Welcome to
Interagency Use of Facial Recognition...
Does it work?

Please record your attendance using the Sign In Sheet

June 10, 10:30 a.m. - Noon
International Salon 2
Interagency Use of Facial Recognition... Does it work?

Moderator: Lance Taylor
Georgia Department of Driver Services
June 10, 10:30 a.m. - Noon
Florida’s Facial Recognition Network

Hosted by Pinellas County Sheriff’s Office

Advances in Facial Recognition

Inter-agency collaboration – how does it work?
A quick exercise
The Pinellas County Sheriff’s Office (PCSO) began efforts with FR technology in 2001 and has since emerged as a primary provider of law enforcement applications for face recognition.

PCSO uses FR for corrections processing, mobile identification, investigations, and allows access to trained authorized users via Florida’s Criminal Justice Network (CJNET).

Square Miles: 279
Population: 917,000
Agency Members: 2,800
Annual Bookings: 55,000
Avg. Inmate Pop.: 3,400

Patrol Operations
Corrections Operations
Judicial Operations
PCSOS Facial Recognition Components:
- **Corrections Processing** – Identification and Verification at Booking
- **Mobile Identification** – Street Level Identification
- **Investigations** – Investigative Browser Web Based Search Tool
- **Statewide FR Partnership** - to Authorized Users via FR-Net

**2001 - 2008**
- Implemented Facial Recognition enabled mugshot system
- Deployed web-based Image Query and Facial Search
- Initiated Statewide data sharing expansion effort
- Deployed Mobile Identification Systems (MIS)
- Contract with DoD Irregular Warfare Support Program

**2009 - 2013**
- Integrating Florida DHSMV
- Contract with DoJ Community Oriented Policing Services
- NIJ Grant with Michigan State University on Sketch Matching
- Contract with DoD Biometric Identity Management Agency (BIMA)
- FACES – Face Analysis, Comparison, and Examination System
- Online user training
PCSO participates with emerging and novel face recognition tools and processes that benefit law enforcement, military and federal government through involvement with:

- DoD Irregular Warfare Support Program (IWSP)
- DoJ Community Oriented Policing Services (COPS)
- DoD Biometric Identity Management Agency (BIMA)
- FBI’s Facial Identification Scientific Work Group (FISWG)
- National Institute of Justice
- DHS Biometrics TWG
- IEEE – Certified Biometrics Program
Early Facial Recognition Systems met with mixed results and reviews. Public scrutiny assisted the direction of future successful use and outcomes.
The public views face recognition technology as a force multiplier for law enforcement operations.
Facial recognition analyzes the characteristics of a person's facial features. It measures the overall facial structure, including distances between eyes, nose, mouth, and jaw.

**Advantages:** minimal user interaction, non-intrusive, verification or identification can be accomplished

**Disadvantages:** image quality dependent, public perception

**AFIS for Faces**

Produces a mathematical value to uniquely represent and identify a face
A unique template – a facial value – is produced...

Value

Templates are applied to the image...

The probe is searched against one or more data sets of other facial values...

The FR system returns an image gallery of rank-ordered results:

FR enrolls a subject’s facial image...

Probe
What is driving the need for facial recognition...
With other biometric solutions available, why FR?

- Face is the most collected Biometric
- Less constraint for sharing face data (Within law enforcement)
- Lack of physical evidence (Sometimes face is all we have)
- Interaction at safe distance.

Vein Pattern  Ear Pattern  Fingerprint  Iris  Hand Geometry  Gait  Vein Pattern
Affects Review
✓ Twins
✓ Aging

Will not work:
✓ Masks

Affects Performance:
✓ Poor Image Quality
✓ Significant Aging
✓ Sunglasses
✓ Facial Hair
✓ Plastic Surgery
Misconceptions

In Hollywood Facial Recognition:

- Can use any equipment.
- Can be used anywhere.
- Can search against anyone.
- Can use any image.
User Expectations for Face Recognition
ATM Robbery
Reasons that you can’t find a match:

The suspect is not in the database

Poor quality image

Poor quality enrollment

The suspect’s appearance has changed significantly

They’re there but you don’t see them
Automated Face Recognition and obvious matching

YOU... determine what a match is...
What helps the operator with comparison?

