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FACIAL RECOGNITION TECHNOLOGY & OSBI

BY BEN GHEREZGIHER

Forgot your password? Not a problem! Lost your ID? No need to worry! Soon, your face may be the only key you need to access ATMs, enter secure buildings, or log on to your e-mail. Facial recognition technology, until recently relegated to the realm of science fiction, is now becoming a central security feature for companies and organizations all over the world.

Facial Recognition Scan

Facial recognition is an identity verification technique that matches the structure of a person's face to his/her picture with over 99% accuracy if quality facial images are used.

LIVE SCAN DEPLOYMENT FULL STEAM AHEAD

BY RON YOUNG

The Oklahoma State Bureau of Investigation is providing Live Scan devices to 25 agencies in Oklahoma this year. These devices replace the black printers' ink used for the past 79 years to capture fingerprints and palm prints in the booking process.

The agencies were selected based upon the number of criminal fingerprint submissions to the state repository. The top 25 were identified and have been chosen to receive these devices. Federal grant monies are being utilized to fund these devices.

Live Scan will greatly enhance the booking process in our state. The fingerprints and palm prints will be captured one time and then submitted electronic-

FACIAL RECOGNITION CONTI.

While only recently gaining the public's attention, facial recognition technology has been in development for well over a decade and has been used for commercial purposes since 1997. It is a branch of biometrics that is an increasingly popular method of identity verification that is more reliable than traditional codes, pictures, and passwords.

Biometric technology takes unique physical characteristics, such as fingerprints, eyes, ears, or faces, and compares them with a database developed for identification purposes. Unlike handprints and iris scans, "face prints" are obtained in a non-intrusive manner, and the scanning and matching system is less expensive than other techniques.

"The face contains over 80 nodal points, but only 14-to-22 stable nodal points are needed for a successful match."

To obtain a face print, cameras scan the peaks and valleys of features, called nodal points. The face contains over 80 nodal points, but only 14-to-22 stable nodal points are needed for a successful match. Stable nodal points are those that do not fluctuate with weight or expression, such as eye socket depth. Once a face print is obtained, it is compared to a database of images.

Because of its speed and accuracy, facial recognition software has become popular in casinos as a means to identify known cardsharps. The technology has also been used as a security precaution to spot known terrorists in international airports. Tampa, Florida is one of the first cities to use facial recognition in a public setting in an effort to reduce crime rates. In the 2001 Super Bowl, Tampa officials scanned the faces of the 100,000 spectators and compared each with its database of known felons.

Privacy advocates may say this technology may be intrusive to one's privacy. However, users of these techniques for law enforcement purposes assert that only public offenders and missing children, whose photographs are in the databases, are affected.

OSBI's Implementation of Facial Recognition Technology:

The OSBI recently implemented another addition to the list of crime fighting tools we have available for law enforcement in Oklahoma; a Facial recognition technology as part of the identification services.

The Automated Fingerprint based Identification System (AFIS) was upgraded to the state of the art AFIS architecture that has greatly enhanced the capabilities of OSBI to make positive identification utilizing fingerprints without human intervention in over 95% of out ten-print submissions. A fully integrated mug shot repository was added to make the criminal history database more complete.

The mug shot database is designed to accommodate over 2 million records

FACIAL RECOGNITION CONTI.

which include facial images, scars, marks and tattoos linked with the criminal history record created for an offender. While adding the images to the database, a facial template is created by the facial recognition software and placed in an index for later searching if an image of subject is presented for facial matching.

The FR software utilizes the distinctive features of the face - including the upper outlines of the eye sockets, the areas surrounding the cheekbones, the sides of the mouth, and the location of the nose and eyes - to perform verification and identification. Most technologies are somewhat resistant to moderate changes in hairstyle, as they do not utilize areas of the face located near the hairline. When used in identification mode, facial recognition technology generally returns candidate lists of close matches as opposed to returning a single definitive match (as do fingerprint and iris-scan technologies). In most cases where there is a good quality image on file and a reasonable quality of search image is presented, the results have been very successful showing the candidate on the number one position of the candidate list.

FR can play a significant role as a crime fighting tool by matching facial images obtained from a crime scene such as convenience stores or banking institutions where there is a facial image as an evidence. Other related services such as photo lineups from the massive mug shot database, and wanted posters can be generated from the repository software.

