Powering the trusted identities of
the world's people, places & things

Integrated Document and Biometric Scanners

Daniel Raguin, April 9, 2025

Part of ASSA ABLOY

Secure Document Scanners

Use case:

- Scanning of government ID and other travel documents

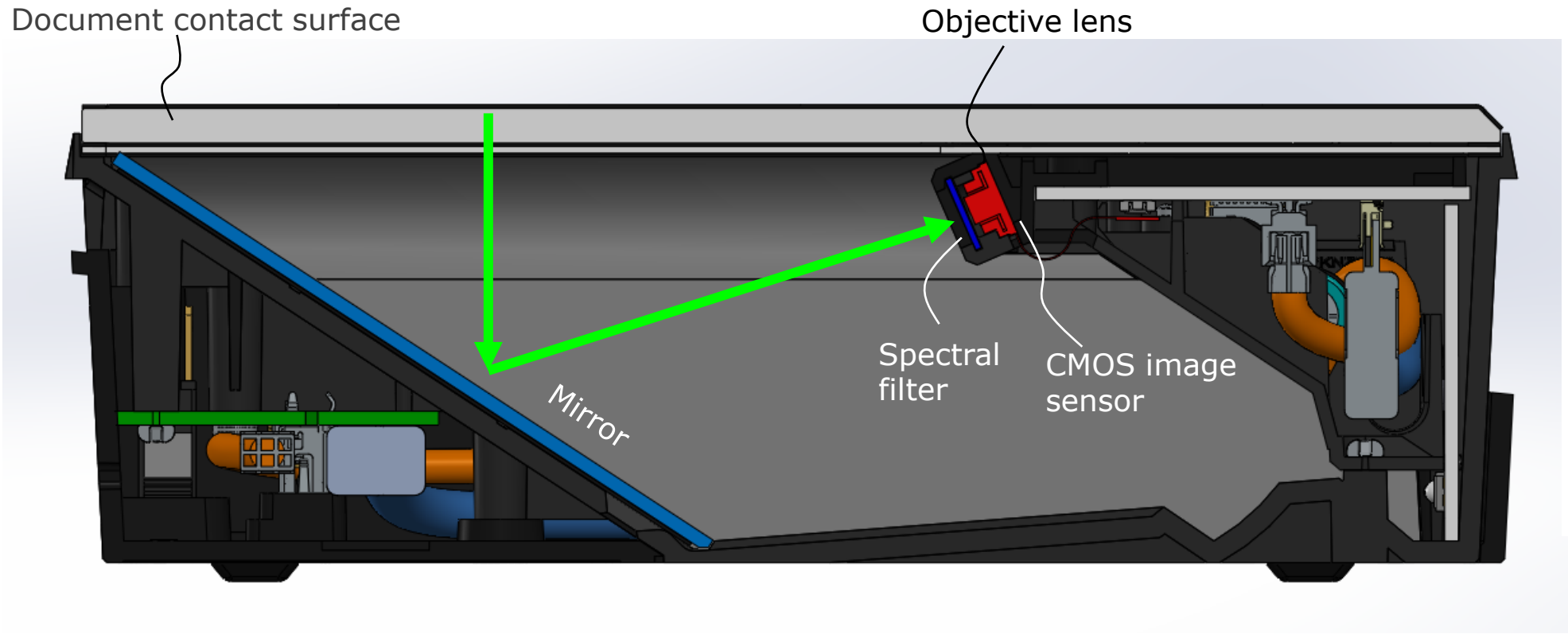
Modality	Security Benefit
MRZ data	Read and verify
Visible image	What humans see, face ID
NIR image	Ink authenticity
UV image	Fluorescence of paper
OVD Image	Highlight OVDs (holograms, optically variable inks)

Added security:

- Capture of fingerprint or other biometric data
  - Travelers – registered, ABC gates
  - Agent running document scanner