**Face Identification Training**

Images redacted

The proliferation of automated FR systems is driving the need for education in Facial Identification.
Facial Recognition is a valuable enhancement to law enforcement identification and verification processes.

Law Enforcement must have a realistic understanding of the technology.
Face Recognition Components at Pinellas
Intake – 1:N

Release – 1:1

Formal Booking – 1:N
Inmate Booking

Facial search of all incoming inmates

Facial verification of all released inmates

At age 14

At age 27
Manual examinations of face image sets to assist in determining identity.
Identity Comparison Report dispensed to requesting agency.

Images redacted
FACES:

- Web-based FR search tool that can search against 30+ million faces from 30+ sources.
- PCSO administers IBrowser and grants open access to authorized trained users.
- PCSO provides LE training of best practices for automated facial search and manual face comparisons.
FR-Net is available through the law enforcement links section of CJNET

1500+ Florida LE users and growing
PCSO processes search requests from local, state and federal agencies.

*Request process is simple:* email submission from agency email with original/best quality image to:

FRNET@pcsonet.com
Image enhancement is performed to *adjust non-standard* or “in the wild” images to better perform with automated facial recognition searches.

- Normalize and enhance to improve search performance
- Occlusion removal if possible
- 3D renders for pose correction
FR-Net Partnerships & Expansion
PCSO has established a growing partnership expansion program Florida Sheriff's, Florida Department of Corrections, Fairfax Virginia NOVARIS, Drug Enforcement Administration and the Florida DHSMV.

10 Million Records
Driver’s license data is paramount to LE investigations and identification processes.

2009 – DHSMV/PCSO pilot with 2 counties
2013 – DHSMV updated ABIS and enrolled full state

18 Million Records

BIG CHALLENGE
Integration of civilian data into a law enforcement FR system.
DHSMV provides a web service to Pinellas to submit probes and return galleries

All records remain with DHSMV

PCSO submits an image for search against the DHSMV FR system

DHSMV returns the FR result to PCSO’s FACES application
The Florida Driver License

*Biometric Identification Operating System:*

Facial Recognition Solution (FDL-BIOS-FRS) provides a facial recognition solution for use by the Department and other stakeholder partners to combat identity related crime and terrorism by leveraging Florida Driver License images contained in the Florida Driver License Information System (FDLIS).
**Current Status:**

- Allows for analytical (investigative) comparisons against the full data-set of active driver license and ID card holders’ latest digital image.

- Current image count +/- 17.2 million images

- Interface with the Pinellas County Sheriff’s Office (PCSO)

- FACES System allows for investigative probe of the full DHSMV data set and Pinellas FACES data set
Current Project Enhancements:
Recent project enhancements have resulted in:

• Expanded access to law enforcement in both tactical (roadside) and analytical (investigative) environments

• Upgraded system to the latest version of system web interface (4.3)

• Upgraded system to the latest version of the MorphoTrust FR solution (ABIS 7)

• Increased web interface concurrent user license from 15 to 90 concurrent users
Current Project Enhancements: cont’

• Increased image count to +/- 21.5 million images (latest image from each active record)

• Added 6 Facial Examiner Workstations for deep analytics and adjudication (equipment and software)

• Provided Facial Examiner Workstation Training

• Provided 1,500 digital cameras to Patrol Operations Troopers for tactical deployment (training and deployment in process – cameras received)
Future Project Enhancements:

• 1:N (one to many) System Scrub and Flag

• 1:N and 1:1 Counter Matching will allow DHSMV to compare images at the time of license issuance to detect and prevent fraud

• Can interface with other facial recognition systems which contain images from corrections and/or local law enforcement agency records management systems (RMS)

• Can interface with other government systems to prevent fraud, waste, and abuse

• Addition of other biometrics (Iris, Fingerprint, etc.)
PCSO provides training, administers access, audits use for FR-Net

All Florida Fusion Centers have access

PCSO continues to expand partnership and collaborative efforts with:
  FDLE’s MEPIC
  FDLE’s Sex Offender & Predator

