CVC Tech.Rep. #24 June,1998
(Revised: February, 1999)

The AR Face Database

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Abstract

This report summarizes the face database created at the CVC (Computer Vision Center) in 1998 by Aleix Martínez and Robert Benavente. It consists of over 3,000 color images. All images correspond to frontal view faces with different facial expressions, different illumination conditions and with different *characteristic changes* (people wearing sun-glasses or scarf). This face database contains images from 116 people (63 males and 53 females). Everyone was asked to come twice to the CVC, where the pictures were taken under strict controlled conditions. These two different sessions were separated in 14 days (two weeks time). No restrictions on wearing (clothing, glasses, etc.), make up, hair style, etc., were imposed to participants.

This face database is publicly available and can be obtained by sending an e-mail to `aleix@ecn.purdue.edu` or visiting the following web sites:

`http://rvl1.ecn.purdue.edu/~aleix/aleix_face_DB.html`

or `http://RVL.www.ecn.purdue.edu`.

It is totally free for research institutions or staff of research institutions that wish to test their systems. Commercial distributions or any act related to commercial use of this database is **strictly** prohibited.

Key words: Face databases, face recognition.

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1 Introduction

The act of recognizing human faces at different orientations, at different illumination conditions, with different facial expressions, etc., has arisen as an important area of research. Several commercial or industrial applications are waiting for faster and more robust algorithms to appear. For this reason, we have built a new face database that allows computer vision researchers to test their algorithms and compare their results with other systems developed by other research groups.

Many other good face databases can be found in the Internet (via ftp or http). Among them it is worthwhile to point out:

- **MIT face database**: Many different points of view of the same face.

  FTP: `ftp://whitechapel.media.mit.edu/pub/images/`

- **C-M face data base**: Good for localization at different scales.

  HTTP: `http://www.ius.cs.cmu.edu/IUS/har1/har/usr0/har/faces/test/`

- **Weizemann institute face database**: 20 different people at different illumination conditions, with different facial expressions and from different points of view.

  FTP: `ftp://eris.wisdom.weizmann.ac.il/pub/FaceBase/`

- **Yale face database**: Consists of 265 grayscale images of 15 people. There are 11 images per subject with different facial expressions and different illumination conditions.

  HTTP: `http://giskard.eng.yale.edu/yalefaces/yalefaces.html`

- **ORL face database**: 40 different people with different facial expressions and some of them wearing glasses. There are 10 images per subject.

  HTTP: `http://www.camorl.co.uk/facedatabase.html`

Other large face databases are:

- **FERET**: Huge database of human faces (USA).

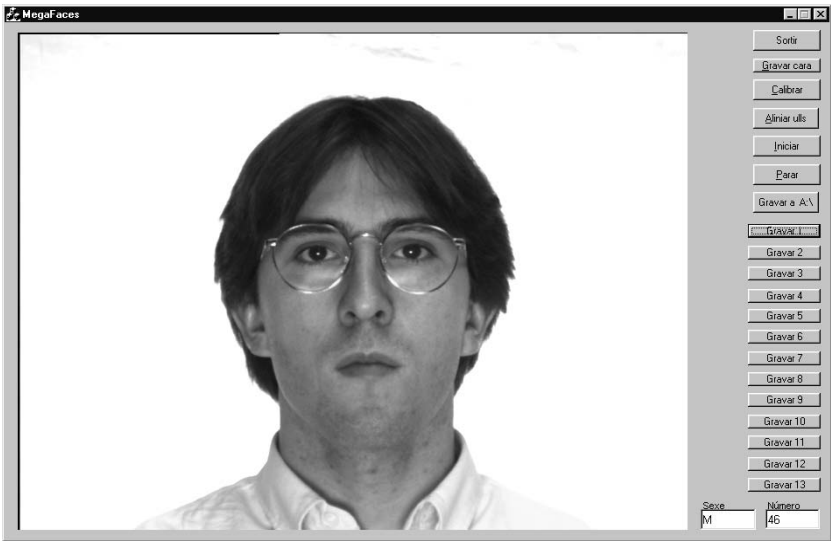


Figure 1: The application used.

