

Note on CASIA-Iris-Mobile-V1.0

1. Introduction

Mobile devices play an increasingly important role in daily life. Large amount of private data are stored and mobile payment is widely used. A growing concern has been paid to the security application of mobile devices. Compared with traditional knowledge-based authentication methods, biometrics is user-friendly and reliable, hence provides encouraging options to strengthen the security. The iris modality is more stable and distinctive compared with fingerprint, face, voice, etc. Irises are also difficult to be replicated for spoof attacks. Therefore, iris recognition is a promising solution for mobile authentication. This is a new application of iris recognition technology that allows recognition in any place and more relaxed conditions, which needs further studies.

Most current work is based on visible light imagery and subjects in current datasets are Caucasians whose iris texture is clearly displayed under visible light. But Asian irises reveal little texture feature under visible light due to high density of melanin pigment. For the sake of promoting the iris recognition research on mobile devices under NIR illumination, we build the CASIA-Iris-Mobile-V1.0 database (or CASIA-Iris-M1 for short).

2. Brief Descriptions and Statistics of the Database

CASIA-Iris-M1 contains totally 11,000 images from 630 Asian subjects. It includes three subsets: CASIA-Iris-M1-S1, CASIA-Iris-M1-S2, and CASIA-Iris-M1-S3. All images were collected under NIR illumination and two eyes were captured simultaneously. Partial face patterns especially the periocular regions are also included in the image region of interest. Therefore, the database is also valuable for multi-modal information fusion. Images are 8 bit gray-level files stored as JPG format. Detailed information of each subset is given in Table 1.

2.1 CASIA-Iris-M1-S1

Images of CASIA-Iris-M1-S1 were captured using an NIR iris imaging module (CASIA NIR mobile module V1) that composes of a NIR camera and several NIR illuminators. It is small in volume (about 5cm × 2cm × 1cm in Width × Height × Thickness) and therefore can be conveniently attached to a mobile phone through micro USB. The module captures valid images at about 25cm standoff distance. The resolution of the whole image is 1080×1920 and the diameter of an iris is about 110 pixels.

CASIA-Iris-M1-S1 includes 1400 images captured from 70 Asian subjects. There are twenty images for each subject. Example images are given in Fig. 1. The main sources of intra-class variations are low resolution and specular reflections.

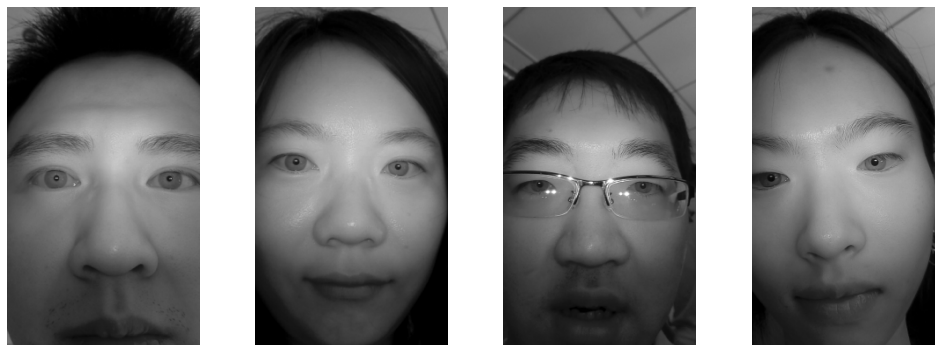


Fig.1 Example images in CASIA-Iris-M1-S1.

2.2 CASIA-Iris-M1-S2

Images of CASIA-Iris-M1-S2 were captured using an improved NIR iris imaging module (CASIA NIR mobile module V2). This subset includes 6000 images captured from 200 Asian subjects. There are altogether three collection distances, which are 20 cm, 25 cm and 30 cm. At each distance, 10 images are collected. Therefore, each volunteer contributes 30 images. The resolution of the whole image is 1968×1024 . Example images are shown in Fig. 2. Iris diameter decreases obviously with collection distance increases, which makes recognition performance degradation. Iris diameter distributions of various distances are shown in Fig.3.

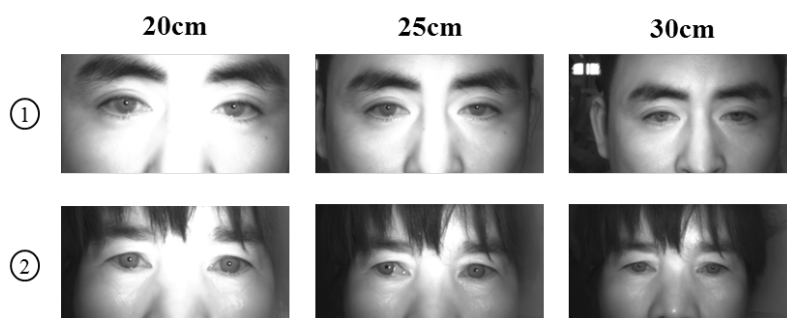


Fig.2 Example images in CASIA-Iris-M1-S2.

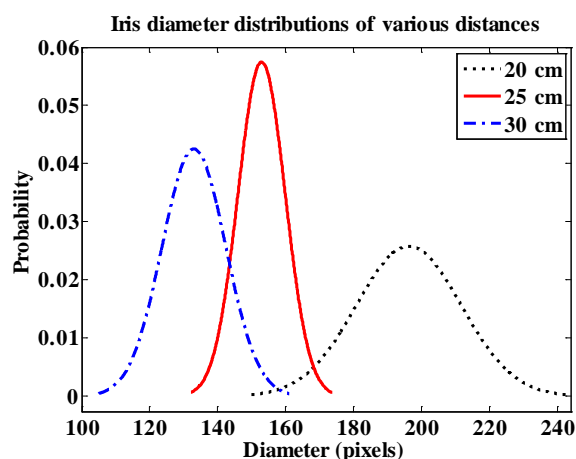


Fig.3 Iris diameter distributions of various distances.

