

The IMM Frontal Face Database

An Annotated Dataset of 120 Frontal Face Images

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29. August 2005

Abstract

This note describes a data set consisting of 120 annotated monocular images of 12 different frontal human faces. Points of correspondence are placed on each image so the data set can be readily used for building statistical models of shape. Format specifications and terms of use are also given in this note.

Keywords: Annotated image data set, frontal face images, statistical models of shape.

1 Data Set Description

This database consists of 12 people (all male). A total of 10 frontal face photos has been recorded of each person. The data set is containing different facial poses captured over a short period of time, with a minimum of variance in lighting, camera position, etc.

All photos are annotated with landmarks defining the eyebrows, eyes, nose, mouth and jaw, see Figure 1. The annotation of each photo is stored in the ASF format, described in Appendix A.

2 Specifications

2.1 General Specifications

2.1.1 Specifications of Test Persons

All test persons are males, not wearing glasses, hats or other accessories.

2.1.2 Specifications of Facial Expressions

Table 1 lists the facial expressions captured in this data set.

Facial expressions	Description
No expression	The normal facial pose
Relaxed happy	Smiling vaguely (lips closed)
Relaxed thinking	The facial expression is a little tense (try to multiply $57*9$;c)

Table 1: Specifications of facial expressions.

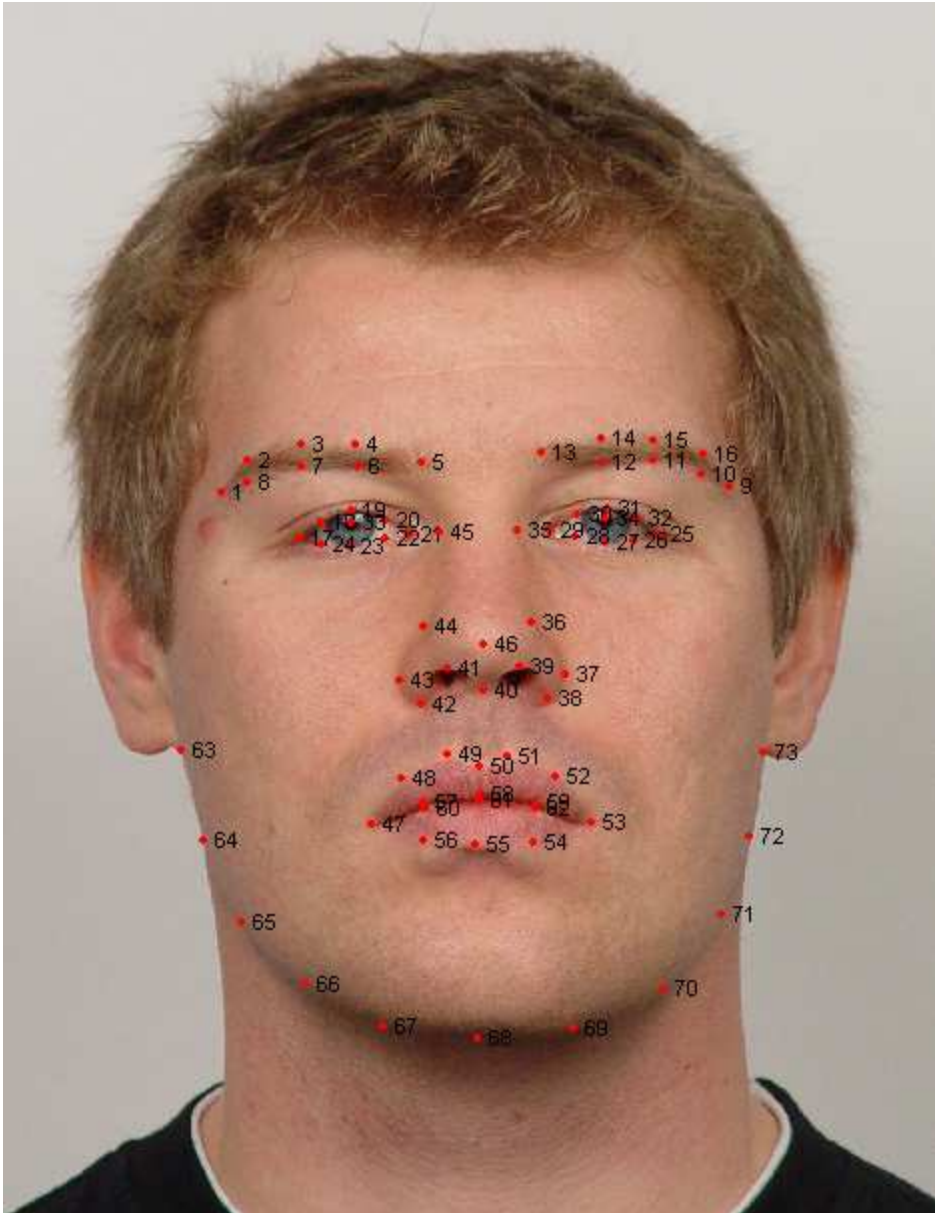


Figure 1: The 73 landmarks annotation defining the facial features; eye-brows, eyes, nose, mouth and jaw.

2.1.3 Image Format and Naming

The images are in JPEG format and named $XX_YY.jpg$ where XX is the person id and YY the photo number. Table 2 shows the correspondence between the photo number and the facial expression.

Photo number	Facial expression
01 to 06	No expression
07 to 08	Relaxed happy
09 to 10	Relaxed thinking

Table 2: Photo number specification.

2.1.4 Annotation Specifications

All photos were annotated with 73 landmarks. Table 3 specifies the correspondence between annotation landmarks and facial features. For the precise landmark placements see Figure 1.

Facial Features	Annotation landmarks
Right eyebrow	1 - 8
Left eyebrow	9 - 16
Right eye	17 - 24
Left eye	25 - 32
Right eyes pupil	33
Left eyes pupil	34
Nose	35 - 46
Mouth	47 - 62
Jaw	63 - 73

Table 3: The 73 landmarks annotation defining the facial features; eyebrows, eyes, nose, mouth and jaw.

