EEE-6561 Fundamentals of Biometric Identification
Spring 2020 Homework #4

February 22, 2020

Due: March 11, 2020, 11:59 PM

This assignment should be completed individually by the student. Late submissions will not be accepted. Proper citation should be provided for any references used. Points will be awarded based upon the thoroughness of the answers you provide.

This assignment involves the implementation of fingerprint minutiae alignment and pairing algorithms which are used for fingerprint matching. To assist, you are provided with software which allows you to view fingerprint images and the extracted minutiae points.

PART I Fingerprint Classification / Data Preparation [10 points]

(a) Using the provided fingerprint viewer software and images, classify the seven fingerprints into the six main fingerprint classes discussed in class.

(b) The bottom of the fingerprint viewer software window provides information on the minutiae extracted from the fingerprint image. Save the information regarding the minutiae points into seven separate text files consisting of three columns. The first column is the x-value, the second column is the y-value and the third columns is the θ-value. The software expresses the minutiae direction in its own coordinate system that is not degrees. Each quadrant is quantized to eight different values. To obtain the θ-value in degrees, it should be multiplied by 11.25.

PART II Fingerprint Transformation [25 points]

Using the minutiae points saved from PART I, implement the fingerprint transformation algorithm discussed in the text. Display your results in a table of the following form:

(FP1)	(FP2)	Δx	Δy	$\Delta\theta$

PART III Fingerprint Pairing [35 points]

Using the minutiae points saved from PART I and the transformation parameters computed in PART II, implement the fingerprint minutiae pairing algorithm discussed in the text. Your choice

1

of thresholds will affect the quality of the pairing. Display your results in a table of the following form:

(FP1)	(FP2)	Distance	Angle	Paired Points	Unpaired Points

What is the average number of minutiae points paired? How did you choose your threshold parameters? Based on the pairing results, which if any of the image pairs would you conclude could possibly belong to the same individual? Explain your answer.

Any programming language is acceptable, but it is recommended that MATLAB be used for the assignment. You are to submit your tables and question responses in the form of a report. You are not required to submit the fingerprint minutiae files or program code.