Document scanner - imaging

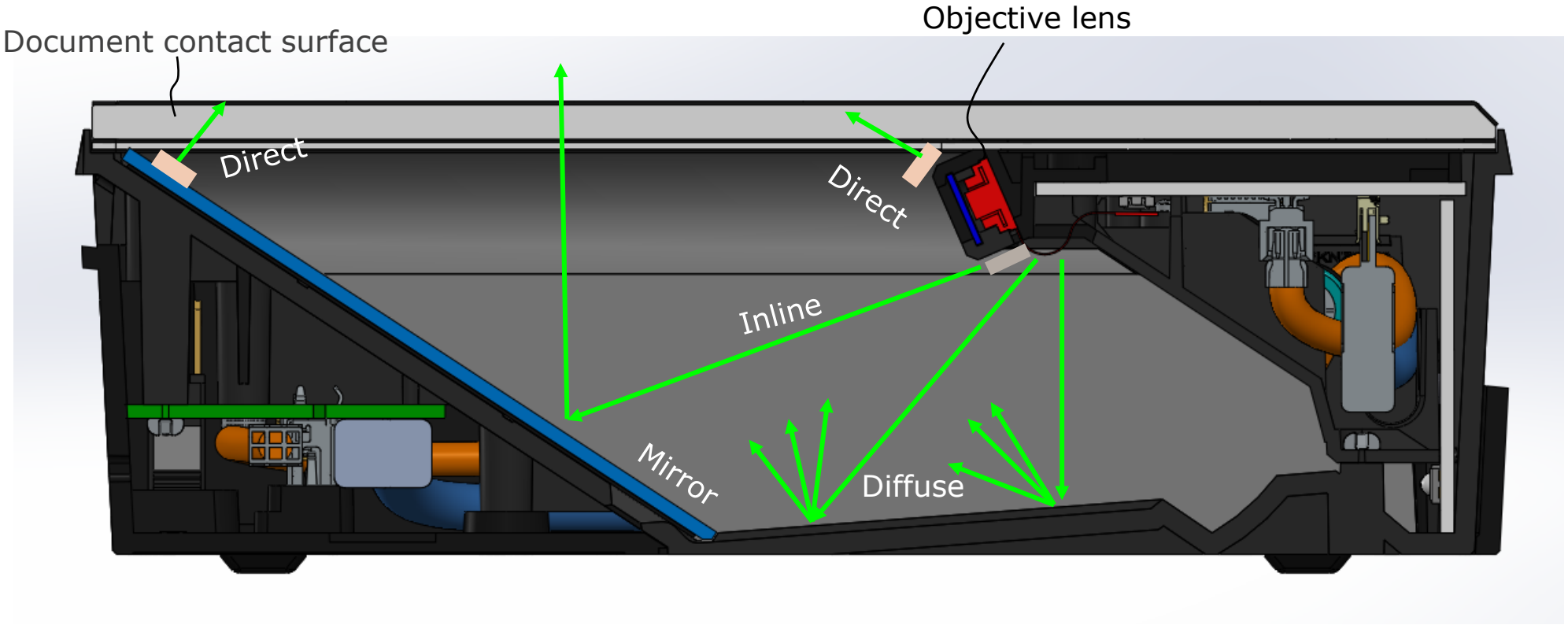
- Fingerprint resolution = 500ppi (prefer >600ppi raw)
- 8 MP AF modules (3840 x 2160)
- 13 MP AF modules (4208 x 3120) ← used for 4k video consumer products



