Iris Challenge Evaluation (ICE) 2006 Protocol

30 March 2006

Introduction

The Iris Challenge Evaluation (ICE) 2006 is the first independent U.S. Government evaluation for iris recognition technology. The ICE 2006 is based on the Face Recognition Vendor Test (FRVT) 2006, an independent evaluation of face recognition algorithms on sequestered data. ICE 2006 will evaluate performance on 1-1 matching, with image quality as an option. Performance will be measured for single iris or both irises of an individual.

The interface for the executables will be based on the Biometric Experimentation Environment (BEE). The BEE was used as part of the Face Recognition Grand Challenge (FRGC) and will be used in the Iris Challenge Evaluation (ICE) 2006. The interface specifications for ICE 2006 are provided in a separate document *Executable Calling Signatures for ICE 2006.* ICE 2006 is open to academic institutions, research institutions, and commercial companies.

ICE 2006 Tasks

The one task being evaluated in ICE 2006 is **1-1 Matching.** The basic biometric verification task is comparing two biometric samples and reporting a similarity score. This task will measure performance when matching is based only on the two biometric samples being compared. Each similarity score between a target biometric sample *t* and query biometric sample *q* is independent of all other biometric samples in the target and query sets. The computation of image quality is an option for 1-1 matching. A single quality score is produced for each target and query image. The quality score for a biometric sample is an integer, with larger numbers indicating better quality.

In ICE 2006, a biometric sample consists of either a single iris image or two iris images. When the biometric sample consists of a single iris image, it can be an image of either a right iris or left iris. When a biometric sample consists of two iris images, one image is a right iris and one image is a left iris of an individual. The biometric samples in target and query sets will consist of either all right iris images, all left iris images, or all two iris biometric samples.

General Rules

To maintain fairness, the Government will adhere to the following procedures for ICE 2006. Information provided to any single Participant will also be provided to all Participants. The primary and preferred source of communications between Participants and ICE 2006 government personnel is the frequently asked question (FAQ) page (http://iris.nist.gov/ICE). The ICE Liaison will be the primary point of contact and will

manage communications with Participants. All e-mails sent to the ICE Liaison and germane to the ICE 2006 will be posted on the ICE FAQ page. Contact with the ICE Liaison other than via the FAQ areas, or contact with someone other than the non-ICE Liaison will only be allowed under extenuating circumstances (for example, major issues with similarity files).

1. **Evaluation Result Output.** Complete results for all experiments must be outputted in the correct format for an executable. If complete results in the correct format are not provided, then results for an executable may not be released. For 1-1 this means complete similarity matrices with floating point numbers for all entries. For image quality, this means an image quality for all biometric samples in a signature set.

2. **Format.** The image format for ICE 2006 is tiff.

3. **ICE 2006 participation agreement.** The ICE 2006 participation agreement must be signed by all participants at the time of executable submission.

Combinations of Executables that can be Submitted

To participate in the two-iris track, ICE 2006 participants must submit a single iris executable. The single iris executable must be able to process left and right irises.

Rules for Executables

This section governs the rules for the executables that are submitted to ICE 2006.

- Each ICE 2006 participant will be given a naming convention for their executables. See the ICE 2006 Application for instructions on receiving the naming convention.

- A separate executable will need to be submitted for single and two iris tasks.

- Participants can submit multiple executables for a task.

- Executables need to be able to be installed multiple times during ICE 2006. We will erase disks and reinstall the operating system and executables to insure the evaluation protocols are being followed.

- Executables will need to be able to run on a stand alone machine.

- There will be no internet access during the ICE 2006 evaluations. Executables will need to be installed and executed without access to the internet.

- Executables will need to able to run in either Windows 2003 or Linux. The targeted versions of the operating systems are Windows 2003 service pack 1 and Fedora 3.

Independence requirements

Parts of the ICE 2006 will be run as a batch process, i.e., executables will be given a list of biometric samples and asked to process them. However, batch processing in ICE 2006 is to expedite the evaluation of tasks that may not be inherently a batch process for potential applications of interest. To make sure the ICE 2006 results generalize to these applications, a set of independence rules have been established. **As part of ICE 2006, executables will be explicitly tested to make sure that the independence rules are obeyed. Failure to follow the independence rules will most likely result in a participant being disqualified from ICE 2006.** Listed below are the independence rules:

- **1-1 Matching:** The computation of a similarity score *s(t,q)* is independent of other biometric samples in the both target and query sets. A simple test for independence, a similarity score *s(t,q)* from a batch process must be yield the same results as when the target set only consist of the *t*, and the query set only consists of *q*.

- **Optional Image Quality:** The image quality rating *IQ(t)* for target sample *t*, must be independent of all other biometric samples in the target signature set. A simple test for independence, *IQ(t)* from a batch process must be the same as when the target set consists of a single target sample *t*.

Training

ICE 2006 does not dictate or require specific training or tuning sets. ICE 2006 participants are free to train and tune their algorithm/system on the data set(s) of their choice. Many ICE 2006 participants are likely to be ICE 2005 participants. ICE 2006 participants are free to train on all the data provided as part of ICE 2005. **All algorithms and systems must be submitted completely trained and tuned.**

Experiment Information Provided

The experimental protocol will provide information about each experiment. The information will reveal whether the experiment is single or double iris, and will be provided in the sigset files that accompanies each experiment.

Notation:

The definition of target, query, gallery, and probe sets is based on Face Recognition Vendor Test 2002 Performance Metrics, by P.J. Grother, R.J. Micheals and P. J. Phillips. Proceedings for the 4th International Conference on Audio Visual Based Person Authentication, 2003 (http://www.frvt.org/DLs/Avbpa_2003_evaluation_metrics.pdf). Below is a list of notations used in the document:

- t target biometric sample
- q query biometric sample
- T target set
- Q query set
- G gallery
- $s(t,q)$ similarity score between target biometric t and query biometric sample q.
- $s(G,q)$ similarity scores between Gallery G and query biometric sample q.
- $s(G,Q)$ the complete set of similarity scores between Gallery G and query set Q.
- $IQ(t)$ image quality measure for biometric sample t.