2.2 Studio Specifications

Figure 2 displays the studio setup.

2.2.1 Specification of Backdrop

In this data set a white projector screen is used as backdrop, which is a uniform nonreflecting surface, distinguishable from the test persons skin, hair and clothes. The camera lens has to be parallel to the background.

2.2.2 Specifications of Camera and Person Placement

The person was sitting down on an office chair and filmed with a straight back. The camera was placed in the same height as the test person eyes. The face of the test person was parallel to the background and the camera lens. An example of a full size image is shown in Figure 3. The camera captures additional space above and below the head of the test person in order to insure, that all test persons can be recorded without altering the studio setup.

2.2.3 Specifications of Light

The diffuse light is coming solely from two spot lights. The light was bounced off using white umbrellas. In the studio there was no interference from sun light, room light etc.

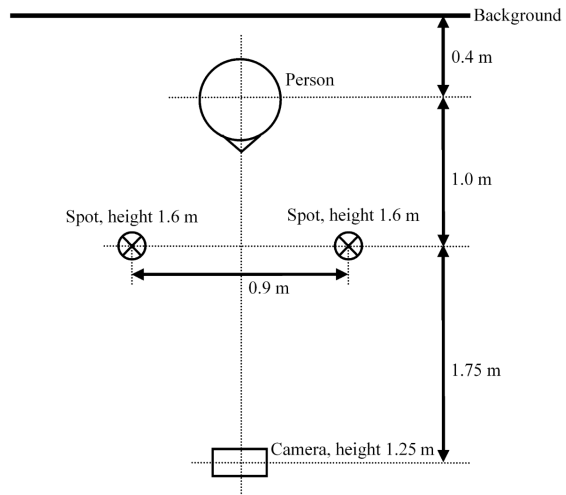


Figure 2: Studio setup: Height of the spots is from floor to bulb. Height of the camera is from floor to center of lens.



Figure 3: Example of a full size image.

2.3 Technical Specifications

2.3.1 Camera Specifications

Name	Sony - Cyber-shot
Image size	5.0 megapixels
Model no	DSC-F717

2.3.2 Image Specifications

Focal length	48 mm ¹
Compression	Fine/Normal (jpg) ²
Iso speed	200
Aperture	F/2.4
Shutter speed	1/100 s
Image size	2560 × 1920 pixels
Exposure Compensation	+ 0.7 EV
White balance	Custom ³

2.3.3 Spot Light Specifications

Spot Light:

Manufacturer	Hedler
Name	Videolux 300

Bulb:

Manufacturer	Osram
Type	Halogen
Name	Photo Optic Lamp
No	64515
Watt	300 w

3 The Work Process Protocol of One Test Person

1. The camera position is placed accordingly to the specifications above (approx 1.25 m from floor to lens and same level as the eyes of the test person).
2. The test person is explained the meaning of the pose to be recorded, in terms of the facial expression.
3. The test person is distracted for one second to "reset" facial features (ex. rolls with the head), and assumes the wanted pose, the photo is recorded. (Make sure the test persons pitch, roll and yaw is not to critical compared to the camera lens. Nostrils should be just visible).
4. Item 3. is repeated until all the photos of this pose are recorded.
5. Item 2. is repeated for all the wanted poses.
6. Record the test persons age.