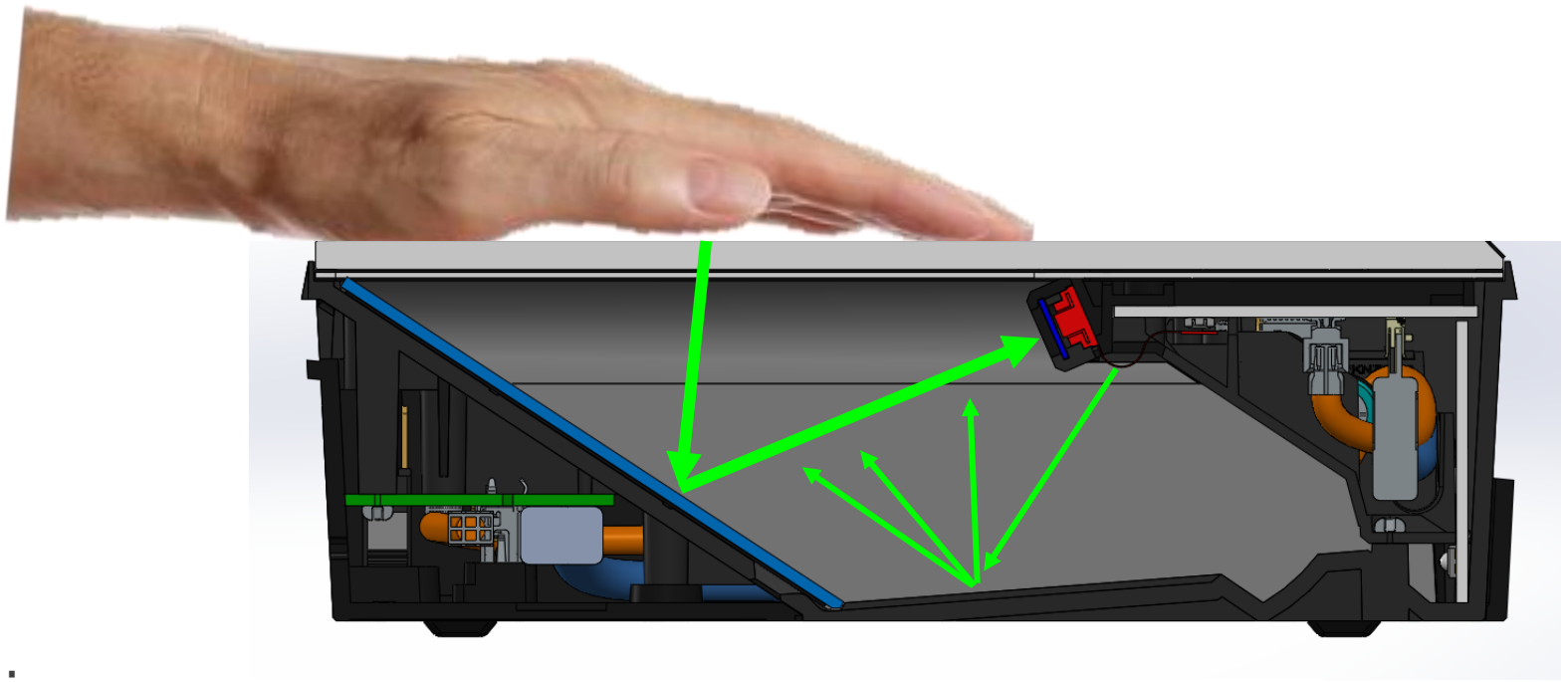
13MP camera module
Voice coil motor with 3P to 5P lens

Document scanner - illumination

- Direct illumination
- Inline illumination
- Diffuse illumination



Contact fingerprint scanning



Upside:

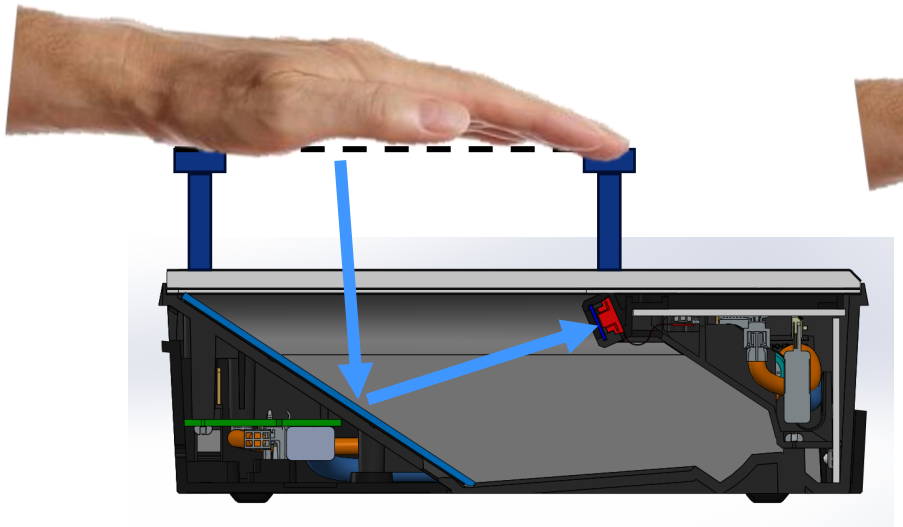
- Can certify with FBI, BSI, etc. since skin in contact with platen

Downside:

- Unlike TIR imaging, contrast of fingerprint in direct view decreases when skin contacts platen
- Increased maintenance of platen due to fingerprint latents

Non-contact fingerprint scanning

Wrist and fingers touch support posts for palm scanning



Back of fingers touch mechanics

True non-contact

Upside:

- No latents to clean

Downside:

- Difficult to certify
- Increased subject use-case knowledge

Focus and Electronic Resolution

- Fingerprint matching is not scale-invariant
- Image resolution must be calibrated
  - Generally, to a 500ppi image

- Straight-forward calibration:
  - Contact prints
  - Portion of skin touching a mechanical support (top or bottom)
  - Hand moves through a fixed focal plane

- Calibration more difficult
  - Non-contact with no hand movement

- Calibration options
  - AF applied current/voltage mapped to a focal plane distance
  - Use a distance measurement module (ToF, ultrasound)