- **M2VTS**: Also a large database.

  HTTP: `http://www.tele.ucl.ac.be/M2VTS/`.

Other links of interest can be found at the face recognition home page at:

http://www.cs.rug.nl/~peterkr/FACE/face.html

or at the face localization home page al:

http://home.t-online.de/home/Robert.Frischholz/face.htm.

We have built a new face database that covers different requisites, which we believe are very important to test face recognition systems.

2 Face database acquisition system

All images were acquired using the same system. The camera parameters (focus and iris), the illumination conditions and the distance from the subject to the camera were strictly controlled during the whole acquisition process. To guarantee such a strict set up, we calibrated the system twice a day: one time in the morning and another time in the afternoon. Calibration was done referring to distance, pose and illumination conditions. Illumination (incident and reflectant) was measured using specific tools.

Description of the system used:

- Pentium 133MHz, 64 MB RAM and 2Gb HD
- Color camera: SONY 3CCDs
- A 12mm optics
- Frame grabber: Matrox Meteor RGB

3 People in the database

A total of 116 different people were correctly introduced into our database. 63 were males, 53 females. All of them come twice to the CVC, so 26 images are available for each person. Some of the people wore glasses or any other feature. None restriction was imposed to participants.

All images are supplied in the CD-ROM version. This includes a total of 60 females and 76 males (although only 116 were finally obtained properly through out the two mentioned sessions). A second set with only the correct grabbed images is also available (*subset* 1).

4 How to use it?

All images are stored in 8 different CD-ROMs as RAW files (only pixel's information was stored) in anti-video scan path. Images are of 768 by 576 pixels and of 24 bits of depth.

Men's image names start with an "M" symbol and women images start with an "W".

Each male image has a unique identifier number that goes from "001" to "076". This number follows the prefix "M" and a hyphen (e.g. "M-001", "M-022", etc). Female's images are exactly the same but with the prefix "W" (e.g. "W-003", "W-020").

The last number identifies the kind of image we are using. The equivalency table is as follows:

- 01 : Neutral expression
- 02 : Smile

- 03 : Anger
- 04 : Scream
- 05 : left light on
- 06 : right light on
- 07 : both side lights on
- 08 : wearing sun glasses
- 09 : wearing sun glasses & left light on
- 10 : wearing sun glasses & right light on
- 11 : wearing scarf
- 12 : wearing scarf & left light on
- 13 : wearing scarf & right light on
- From 14 to 26 : second session (same conditions as 01 to 13)

An example of this can be seen at figures 2 and 3.

A total of 30 sequences of images were also grabbed to test dynamic systems. An example of one of these sequences can be seen at figure 4. Each sequence is composed of 25 images of the same size and features stated above.

Some subsets of this database are also available (or will be available soon):

- Subset 1: contains the correct images sampled at half their size.
- Subset 2: contains the correct images sampled at half their size and stored as gray-level images ($I = 1/3(R + G + B)$).

Other subsets might be appearing in the AR face database homepage.

