Department of Computer Science
Columbia University

Group Project: implement an iris recognition algorithm

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Requirement

1) Implement the exact same design as Ma et al., 2003 paper (see the reference) but focus on Image Preprocessing, Feature Extraction, and Iris Matching **only** and use provided dataset.
2) The CASIA Iris Image Database (version 1.0) (CASIA-IrisV1) dataset should in the **same directory** as your python scripts.
3) **Two** or **three** students per group (will need to include peer evaluation in README). Please fill in the online google form. If you can't find a group member, please let my TA know.

Experiment design

- Database: 108 eyes, 7 iris images per eye, which were captured in two sessions (3 in the first session, 4 in the second session). All images are stored as BMP format with 320x280 pixel size.
- Experiment design: images from the first session will be used for training and images from the second session will be used for testing
- Experimental results:

➢ The Correct Recognition Rate (CRR) for the identification mode (refer to Tables 3 & 10 of Ma's paper)

➢ Receiver Operating Characteristic (ROC) curve for the verification mode (refer to Table 4 and Fig. 13. of Ma's paper)

Submission

- Source codes
  - IrisRecognition.py: the **main** function, which will use all the following sub functions:
  - IrisLocalization.py: detecting pupil and outer boundary of iris. You can choose other iris localization methods if they work better;
  - IrisNormalization.py: mapping the iris from Cartesian coordinates to polar coordinates;
  - IrisEnhancement.py: enhancing the normalized iris;
  - IrisFeatureExtraction.py: filtering the iris and extracting features;
  - IrisMatching.py: using Fisher linear discriminant for dimension reduction and nearest center classifier for classification;
  - IrisPerformanceEvaluation.py: calculating the CRR for the identification mode (CRR for all three measures, i.e., L1, L2, and Cosine similarity, should be >= **80%** , the higher the better), which will output Table 3 & Fig. 10 (refer to Ma's paper); calculating ROC curve for verification mode, which will output Table 4 and Fig. 11 (**using Bootstrap and calculating confidence interval is not required).**

For each script, 1). explain the logic behind the script, e.g., what is the loop for? what is that piece of code for? 2). specify and explain **ALL** key variables/parameters used in the script.

Submission

- A readme file (UNI_UNI2_UNI3_IrisRecognition.README)
  - Explain the whole logic of your design.
  - Briefly discuss the limitation(s) of the current design. How can you improve it?
  - Peer evaluation: Each team member should contribute to this project significantly, example:
  - Team member 1: Role (Iris Localization…)
  - Team member 2: Role (Iris normalization…)
- Compress all files into a single zip file with UNI_UNI2_UNI3_IrisRecognition.zip/.rar as its name
- **If there's any problems occur during the work distribution, you can email me or Professor He individually.**
- All scripts must be runnable (we won't debug for you).
- Do not submit the dataset.

Submit to the coursework, due on Nov 6th (11:59PM)

Extra bonus

- calculating the CRR for the identification mode (CRR for 1+ measure >= 90%, you can get extra 5%)

Reference

- Ma et al., Personal Identification Based on Iris Texture Analysis, IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 25, NO. 12, DECEMBER 2003
- Note_CASIA-IrisV1.pdf