"FR can play a significant role as a crime fighting tool by matching facial images obtained from a crime scene…"

Image Quality:

The performance of facial recognition technology is very closely tied to the quality of the facial image. Low-quality images are much more likely to result in enrollment and matching errors than high-quality images. For example, many photograph databases associated with drivers' licenses or passports contain photographs of marginal quality, such that importing these files and executing matches may lead to reduced accuracy. Similarly well-known problems exist with surveillance deployments. If facial images for enrollment and matching can be acquired from live subjects with high-quality equipment, system performance increases substantially. For facial recognition at slightly greater-than-normal distances, there is a strong correlation between camera quality and system capabilities. It is generally recommended to use a high quality camera and lens to capture surveillance pictures from a distance where variations in light and movement may need to be compensated by the camera hardware.

Image Capture Recommendation:

The OSBI recommends the NIST recommendation on the "best practice recommendations for capturing of mug shots version 2.0" which states the following:

This recommendation reflects a minimum set of common denominators. The provisions of this recommendation are keyed to the quality aspects associated with the unaltered captured mug shot image. For new mug shot images being captured, the specifications contained in this recommendation are equally applicable to real time electronic capture of mug shots as well as the electronic conversion of photographic images.

POSE

The full-face or frontal pose is the most commonly used pose in photo lineups and shall always be captured. This pose is in addition to profiles or intermediate angled poses captured to acquire perspective and other information. For subjects who normally wear eyeglasses, a frontal mug shot image should be captured of the subject without glasses. This is required due to the glare from external illumination. An additional image can optionally be captured of the subject wearing eyeglasses.

"The subject's captured facial image shall always be in focus from the nose to the ears."

DEPTH OF FIELD

The subject's captured facial image shall always be in focus from the nose to the ears. Although this may result in the background behind the subject being out of focus, it is not a problem. For optimum quality of the captured mug shot, the f-stop of the lens should be set at two f-stops below the maximum aperture opening when possible.

CENTERING

The facial image being captured (full-face pose) shall be positioned to satisfy all of the following conditions:

- The approximate horizontal mid-points of the mouth and of the bridge of the nose shall lie on an imaginary vertical straight line positioned at the horizontal center of the image.

- An imaginary horizontal line through the center of the subject's eyes shall be located at approximately the 55% point of the vertical distance up from the bottom edge of the captured image.

- The width of the subject's head shall occupy approximately 50% of the width of the captured image. This width shall be the horizontal distance between the mid-points of two imaginary vertical lines. Each imaginary line shall be drawn between the upper and lower lobes of each ear and shall be positioned where the external ear connects to the head.

LIGHTING

Subject illumination shall be accomplished using a minimum of three (3) point balanced illumination. Appropriate diffusion techniques shall also be employed and lights positioned to minimize shadows, and to eliminate hot spots on the facial image. These hot spots usually appear on reflective areas such as cheeks and foreheads. Proper lighting shall contribute to the uniformity of illumination of the background described in the exposure requirement.

BACKGROUND

The subject whose image is being captured shall be positioned in front of a background which is 18% gray with a plain smooth flat surface. A Kodak or other neutral gray card or densitometer shall be used to verify this 18% gray reflectance requirement.

EXPOSURE

The exposure shall be keyed to the background. Several areas of the recorded 18% gray background shall be used to verify the proper exposure. The averages of the 8-bit Red, Green, and Blue (RGB) components within each area shall be calculated. Each of the RGB means shall fall between 105 and 125 with a standard deviation of plus or minus 10. Furthermore, for every area examined, the maximum difference between the means of any two of the RGB components shall not exceed 10.

ASPECT RATIO

The Width:Height aspect ratio of the captured image shall be 1:1.25.

MINIMUM NUMBER OF PIXELS

The minimum number of pixels in an electronic digital image shall be 480 pixels in the horizontal direction by 600 pixels in the vertical direction. It should be noted that the image quality of the captured mug shots and facial images will be improved as the number of pixels in both directions are increased. However, as images are captured with an increased number of pixels, the 1:1.25 (Width:Height) aspect ratio will be maintained. Two considerations must be noted regarding this aspect of the recommendation. First, the normal orientation of many available cameras is the landscape format which specifies a greater number of pixels in the horizontal than in the vertical direction. Unless these cameras capture at least 600 pixels in the vertical direction, it may be necessary to rotate the camera 90 degrees. Second, the 480x600 capture format exceeds the VGA display format of 640x480. Therefore, at a minimum, an SVGA specification of 800x600 pixels will be required to display the facial image. The image will occupy less than the total number of available horizontal pixels.

"...the image quality of the captured mug shots and facial images will be improved as the number of pixels in both directions are increased."

Facial Recognition Imaging Cont.

