Guide to the CMU Multi-PIE Face Database

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Abstract

We collected the CMU Multi-PIE face database in four sessions between October 2004 and March 2005 to support development of algorithmns for the recognition of faces across pose, illumination and expression conditions. Subjects were recorded inside the CMU 3D room using a hardware-synchronized network of 15 high quality video cameras and 18 flashes. During the recording subjects were instructed to display a range of different facial expressions including smile, surprise, squint, disgust and scream. In addition high resolution still images were acquired as well. A total of 337 subjects were recorded, with 129 subjects appearing in all four sessions. Overall the database contains more than 750,000 images for 305 GB of data. The Multi-PIE database is an extension and improvement to the CMU PIE database, which was collected in the fall of 2000.

1 Database Organization

1.1 Overview

The database is organized into the following subdirectories:

- `data/`: Directory containing all the image data
- `meta/`: Contains meta information
- `photo_book/`: PDF file (and corresponding TeX file) containing one image for each subject in the database along with the subject ID.

See Figure 1 for an illustration of the organization of the database.

1.2 Image File Structure

All image data is contained in the `data/` directory, organized into separate subdirectories for each recording session. Each session directory contains the following subdirectories:

- `highres/`: High resolution image(s) of each subject in the session
- `movies/`: Short movie clips of each multi-view sequence showing all camera views and all illumination conditions

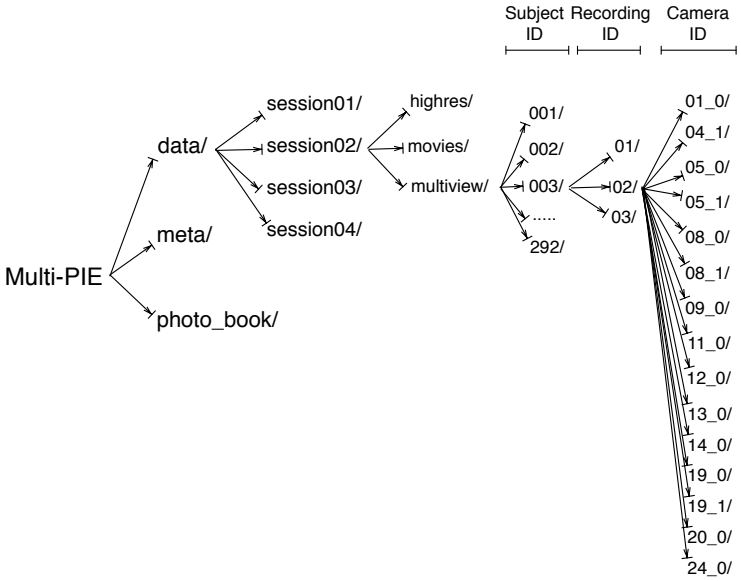

Figure 1: Overview of the organization of the Multi-PIE database into subdirectories.

- `multiview/`: Multi-view data for each subject

The `highres/` directory is organized into separate subdirectories for each subject. Each subject subdirectory contains one or two JPEG images, depending on the recording session. Files are named after the following scheme:

$$\underbrace{001}_{1}\_\underbrace{01}_{2}\_\underbrace{01}_{3}.\text{jpg}$$

with 1 = Subject ID, 2 = Session Number, and 3 = Recording Number.

The `movies/` directory contains 20-frame movie clips of each multi-view sequence showing a montage of all camera views across all illumination conditions. Files are named after the following naming convention:

$$\underbrace{001}_{1}\_\underbrace{01}_{2}\_\underbrace{01}_{3}.\text{mpg}$$

with 1 = Subject ID, 2 = Session Number, and 3 = Recording Number.

The `multiview/` directory is organized into separate subdirectories for each subject. Additional organizational structure is provided through recording session and camera subdirectories, resulting in the following image path:

$$\underbrace{001}_{1}/\underbrace{01}_{2}/\underbrace{05\_1}_{3}/\underbrace{001}_{1}\_\underbrace{01}_{4}\_\underbrace{01}_{2}\_\underbrace{051}_{3}\_\underbrace{00}_{5}.\text{png}$$

with 1 = Subject ID, 2 = Recording Number., 3 = Camera Label (as defined in Figure 2), 4 = Session Number, and 5 = Image Number.

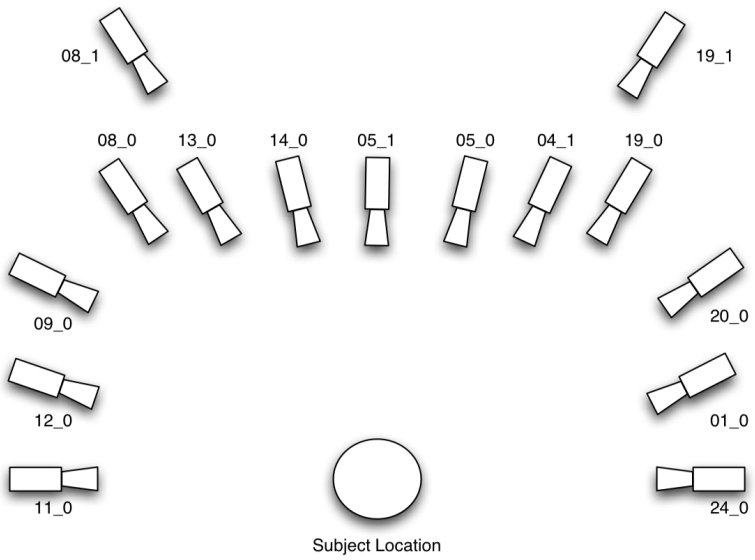

Figure 2: Camera labels and approximate locations inside the CMU 3D room. There were 13 cameras located at head height, spaced in 15° intervals. Two additional cameras (08_1 and 19_1) were located above the subject, simulating a typical surveillance camera view. 模拟典型的视频监视图像

1.3 Meta Information

The `meta/` subdirectory contains subject information and a list of filenames of erroneous images. The file `subject_list.txt` lists all subject IDs along with year of birth, gender and session attendance information (four digits, one for each session, recording a `1` if the subject attended the session and a `0` if not).

During the replacement of a defective flash in session 3, camera `12_0` moved slightly, so that 有缺陷的闪光灯 in subsequent recordings a flash on the opposite site of the camera was visible in the image, partly saturating the image. The camera position was corrected again for the recording of session 4. The file `errata.txt` contains a list of filenames of all 204 images affected by this problem.

2 Database Statistics

In total, the Multi-PIE database contains 755,370 images from 337 different subjects. Individual session attendance varied between a minimum of 203 and a maximum of 249 subjects. Of the 337 subjects 264 were recorded at least twice and 129 appeared in all four sessions. See Table 1 for details.

The subjects were predominantly men (235 or 69.7% vs. 102 or 30.3% females). 60% of subjects were European-Americans, 35% Asian, 3% African-American and 2% others. The average age of the subjects was 27.9 years.

Individual Session Attendance			
Session 1	Session 2	Session 3	Session 4
249	203	230	239
Repeat Recordings			
4 Sessions	$\geq$ 3 Sessions	$\geq$ 2 Sessions	1 Session
129	191	264	73

Table 1: Attendance statistics for the different recording sessions of the Multi-PIE database. 264 of the 337 subjects were recorded at least twice.

3 Database Website

Additional information on the database such as experimental protocols used in the reference publication, normalized images, and 3-point feature data is available on the database website at `http://multipie.org`.