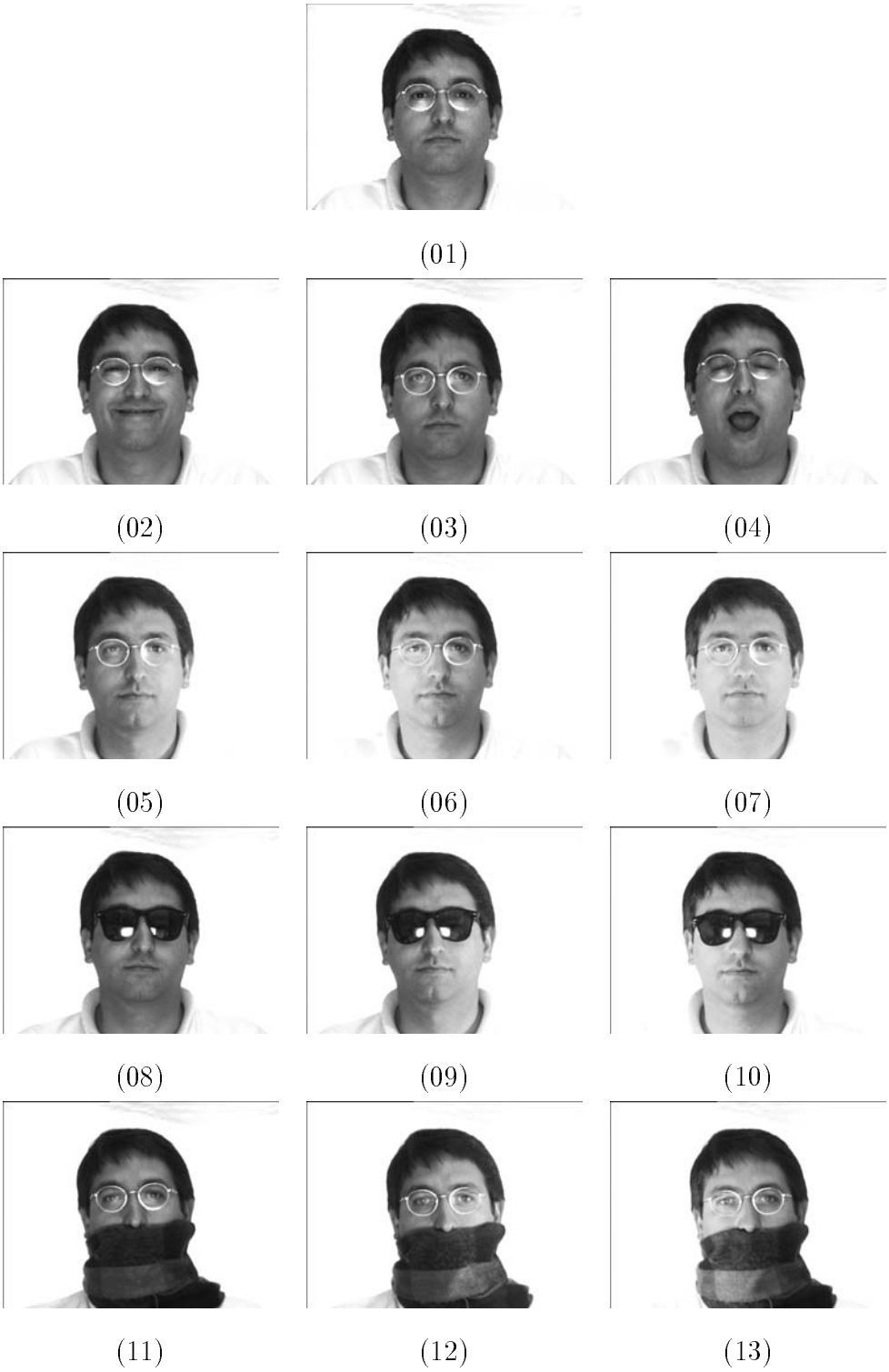