COLORSPACE

Captured electronic color facial images are required. Digital images shall be represented as 24-bit RGB pixels. For every pixel, eight (8) bits will be used to represent each of the Red, Green, and Blue components. The RGB color space is the basis for other color spaces including the Y, Cb, Cr and YUV. Additional color management techniques are available from the International Color Consortium. Information regarding these techniques can be downloaded from the following URL: www.color.org

PIXEL ASPECT RATIO

Digital cameras and scanners used to capture facial images shall use square pixels with a pixel aspect ratio of 1:1.

COMPRESSION ALGORITHM

The algorithm used to compress mug shot and facial images shall conform to the JPEG Sequential Baseline mode of operation as described in the specification approved by the ANSI X3L3 Standards Committee. The target size for a JPEG compressed color mug shot image file shall be 25,000 to 45,000 bytes.

FILE FORMAT

The JPEG File Interchange Format (JFIF) shall contain the JPEG compressed image data. The JFIF file shall then be part of the transaction file for interchange which conforms to the requirements as contained in ANSI/NIST-ITL 1-2000.

Video Explains OSBI's Crime Fighting Role

The Oklahoma State Bureau of Investigation has produced a 13 minute video detailing how the bureau can help local law enforcement solve crimes.

The video begins with a mock crime scene — the murder and sexual assault of a woman. Throughout the video, units within OSBI work and analyze evidence gathered from the scene. This process takes you inside OSBI and shows you the latest technology used to fight crime.

The units highlighted include the drug unit, criminal intelligence, forensic biology, ballistics, forensic art, polygraph, and AFIS. The video also provides history of the agency and shows how much technology and crime fighting has advanced to where we are today.

This video is available to any law enforcement agency interested in understanding what OSBI can provide them. You can request either a VHS copy or a DVD copy at no expense. OSBI will also use this production for recruitment and educational purposes.

Livescan Deployment Cont.

ally. A search of AFIS will be conducted to determine whether the person being booked is a first time offender or a repeat offender, and the submitting agency will receive the state search results at the live scan device within ten minutes. The FBI results will be returned to the arresting agency within 2 hours.

Live Scan devices have been installed and are operational in the following agencies:

1. Ada Police Department
2. Beckham County Sheriff's Department
3. Canadian County Sheriff's Department
4. Carter County Sheriff's Department
5. CLEET
6. Comanche County Detention Center
7. Custer County Sheriff's Department
8. Grady County Sheriff's Department
9. Midwest City Police Department
10. Pottawatomie County Public Safety Center
11. Payne County Sheriff's Department

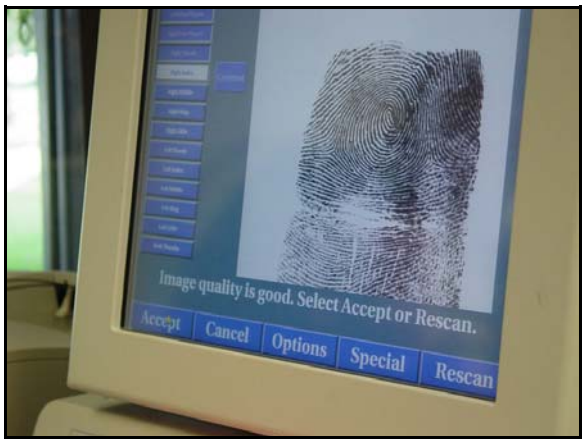
Additional sites are scheduled for installation in May and July of this year. Those counties scheduled for May are:

1. Garfield
2. Kay
3. Lincoln
4. Muskogee
5. Rogers
6. Sequoyah
7. Tulsa
8. Wagoner
9. Washington

Those scheduled for July are:

1. Bryan
2. Jackson
3. Oklahoma
4. Texas
5. Woodward

Additional sites will be added in the future as funding is available.



Digital Fingerprint Image on Live Scan

ANNUAL OSBI LAW ENFORCEMENT GOLF TOURNEY SET

The OSBI Employees' Association is again hosting a golf scramble in Watonga. This year's event is scheduled for June 11th. The entry fee to participate is $45 per person. Teams of four golfers will be randomly selected. A pre-chosen 4 person team can play, but will not be allowed to compete for a trophy.

Door prizes will be handed out, and News 9's Amy McRee will be the celebrity golfer for the day. Watch out — she's good!

Money raised from this event will benefit the OSBI Employees' Association.
To register contact Rodney Eaton with the Employees' Association at 1-800-522-8017 or 848-6724.