Image processing

- Raw images
  - Low contrast fingerprint ridge & valley
  - Color images (low-cost COTS camera modules)

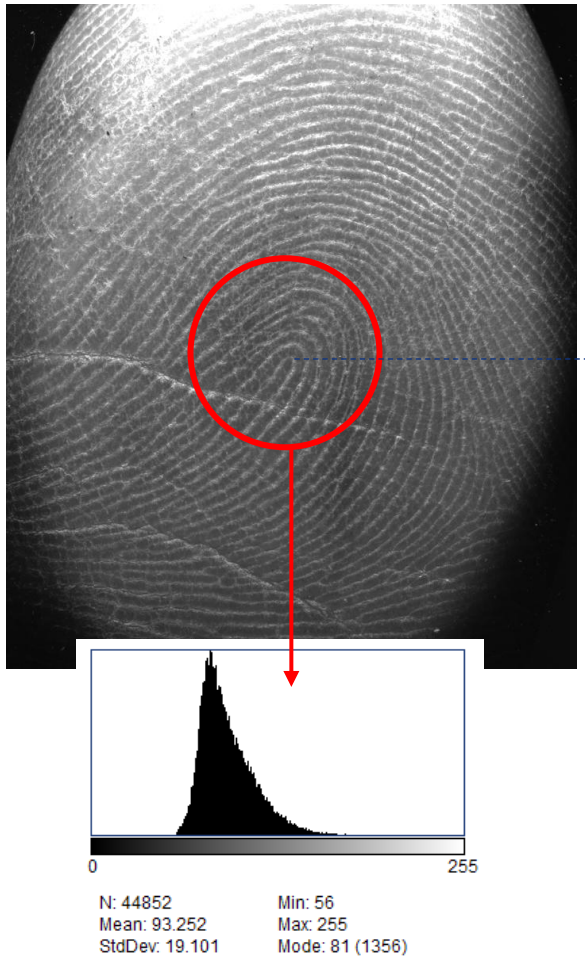
- Image processing
  - Split color channels
  - Flat-field correction
  - Image contrast enhancement (CLAHE)
  - Noise reduction (Non-local means)
  - Geometrical correction
    - Correct Lens distortion
    - Down sample to 500ppi

Non-contact image

Contact (direct-view fingerprints)

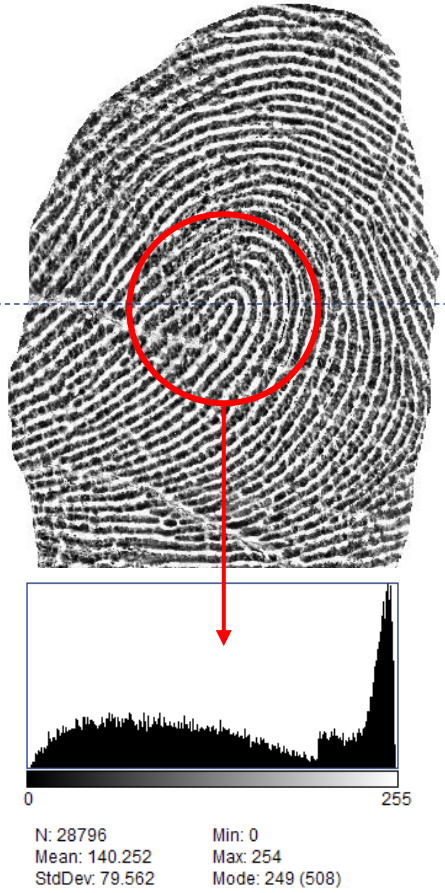
HID Nomad30 PIV-certified fingerprint scanner (capacitive TFT)