¹Equivalent to 190 mm with a 35 mm FOV.

²The average file size was 1.9MB.

³The white balance on the camera was calibrated to the backdrop with the spotlights.

4 Things to Improve

- Green background (not shiny).
- More diffuse lighting (the lighting can be placed further away from the test person).
- A real photo chair (not an office chair).
- Fixed focal length (a camera where you can see the current exact focal length).
- Strict rules for test persons pitch, roll and yaw.

5 Terms of Use

The data set can be freely used for education and research. The only requirement is that a reference to this note is given.

A ASF – AAM Shape Format Specification

An ASF file is structured as a set of lines separated by a CR character. Anywhere in the file, comments can be added by starting a line with the '#' character. Comment lines and empty lines are discarded prior to parsing. The layout of an ASF file is as follows:

- Line 1 contains the total number of points, n , in the shape.
- Line 2 to $n+1$ contains the point information (one line per point) such as the point location, type, connectivity etc., see below. Hence, quick and simple access is preferred over data compactness.
- Line $n+2$ contains the *host image*, i.e. the filename of the image where the annotation is defined.

The formal point definition is:

point := <path#> <type> <x-pos> <y-pos> <point#> <connects from> <connects to>

<path#> The path that the point belongs to. Points from different paths must not be interchanged (in the line order).

<type> A bitmapped field that defines the type of point:

- Bit 1: Outer edge point/Inside point
- Bit 2: Original annotated point/Artificial point
- Bit 3: Closed path point/Open path point
- Bit 4: Non-hole/Hole point

Remaining bits should be set to zero. An inside artificial point which is a part of an closed hole, has thus the type: $(1 \ll 1) + (1 \ll 2) + (1 \ll 4) = 1 + 2 + 4 = 7$.

<x-pos> The relative x-position of the point. Obtained by dividing image coordinates in the range [0;image width-1] by the image width (due to strange historic reasons...). Thus, pixel $x = 47$ (the 48th pixel) in a 256 pixel wide image has the relative position $47/256 = 0.18359375$.

<y-pos> The relative y-position of the point. Obtained by dividing image coordinates in the range [0;image height-1] by the image height (due to strange historic reasons...). Thus, pixel $y = 47$ (the 48th pixel) in a 256 pixel tall image has the relative position $47/256 = 0.18359375$.

<point#> The point number. First point is zero. This is merely a service to the human reader since the line at where the point occurs implicitly gives the real point number.

<connects from> The previous point on this path. If none <connects from> == <point#> can be used.

<connects to> The next point on this path. If none <connects to> == <point#> can be used.

Further, the following format rules apply:

- Fields in a point specification are separated by spaces or tabs.
- Path points are assumed to be defined clockwise. That is; the outside normal is defined to be on left of the point in the clockwise direction. Holes are thus defined counter-clockwise.
- Points are defined in the fourth quadrant. Hence, the upper left corner pixel is (0,0).
- Isolated points are signaled using <connects from> == <connects to> == <point#>.
- A shape must have at least one outer edge. If the outer edge is open, the convex hull should determine the interior of the shape.

Example ASF file

```
<BOF>
#####
#
#   AAM Shape File - written: Monday May 08 - 2000 [15:22]
#
#####

#
# number of model points
#
83

#
# model points
#
# format: <path#> <type> <x rel.> <y rel.> <point#> <connects from> <connects to>
#
0  0  0.07690192  0.44500541  0  82  1
0  0  0.09916206  0.42914406  1  0  2
0  0  0.12925033  0.39573063  2  1  3

...

0  0  0.07579006  0.52910086  80  79  81
0  0  0.06128729  0.49762829  81  80  82
0  0  0.05858913  0.46610570  82  81  0

#
# host image
#
F1011flb.bmp

<EOF>
```