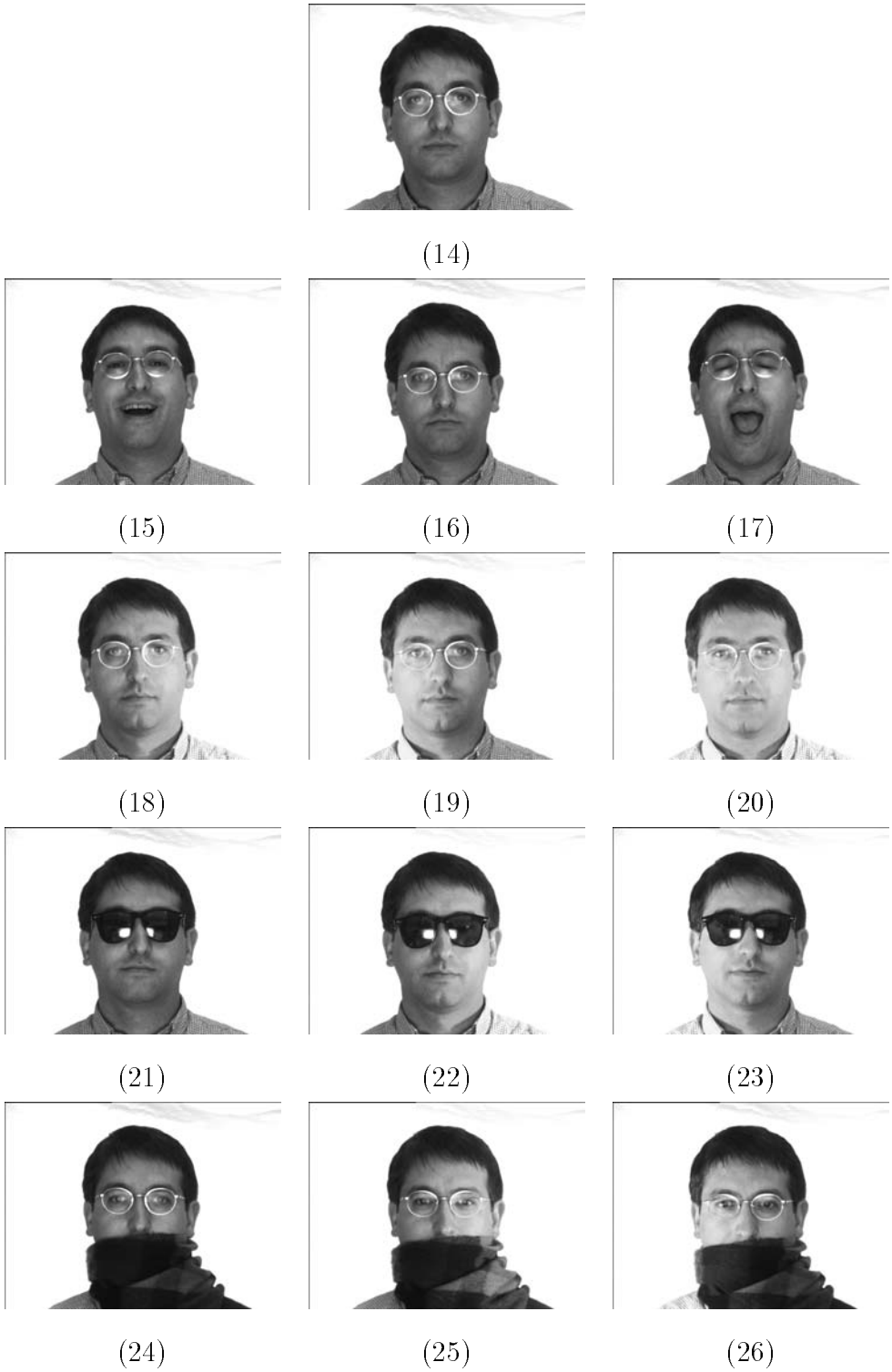


