Face Recognition in Criminal Investigations Case Study

With the expanded use of video surveillance cameras and camera equipped mobile phones throughout the world, we are seeing an explosion of available crime scene video/still photo evidence that contains suspect face images. Law enforcement agencies can now use these crime scene latent face images to identify possible persons of interest in these criminal investigations by the use of the Cognitec FaceVACS-DBScan face recognition system.

Cognitec’s new Examiner component of FaceVACS-DBScan system allows for the enhancement of images for comparison to the gallery. This allows operators to develop watch lists of potential matches while maintaining a full audit trail for each step in the process. It also helps investigators identify individuals in crime scene photos and surveillance videos by matching facial images against the agency’s mugshot repository. FaceVACS-Examiner also provides a set of inspection tools that helps identify the person in question in a timely manner, allowing investigators to act upon the search results in the critical time period after a crime has been committed.

The FaceVACS-Examiner enhances crime scene video face images for interlaced video, poor lighting, motion bluriness, low resolution, aspect ratio inconsistencies and off angle poses. The enhanced images are then searched against the full Mugshot Repository with possible demographic filtering and candidate lists created.

The Cognitec Examiner latent face client also contains the face search image verification tools (side–by-side split screens with interactive image viewing controls, key face landmark feature angle and distance measurement tool) necessary for the examiner to compare the search and candidate list face images to verify investigation results.

Probe Enhancement
This toolset allows the operator to generate artificial new probes from existing probes by applying specific image enhancers. Performing probe enhancement is driven by the goal that the identity of the person is positioned at a low rank in the candidate list.

The figure to the right displays an off angle pose correction of a crime scene latent face image enhanced with the Examiner pose correction filter. This filter makes a 3D image of the original 2D image that allows the operator to position the face in a forward facing position to improve the face matching results when matching to a frontal positioned mugshot in the mugshot repository.
The figure to the right displays an aspect ratio corrected image. As you can see the original facial image on the left is too long and narrow to be a correct representation of the individual’s face and will not correctly match to the individual’s mugshot residing in the mugshot repository.

The figure on the right displays an additional Examiner face cropping filter being used on the previous aspect ratio problem corrected face image. The face cropping filter properly positions the facial image to a forward facing position and crops the image to remove the background, non-facial image components of the image.

The figure on the right displays an old low resolution image that does not contain enough facial feature definition to properly match to today’s high definition mugshot image repositories. A histogram equalization filter was used to enhance the image to provide better facial feature extraction.

The figure on the right displays a low resolution image of the individual that is pixelated and is corrected with a median filter that smooths the area between the pixels to remove the pixilation from the facial image.
The figure on the right displays an image that was taken from an analog camera and then digitized to a still photo. This analog to digital conversion creates an interlaced still that is corrected with the de-interlacing filter provided in Examiner.

**Candidate Investigation**

Allows organization, managing and maintaining all information associated with an investigation case. It includes subject sets, probe sets, exclude lists and watch lists. Demographic data is maintained and is subject to filtering applied to the various sets/lists.

The image to the right displays the match results candidate list for a search utilizing a hand drawn composite sketch of an individual. Please note this is an aged interpretation drawing of a wanted individual.

The image to the right displays the match results candidate list for a search utilizing an electronically drawn composite sketch of a wanted person. Please note the top two candidates in the candidate list are correctly matched to this composite image. This electronic composite image was produced using Faces composite software.

**Detail Match Inspection**

Provides the toolset for comparing the match results conveniently in ranked order to confirm the specific match. Probe and reference images can be examined in different views allowing for a more comprehensive match confirmation.
The image to the right displays the match results candidate list for a search of an individual. Please note the twenty plus years age difference of the individual’s two photos and the difference of beard and glasses in the photos and the number one candidate list position of the individual.

The image to the right displays the side by side image verification screen used in Examiner.

The image to the right displays the side by side image verification screen with the line blending verification tool used in Examiner.

The image to the right displays the side by side image verification screen with the angle and distance measurement tool from Examiner used to track the location of a facial mole location on the probe and file candidate images.