RAW

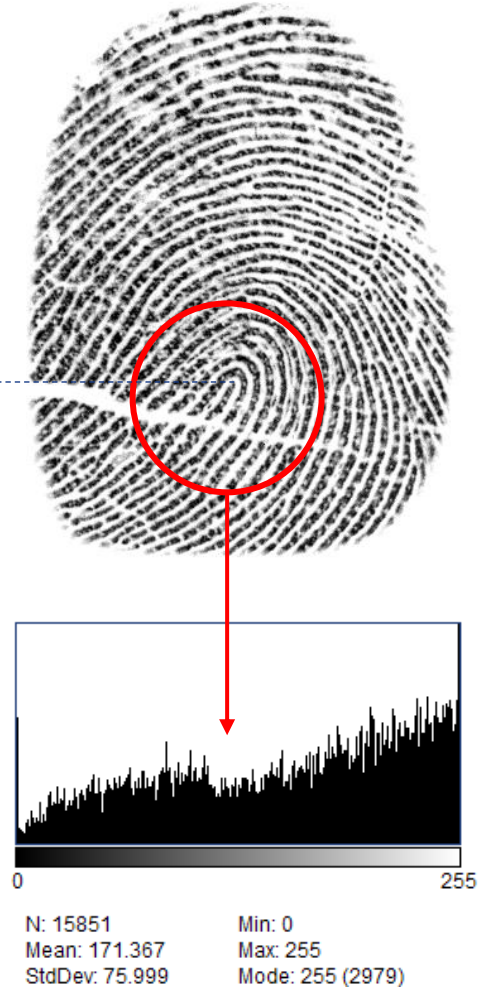


Grayscale range ~ 100 grey

PROCESSED



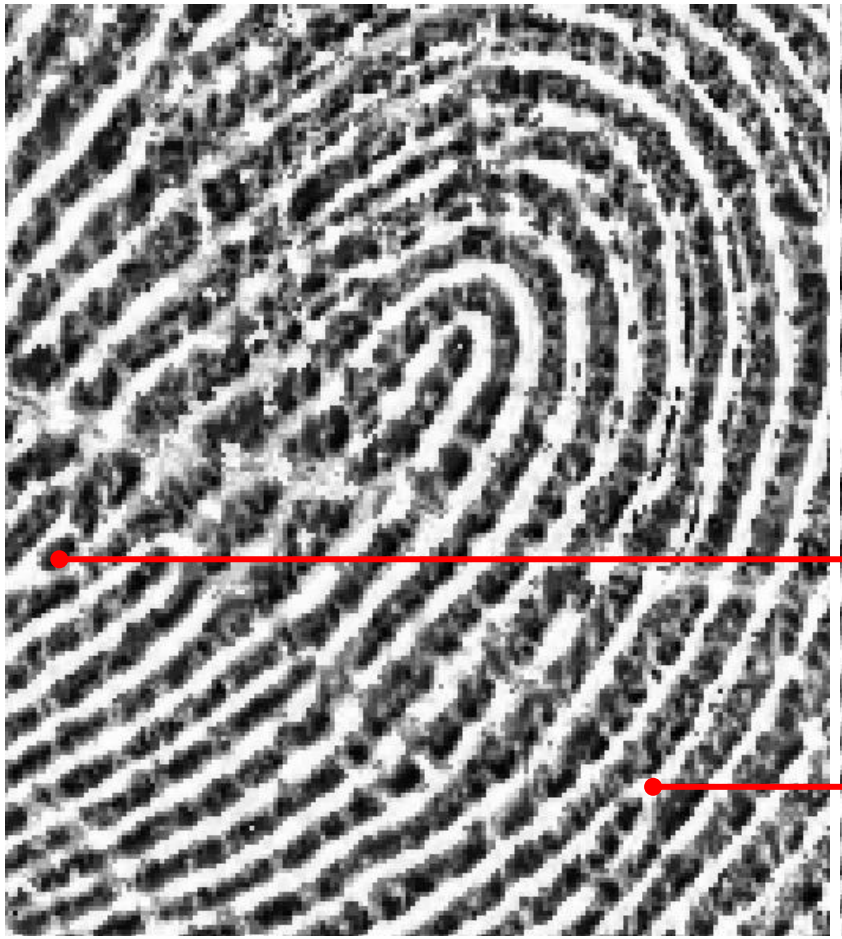
Grayscale range ~ 250 grey



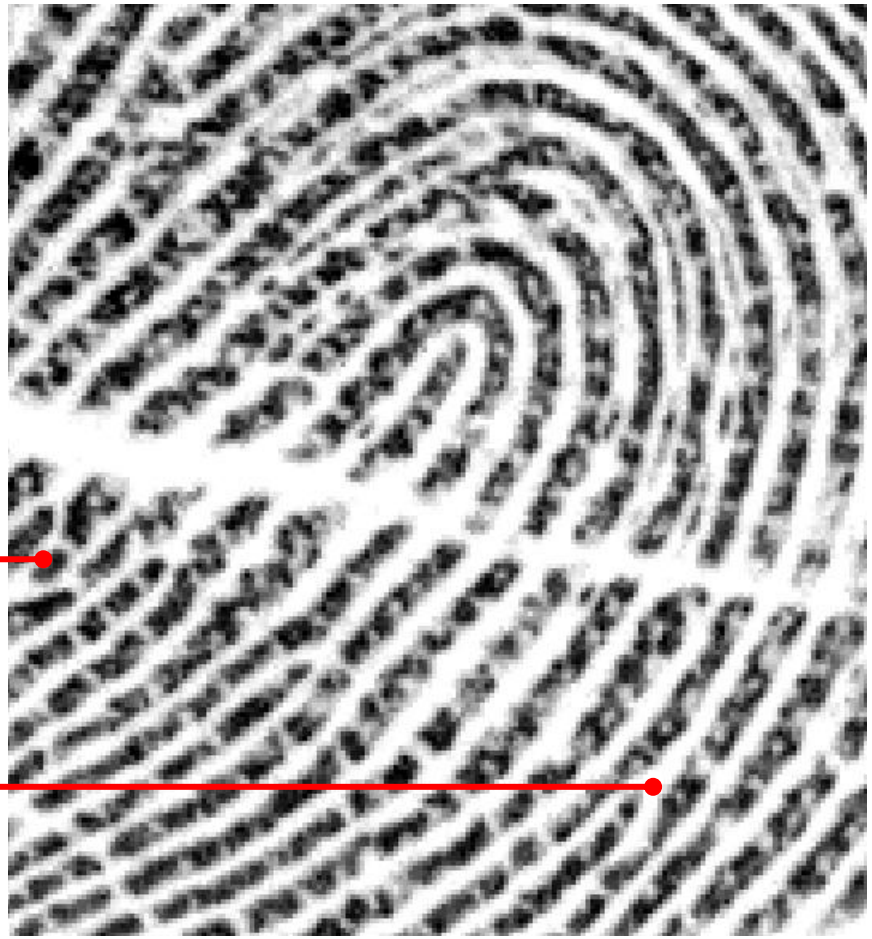
Grayscale range ~ 255 grey

