Slap Fingerprint Segmentation Evaluation 2004

Test Plan

Introduction

The Slap Fingerprint Segmentation Evaluation 2004 (SlapSeg04) is an assessment of the accuracy of algorithms used to segment slap fingerprint images into individual fingerprint images.

- Slap fingerprints (slaps) are taken by simultaneously pressing the four fingers of one hand onto a scanner or fingerprint card. Slaps are also known as four-finger simultaneous plain impressions.
- Slap segmentation is the process by which a single image containing four fingerprint images is divided into four images of the individual fingers.

SlapSeg04 is being conducted by the National Institute of Standards and Technology (NIST) on behalf of the Department of Justice (DOJ) Justice Management Division (JMD), IDENT/IAFIS Integration Project.
The use of slap fingerprints for background checks is being considered in a variety of U.S. Government fingerprint systems (including U.S.VISIT and IAFIS). The segmentation of slap fingerprints is known to have an associated error rate, but no rigorous evaluation of current slap segmentation algorithms has ever been conducted. Knowing whether existing segmentation software is feasible for operational use will be of practical interest and value to policymakers. The sponsors of this study want to determine the practicality of these operational scenarios:

- Batch segmentation of large databases of livescan, paper, or mixed slap fingerprints
- Realtime segmentation of livescan slap fingerprints at the time of capture

This evaluation will determine the accuracy (and error rate) of existing slap segmentation algorithms on a variety of operational-quality slap fingerprints, as well as the ability of segmentation algorithms to detect when segmentation was successful.

Sponsors and Partners

Sponsors

- Department of Justice (DOJ) Justice Management Division (JMD),IDENT/IAFIS Integration Project
- National Institute of Standards and Technology (NIST)

Partners

- U.S. VISIT Program, U.S. Department of Homeland Security
- Federal Bureau of Investigation

Participation Requirements

Makers of commercially available, mature prototype, or research slap segmentation software are invited to participate in SlapSeg04. SlapSeg04 is not evaluating image acquisition devices (fingerprint scanners) or fingerprint matching software.
Participants will submit a segmentation application that takes as input a slap image, and outputs (up to) four segmented images, each corresponding to one of the individual fingers pictured in the slap. It is recommended that the segmentation application return segmentation quality values, indicating the likelihood that each finger was correctly segmented. All testing will be conducted at NIST.
The SlapSeg04 API Specification defines the required interface to the segmentation application, including formats of input and output files.

Evaluation Objectives and Methods

The primary criteria for evaluating segmentation software will be :

- The ability to correctly segment all four fingerprint images from a slap image
- The ability to recognize and signal unsuccessful segmentation

The ability to correctly identify finger positions, especially when hand positions are unidentified, may also be evaluated. Rotation or bounding box information, if provided, is informational and will not be used for evaluation.
The primary method for evaluating segmentation accuracy will be to use multiple matchers to score the output segmented images against corresponding rolled images (which were captured at the same time, using the same device/method). Each of the four segmented images produced by a segmentation application from a slap image will be matched against a rolled fingerprint corresponding to the same finger. Multiple fingerprint matchers will be used. Manual validation of results will be used as necessary.

Slap Fingerprint Data

Evaluation Data The fingerprints used for evaluation have been collected from a range of U.S. Government sources. Some of the fingerprints are representative of current operational data, others are representative of legacy data, and some are from non-operational (controlled) data. The majority of the fingerprints used come from the sources used in FpVTE 2003. Since the fingerprints used for evaluation are considered Sensitive but Unclassified data, none of the evaluation data can be made available for testing or training of software. The evaluation data includes a mix of slap images from livescan devices, scanned from inked paper cards, and unspecified sources. Segmentation of slaps from paper is usually more difficult, due to problems such as stray marks, printed text, overlapping thumb images, and background texture.
The livescan fingerprints were captured by the following devices:

- CrossMatch 442
- CrossMatch ID1000
- DBI 1133S5
- Identix TP2000
- Identix TP600
- Ricoh IS-510
- Smiths Heimann LS2 Check

- Note: The listing of makes and models does not imply a recommendation by NIST or SlapSeg04 personnel, but simply recognizes the actual devices used by the variety of agencies that contributed data to SlapSeg04.
  Inked cards were scanned using FBI EFTS Appendix F-certified flatbed scanners.
  The type of scanner used to capture each fingerprint will not be provided in the tests.

Sample Data

A small amount of data (approximately 50 images) will be made available to registered participants to be used to test compliance with the API Specification: Participants will use the Sample Data to verify that they can read Wfiles as input. Participants must send the segmented images they created using the Sample Data to the SlapSeg04 Liaison for validation before submitting software for evaluation. When software is received by NIST, installation will be checked by running the Sample Data, and comparing those results to the sample results submitted earlier by the Participants. The purpose for this sample data is to provide data representative of the format of the evaluation data. It is not representative of the evaluation data in terms of image quality or other characteristics. The Sample Data includes a disproportionate number of problem cases. Practice Data For Participants who want additional slap data for testing or training, NIST Special Database 29 (SD29) contains full sets of fingerprint that were scanned from paper cards. The slap images from SD29 are representative of the paper source slaps to be used in the evaluation. Unfortunately, no livescan data can be released as sample data. Registered Participants will be sent Practice Data CDs containing the slap images from SD29 in WSQ files, as well as the complete SD29.