Successes are shared with the LE Community to demonstrate how to utilize the technology
In 2010 PCSO established Florida’s Face Recognition Network (FR-Net) with a purpose to inform the LE community on pertinent FR activities, educate users, demonstrate successes and collaborate via a quarterly newsletter.
Pinellas County Sheriff’s Office
Collaborative Face Activities
National Institute of Justice, PCSO collaborative with MSU

Project goal:

• MSU to build a sketch FR system
• Develop algorithm leading to higher sketch match accuracy
• Install prototype system at PCSO
• Evaluate performance
• Completion: September 2013

Efforts led by Dr. Anil Jain and Dr. Brendan Klare
Florida case involving 3 composites generated by the same artist from different victims.

PCSO searches composites, but is doubtful on yielding successful results with the current ABIS.
Composite searched with binning – no match in top 300
Project goal:

- Develop law enforcement FR best practices
- Viewed sketch match performance
- Child to adult match performance
- Decedent identification
- Real-time identification against VLDB
- Covert collection and search
- Expand FR in Florida (10 additional agencies)
- Develop new search and comparison tools
- Develop online FR/FI training program
- **Completion: August 2013**
PCSO started decedent searches in 2010 to address:

- Medical Examiner image collection and quality assessment
- In field forensic image collection and quality assessment
- Rapid in field identification
- Assist with best practices for post mortem image collection
Facial Recognition accuracy on composites and sketches is based upon the precision of facial landmark and feature placement. Minute changes in feature set placement can significantly affect FR accuracy. Comparisons between sketch and subject pairs is subjective and for lead purposes.
Reconstructions from post mortem images prove most promising due to retention of core landmark and feature set placement. Post mortem images demonstrate with non-standard image capture as compared to images contained within the FR system. Mugshot/DL images adhere to collection practices that differ from the ME capture process.
Images redacted

POSITIVE IDENTIFICATION FOUND
POSITIVE IDENTIFICATION FOUND

Images redacted

<table>
<thead>
<tr>
<th>NOMINAL QUALITY</th>
<th>IPD 293</th>
<th>Even illumination</th>
<th>Non-neutral expression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No occlusion</td>
<td>On axis</td>
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Images redacted
DETAILS: Miami-Dade Police Department Forensic Artist Samantha Steinberg requested assistance with identification of an unknown suicide victim. Ms. Steinberg forwarded the post mortem image and her reconstruction depicting the subject in life. The subject was positively identified from the DHSMV dataset and information immediately provided to the MDPD Detective working the case. Information was also provided to the Medical Examiner’s Office since fingerprints were met with negative results.
Image Quality Basics
Each subject is identifiable, but not necessarily a suitable probe for automated face recognition.

User training and image assessment practices assist with user expectations.
Latent Print

Lighting

Sharpness

Pose

Expression

Resolution

Occlusion
• **Lighting**
  If photographing a subject for facial recognition place the flash mode to “Fill Flash” as to reduce daylight shadowing.

• **Pose**
  Subject should demonstrate a relaxed or neutral facial expression. Smiles and other facial expressions should be dissuaded.

• **Angle**
  Subject should be straight and on axis.

• **Occlusion**
  Facial photos should be unobstructed by hats, glasses, and hair when possible.
**Aspherical Distortion:** The aspherical elements of a lens help compensate for many lens aberrations common in simpler lens designs. Distortion presents in non-spherical lens and may demonstrate distortion at close distances. To compensate for distortion take the image at a minimum distance of 4 feet from subject without a zoom or greater than five feet and with a zoom.