Contact (direct-view fingerprints)

Direct View - RAW

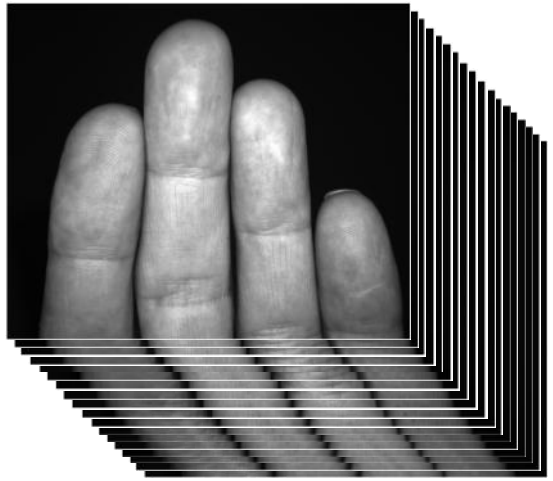


Direct View - PROCESSED



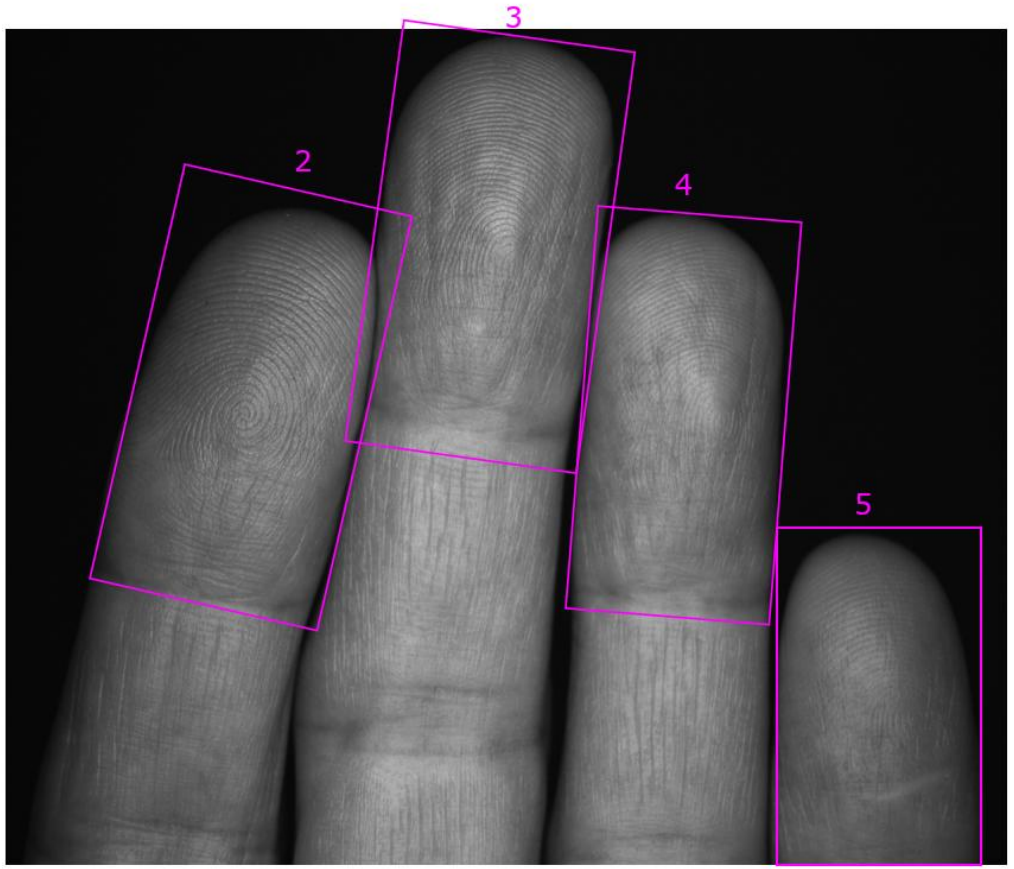
HID Nomad30 PIV-certified fingerprint scanner (capacitive TFT)

