

Key

EE435 Spring 2012 PS01 (Problem Set 01)

Due: Wednesday 1/18/2012

1. What is the purpose of the enrollment phase in a biometric system?

Acquire data from individuals to store in a database along with their identity.

2. What is the purpose of feature extraction? What is a template?

To generate a compact but expressive digital representation of an underlying biometric trait. This representation is the template.

3. What are three of the possible names of the raw biometric images that are stored in a database along with their templates? What are three possible names of the images acquired during the recognition phase?

enrollment { gallery images
reference images
stored images
enrollment images

recognition { probe images
query images
input images

4. Describe the difference between *identification* and *verification*.

verification - determining if you are who you say you are
- a 1-to-1 match

identification - determining if I know you
- a 1-to-many match

5. What is meant by intra-user variation when referring to biometric features?

Samples of the same biometric (e.g. right index finger) will vary depending on a number of factors - noise, lighting, humidity, sensor condition, etc.

6. The Disneyworld complex uses fingerprint recognition to ensure that people who have purchased a multi-day pass are the only ones who can use it. Over the course of a week-long period sometime in the near past, the following occurred:

13,055 persons bought multi-day passes, and over the course of their stay at Disney, attempted entry 42,448 times. Of these, 294 were rejected and had to go to the customer service window to correct it.

Over the same time period, 7238 attempts were made to enter by unauthorized persons, and 16 were successful.

What is the FAR?

$$\frac{16}{7238} \times 100\% = \boxed{0.2211\%}$$

What is the FRR?

$$\frac{294}{42448} \times 100\% = 0.0069 \times 100\% = \boxed{0.69\%}$$

7. A biometric system that protects a door operates at its EER, which is 2.2%. If 50,000 unauthorized users attempt entry to the door, how many do you expect to be able to enter? If 586 authorized users attempt entry, how many will be turned away (not be able to enter)?

$$.022 = \frac{FA}{50,000}$$

$$FA = \boxed{1100} \text{ unauthorized}$$

$$.022 = \frac{FR}{586}$$

$$FR = 12.89 \rightarrow \boxed{13} \text{ authorized}$$

8. Describe the use of hand geometry as a biometric in terms of its universality and permanence.

- Most everyone has a hand, so very universal. If someone who needs to be in system has no hand, other arrangements need to be made.
- Hand geometry will change over time, so templates would need to be updated periodically. Pretty stable as adult, barring injury.

9. Collect the following information from 8 males and 8 female mids.

- Ground truth (1 = male, 2 = female)
- Height in inches
- shoe size
- ring size
- # of situps in last PRT
- # of pushups in last PRT
- time in last PRT run (in seconds)
- overall score on last PRT

You can include yourself as one of the mids, but DO NOT use anyone else in the class or anyone who has already given their information to one of your classmates (ask them if they've already contributed).

Record this info in an Excel spreadsheet (fill in the one that is downloadable from the course website under the Homework link) and email it to me. Name this file using your last name, for example *Zelmat.xls* or *Zelmat.xlsx*, depending on your version of MS Excel.