**

## VERIFICATION

- Passport & ID card
  - Captures 3D image invariant to light & angle
  - Use existing 2D photo-documents for verification
- Police "Mugshot" database
  - Enhanced 3D capture
  - 2D CCTV input may also be compared to 3D database