Non-Contact Direct View through focus



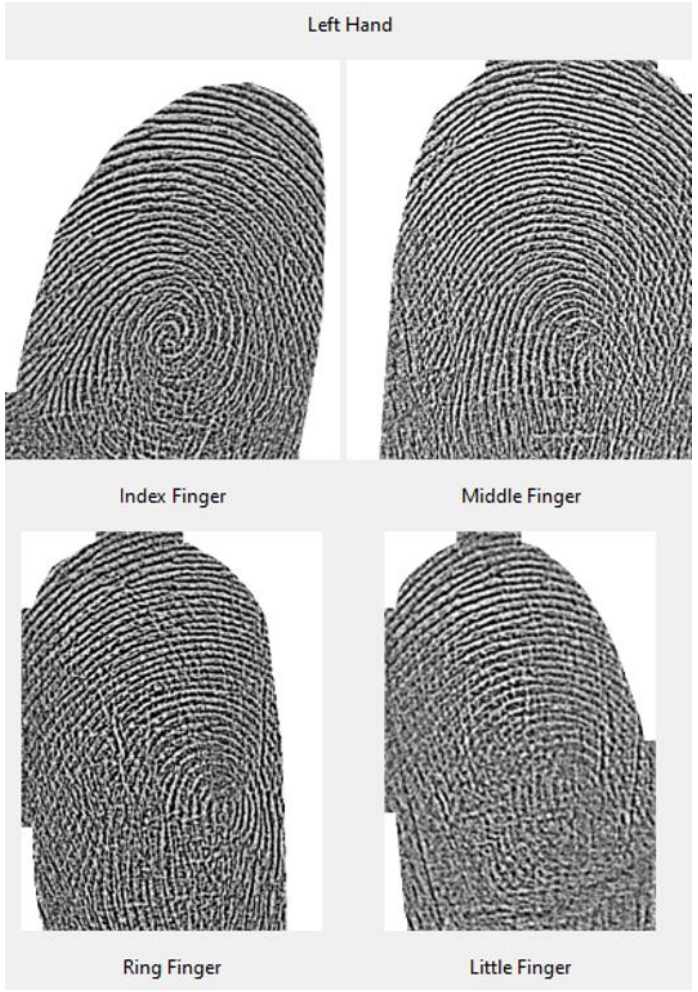
1

- Hand in motion
- Collect stack of images as fingers pass through focal plane



2 Segment the hand

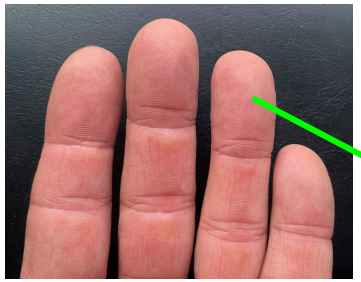
- Segment the fingers
- Identify left vs right hand
- Label fingers
- Select best focus image for a given finger

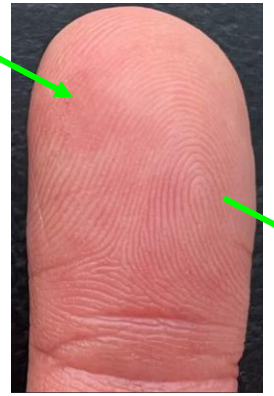


3

- Create “Matchable” prints
  - Find ridge and valleys
  - Rescale images to 500ppi