Figure 2: Example of the images acquired during the first session.



(14)

(15) (16) (17)

(18) (19) (20)

(21) (22) (23)

(24) (25) (26)

Figure 3: Example of the images acquired during the second session.

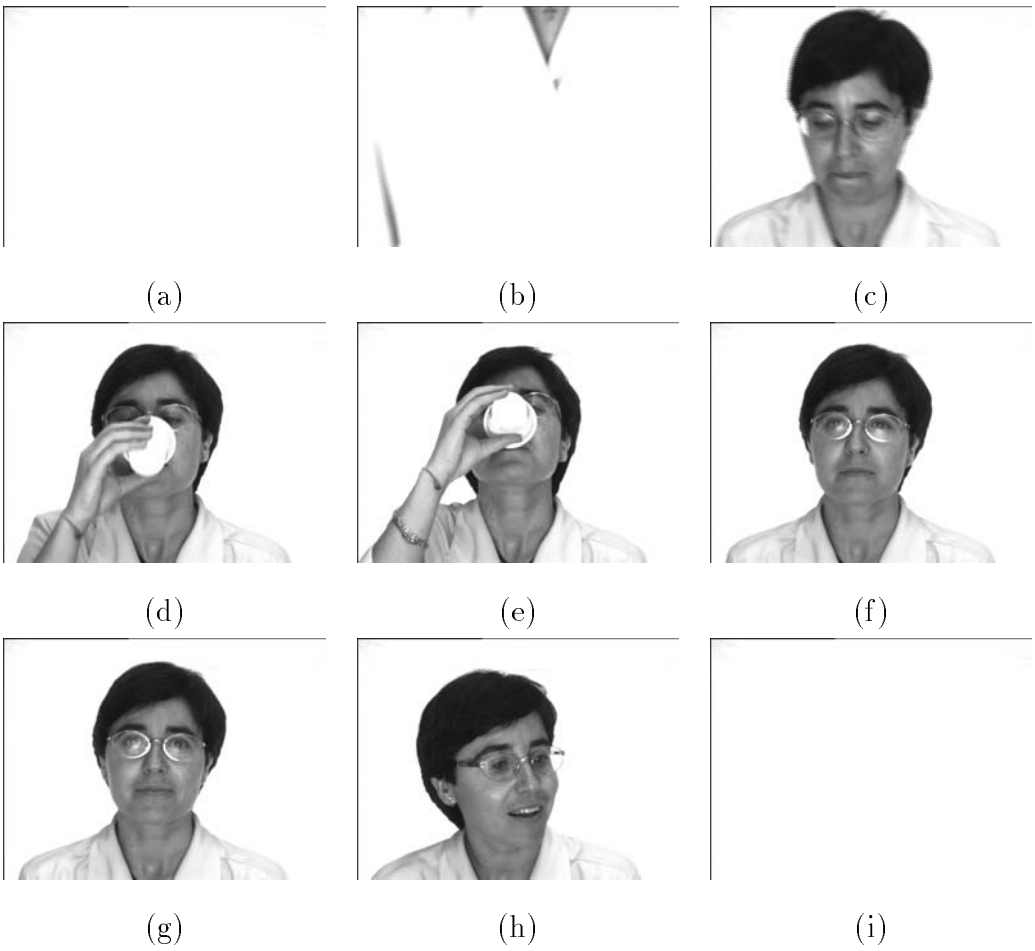


Figure 4: An example of a sequence of images of human faces. All sequences are of people appearing in the database. Three different sequences were grabbed from 10 different people. Each sequence is composed of 25 images. Only few images are shown here for simplicity.

5 Remarks

This database is publicly available. It is freely distributed for research staff and institutions. All publications that use the AR face database **should** make a reference to this report.

Please sent any interesting achievement done in face recognition to:

`aleix@ecn.purdue.edu`

Software related to the AR face database is also of interest. Send it to us and will put it in (or linked from) the AR face database homepage.

6 Acknowledgements

This face database was created and made publicly available thanks to many great people. The idea of a new face database arose in 1997 while the first author was working at the Robot Vision Lab (RVL) at Purdue University. The database was defined with the help of people of the RVL. This database was obtained in the Computer Vision Center (CVC) at Universitat Autònama de Barcelona (Barcelona, Spain). This was done thanks to the CVC resources. Thanks to Dr. Jordi Vitrià for useful discussion. The search of the people that collaborate in this database was made possible thanks to many people; specially to: Prof. Antoni Castelló, Dr. Enric Marti and Dr. Dolores Cañamero. Finally, this database has been made publicly available thanks to Prof. Avi Kak and the RVL resources (at Purdue University).

Aleix Martinez is now working at the RVL at Purdue University. Robert Benavente is at the CVC at Universitat Autònoma de Barcelona.