Automated Facial Recognition search outcomes can be significantly affected by aspherical distortion due to the nature of the enrollment/template generation of a distorted probe image. PCSO database images are collected via standardized collection processes and not prone to distortion.
DETAILS: Pinellas County Sheriff’s Office responded to a non-responsive bicycle accident victim. PCSO deputies took multiple photos of the subject and were advised medical equipment could not be removed. MDPD Forensic Artist Samantha Steinberg assisted with generated a reconstruction of the subject with medical equipment removed. The subject was positively identified from the DHSMV dataset.
Face Recognition & ICAC
✓ Identify victims depicted in child pornography/prostitution
✓ Identify subjects extracted from social media sites
✓ Identify subjects extracted from cell phones
✓ Identify subjects from escort services advertised on websites
✓ Identify subjects captured on video during undercover operations
✓ Identify child pornography perpetrators

Images redacted
“During an Internet Cyber Operation involving adults interacting with children an unknown subject was “chatting” with what he thought was a juvenile but in fact an investigator. The investigator wanted to try and identify the subject and only had the web image.”

Images redacted

“One of the pictures was good enough to crop the face and utilize for FR. This is the positive result we received.”
“Face recognition can assist with victim identification.”

Images redacted
“Face recognition can assist with victim identification.”

Images redacted
“Face recognition can assist with victim identification.”

Images redacted
“Face recognition can assist with victim identification.”

Images redacted
“Face recognition can assist with victim identification.” 

Images redacted
“Backpage.com notified NCMEC believing subject may be a minor. NCMEC forwarded to PCSO ICAC investigator for assistance.”
The FACES Application
✓ FACES is a web-based tool allowing LE to easily enroll and search face images to assist investigations with identification and verification.

✓ FACES allows online training to show you the best practices to enroll, search, and compare face images.

✓ FACES is user-friendly and directed toward users who are familiar with the Internet Explorer.

✓ FACES is available through CJNET

✓ FACES is authorized access only
Through CJNET’s Law Enforcement Links, you can access FACES:  www.flcjn.net

Follow the link for Law Enforcement links (more...) this will take you to the Law Enforcement links page.
Click “SOPICS - Florida Sheriff’s Consolidated Mugshots & Facial Recognition System.”

FACES is available to trained authorized users.

Image Query is open access and allows demographic data search of all subjects in FACES.
All FACES users may login, retrieve resources, request new users, and request new agency access from the main screen.
New Users may self register for training. If your agency isn't in the agency listing contact Scott.
Users are provided a key via email to access training.

Online materials instruct on FACES use.
Training consists of 6 self pace modules that may be completed within 15 days of registering.
Credentials to access FACES are automatically emailed upon successful completion of training.

All users may print/save a personalized certificate of completion for their records.
Multiple Demographic Details With Scaling, Printing, and Saving
Detailed Zooming

Image Overlay

Detailed Zooming

Split Screen Comparison
FACES
Face Analysis Comparison & Examination System
Demonstration
DATE: 1/10/2013

DETAILS:

Images redacted
DATE: 1/8/2013

DETAILS:

Original Images Provided

Images redacted

Leading The Way For A Safer Pinellas
FACES Facial Gallery With Matches

Original Images and Normalized

Side By Side Comparison and Tattoo match on subjects

Leading The Way For A Safer Pinellas
DATE: 4/4/2013

DETAILS:

Facebook photos from multiple accounts and normalized probe

Images redacted
Leading The Way For A Safer Pinellas
Leading The Way For A Safer Pinellas

Images redacted
DATE: 1/30/2013

DETAILS:

Leading The Way For A Safer Pinellas

Original Images and Normalized

Side By Side Comparison

Faces Facial Gallery With Matches

Images redacted

Prepared by Jake Ruberto
Leading The Way For A Safer Pinellas

FACES Facial Gallery With Matches

Images redacted

Bolo with iPad images and enhanced image of subject

Side by Side matches
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<tr>
<th>Name</th>
<th>Position</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Steven A. Williams, Sr.</td>
<td>Florida DHSMV Chief Technology Officer</td>
<td><a href="mailto:SteveWilliams@flhsmv.gov">SteveWilliams@flhsmv.gov</a></td>
<td>850.617.2391 (Office)</td>
</tr>
<tr>
<td>Scott McCallum</td>
<td>Pinellas County Sheriff’s Office FR System Analyst</td>
<td><a href="mailto:smccallum@pcsonet.com">smccallum@pcsonet.com</a></td>
<td>727.453.7193 (Office)</td>
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