Non-Contact Direct View auto focus





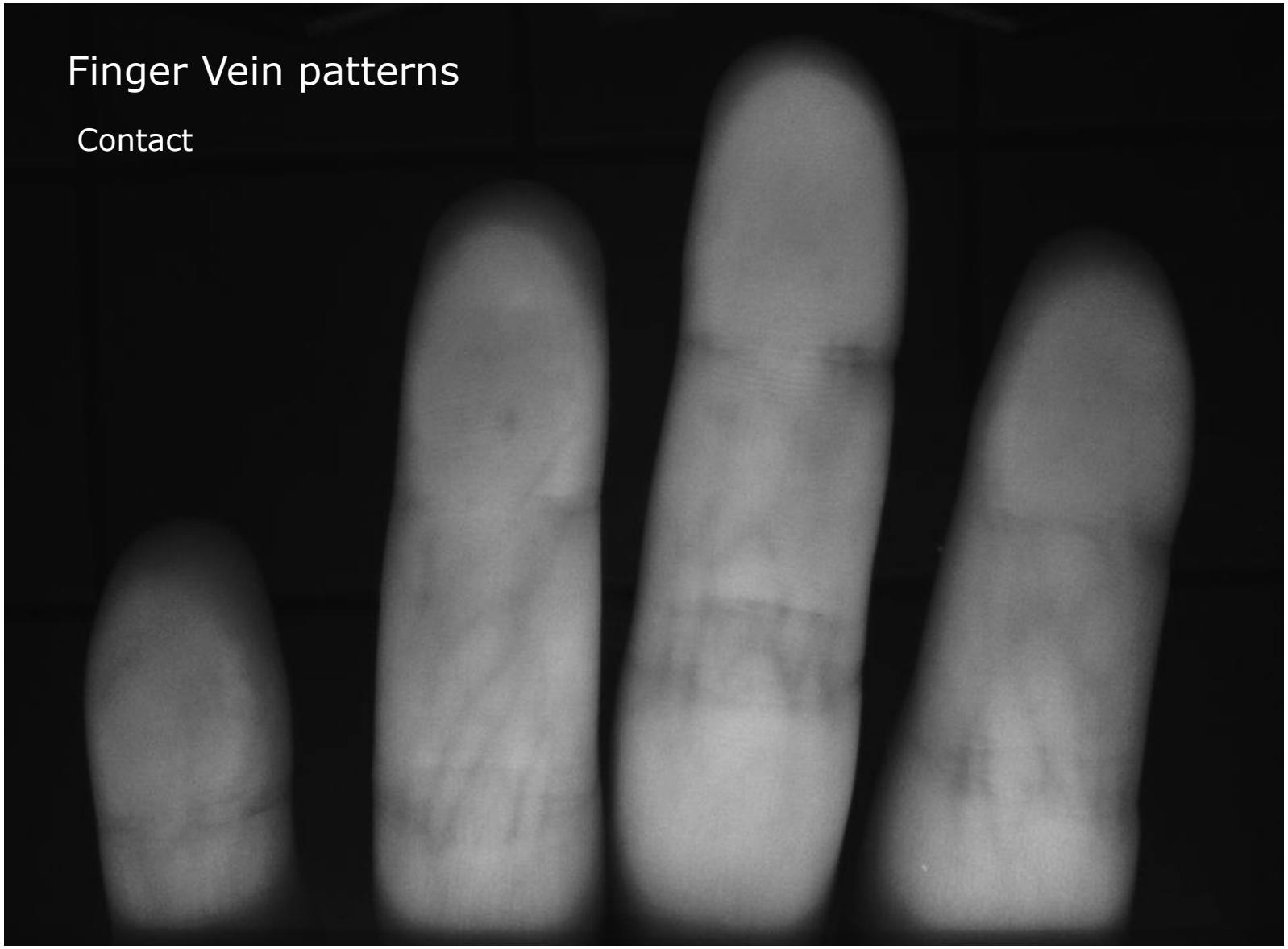
Red Green Blue

Processed Image

Vein Biometrics

Palm Vein patterns
Non-contact

NIR Illumination Images



Conclusions

- Document scanners can be used to capture biometric data
  - Fingerprint
  - Palm
  - Vein
  - Hand Geometry

- Added security to check
  - Travelers
  - Agent operating the document scanner

Thank You