2.3 CASIA-Iris-M1-S3

Images of CASIA-Iris-M1-S3 were captured using a domestic mobile phone with NIR iris-scanning technology. This subset includes 3600 images captured from 360 Asian subjects, which has the largest number of subjects and is good for large-scale recognition research. The resolution of the whole image is 1920×1920 . Example images are shown in Fig. 4. The main challenges of this subset include uneven illumination, specular reflections and occlusion of wearing glasses.

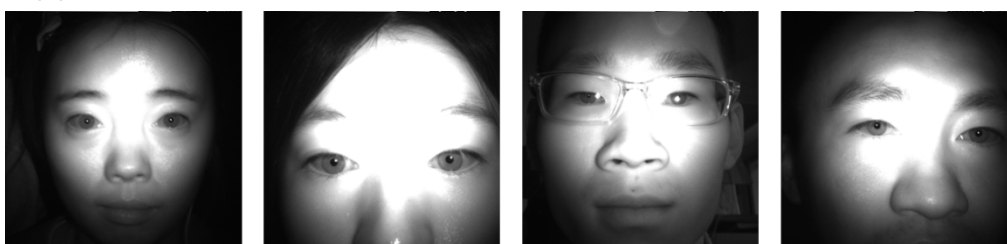


Fig.4 Example images in CASIA-Iris-M1-S3.

Table 1 Detailed information of CASIA-Iris-Mobile-V1.0

| Subset Characteristics | CASIA-Iris-M1-S1 | CASIA-Iris-M1-S2 | CASIA-Iris-M1-S3 |
|------------------------|---|--|---|
| Sensor | CASIA NIR mobile module V1 | CASIA NIR mobile module V2 | A domestic mobile phone with NIR iris-scanning technology |
| Environment | Indoor | Indoor | Indoor |
| Session | one | one | one |
| Attributes of subjects | Most are graduate students of CASIA | Most are workers | Most are students of China |
| No. of subjects | 70 | 200 | 360 |
| No. of classes | 140 | 400 | 720 |
| No. of images | 1400 | 6000 | 3600 |
| Resolution | 1080×1920 | 1968×1024 | 1920×1920 |
| Features | The first NIR mobile iris dataset. | Images are collected at three different distances (20, 25, 30 cm). | Images are captured by a mobile phone. The number of subjects is the largest. |
| Total | A total of 11,000 images from 630 Asian subjects. | | |

3. Database Organization

The file name of each image in CASIA-Iris-M1 is unique to each other and denotes some useful properties associated with the image such as subset category, subject ID, class ID and image ID etc. The file naming rules are listed as follows:

- The images of CASIA-Iris-M1-S1 are stored as:
 \$root path\$/CASIA-Iris-M1-S1/M1YYDNN.jpg
 YYY: the unique identifier of the subject
 D: denotes dual-eye iris image
 NN: the index of the image in the class
- The images of CASIA-Iris-M1-S2 are stored as:
 \$root path\$/CASIA-Iris-M1-S2/M2YYYYDDNN.jpg
 YYYY: the unique identifier of the subject
 DD: the collection distances, which are 20, 25 and 30 cm
 NN: the index of the image in each collection distance of one class
- The images of CASIA-Iris-M1-S3 are stored as:
 \$root path\$/CASIA-Iris-M1-S3/M3YYYYDNN.jpg
 YYYY: the unique identifier of the subject
 D: denotes dual-eye iris image

NN: the index of the image in the class

4. Copyright Note and Contacts

The database is released for research and educational purposes. We hold no liability for any undesirable consequences of using the database. All rights of the CASIA database are reserved. Any person or organization is not permitted to distribute, publish, copy, or disseminate this database. In all documents and papers that report experimental results based on this database, our efforts in constructing the database should be acknowledged such as “Portions of the research in this paper use the CASIA-Iris-Mobile-V1.0 collected by the Chinese Academy of Sciences' Institute of Automation (CASIA)” and a reference to “CASIA-Iris-Mobile-V1.0, <http://biometrics.idealtest.org/>” should be included. A copy of all reports and papers that are for public or general release that use the CASIA-Iris-Mobile-V1.0 should be forwarded upon release or publication to:

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Publications

1. Qi Zhang, Haiqing Li, Man Zhang, Zhaofeng He, Zhenan Sun, and Tieniu Tan. “Fusion of Face and Iris Biometrics on Mobile Devices Using Near-infrared Images”, Chinese Conference on Biometric Recognition (CCBR), pp. 569-578, 2015.
2. Qi Zhang, Haiqing Li, Zhenan Sun, Zhaofeng He and Tieniu Tan, “Exploring Complementary Features for Iris Recognition on Mobile Devices”, International Conference on Biometrics (ICB), pp. 1-8, 2016.
3. Qi Zhang, Haiqing Li, Zhaofeng He, and Zhenan Sun, “Image Super-Resolution for Mobile Iris Recognition,” Chinese Conference on Biometric Recognition (CCBR), pp. 399-406, 2016.
4. Haiqing Li, Qi Zhang, and Zhenan Sun, “Iris Recognition on Mobile Devices Using Near-Infrared Images”, Chapter 5 in Human Recognition in Unconstrained Environments,

