**Benha Journal of Applied Sciences (BJAS)** **print: ISSN 2356–9751**
**Vol.(5) Issue(7) Part (2) (2020), (161-166)** **online: ISSN 2356–976x**
**http://bjas.journals.ekb.eg**

# A Novel Landmarked Face Database for Arab Celebrities

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**Abstract**

In this paper, we present a novel database of colored and gray, plausible face images. The database contains almost 389 images of 79 Arab celebrities with automatically generated landmarks acquired from the web in wild-life. We apply face recognition (face detection) using Caffe-Model with open cv to extract faces from images then store them in 256 × 256 pixels images. The dataset is publicly available for research purposes and can be used as a training and testing material in developing various algorithms related to face detection, inpainting, frontalization, recognition, and analysis. It is challenging to inpaint face images in the wild-life, due to the large variation of appearances, such as expressions, gender, different poses, and ethnicity. This inspired us to establish a dataset that includes the faces of Arab celebrities to use it in future work.

**Keywords:** Face Database, Face Recognition, Deep Learning, Computer Vision, Face Inpainting.

## 1. Introduction

The endless interest in face recognition has two main reasons. Firstly, it's an excellent field for testing combinations of various computer vision and machine learning algorithms. The complexity of the problem requires constant development and improvement of techniques for the extraction of significant features from face under varying conditions and accurate classification of multi-dimensional data. Secondly, there is a growing for techniques that allow accurate identification of individuals and inpainting face images [1].

The automatic face recognition systems meet that need perfectly. The development of fast and reliable recognition systems would allow access control and identification without the need for carrying keys, cards or identifiers. Moreover, capturing the picture can be done without personal consent and does not require any contact with any subject. This makes the visual recognition systems applicable to a wide array of security problems such as perpetrators identification, mobile face unlocks feature or traffic control.

As the face images are very often part of many documents such as driving licenses, national ID cards, passports, etc. Collecting the required data is significantly easier than in the case of other modalities (e.g. retina images or fingerprints). However, the development of a reliable face recognition system is not an easy task. The human face is a highly non-rigid, complex 3D body. Its appearance is susceptible to many factors such as illumination, pose variations, occlusions, changes or structural disturbances (e.g. glasses, ethnicity, make-up, facial hair, etc.). To devise an algorithm robust to these factors one has to have a database of significant size and diversity of contained examples. Common, publicly available databases are required to provide a testing material to perform a rigorous benchmarking of proposed algorithms.

Faces represent a special, very complex class of visual stimuli and have been extensively studied in a wide range of research areas. In particular, facial landmarks are among the most important sources of information about the mental states of others.

At present, there are many databases available for research purposes. A detailed review of them was presented

by Gross [2]. Most of them consist of images with rather low-resolution Table 1. This is a result of the rather prohibitive computational cost of many recognition algorithms applied to high-resolution images at the time of creating the databases. However, most of the current database images not contain Arab faces, this causes a problem in applying some algorithms and making sure the model is efficient in working with most ethnicity of different faces. With this notion, we have decided to create a database containing plausible one size images of 79 Arab celebrities with automatically generated landmarks acquired from the web in wild-life.

**Table (1)** Image resolution in different databases.

| Database | Resolution |
|---|---|
| AR [3] | 768 × 576 |
| Banca [4] | 720 × 576 |
| CAS-PEAL [5] | 360 × 480 |
| CMU Hyperspectral [6] | 640 × 480 |
| CMU PIE [7] | 640 × 486 |
| Equinox IR [8] | 240 × 320 |
| FERET [9, 10] | 256 × 384 |
| JAFFE [11] | 256 × 256 |
| KFDB [12] | 640 × 480 |
| MPI [13] | 256 × 256 |
| ND HID [14] | 1600 × 1200 |
| Yale B [15] | 640 × 480 |

Additional details are given in the remainder of this paper, which is organized as follows. In Section 2, we discuss other related databases of Labeled Faces in the wild which inspire us to create our database also we provide a method to obtain our database. In Section 3, we describe the structure of the database such as number of images. In Section 4, we discuss how we create the database in details such as resolution, cropping, removal of duplicate images, and other properties and give

additional data about landmarks. In Section 5, we discuss potential uses of the database in many applications. Finally, In Section 6, we provide the conclusion and future work.

## 2. Related Databases

There are a large number of face databases available to researchers in face recognition. A non-exhaustive list can be found in Table 2. These databases range in size, scope, and purpose. The photographs in many of these databases were acquired by small teams of researchers specifically for the purpose of studying face recognition. Acquisition of a face database over a short time and in a particular location has significant upper hand for certain types of research. Such an acquisition gives the experimenter direct control over the parameters of variability in the database.

On the other hand, in order to work on more general face recognition problems, in which faces are drawn from a very broad distribution, one may wish to train and test face recognition algorithms on highly diverse sets of faces. While it is possible to control a huge number of variables in the laboratory in an attempt to build such a database, there are two drawbacks to this approach [35]. The first is that it is extremely labor intensive. The second is that it is hard to gauge exactly which distributions of various parameters one should use in order to build the most useful database. What percentage of subjects should wear sunglasses? What percentage should have beards? How many should be smiling? How many backgrounds should contain cars, boats, grass, deserts, or basketball courts?

## 3. Database Structure

The main reason for creating the database presented in this paper was to provide Arab face landmarked data for face detection, inpainting, frontalization, recognition, analysis, facial features extraction, and face recognition algorithms. The dataset images were stored in color 256 × 256 JPG files which are novel compared to most of the available face databases.

**Table (2)** Face databases. This table shows some of the face databases available at the time of writing.

| Database | No. people | No. Images | Resolution | Ref. |
|---|---|---|---|---|
| AR Face Database, Purdue University, USA | 126 | 4K | 768 × 576 | [3] |
| AT&T Database (formerly ORL Database) | 40 | 400 | 92 × 112 | [16] |
| BioID Face Database | 23 | 1521 | 384 × 286 | [17] |
| Caltech 10000 Web Faces | ≈ 1K | 1K | 304 × 312 | [18] |
| CAS-PEAL Face Database | 1040 | 99,594 | 360 × 480 | [5] |
| Cohn-Kanade AU-Coded Facial Expression Database | 100 | 500 sequences | 640 × 480 | [19] |
| Face Recognition Grand Challenge Databases | > 466 | > 50K | 250 × 250 | [20] |
| FERET Database, Color | 1199 | 14126 | 256 × 384 | [21] |
| Georgia Tech Face Database | 50 | 750 | 150 × 150 | [22] |
| “KKWETC” Indian Face Database | 68 | 151 | 5184 × 3456 | [23] |
| Japanese Female Facial Expression (JAFFE) Database | 10 | 213 | 256 × 256 | [11] |
| MIT-CBCL Face Recognition Database | 10 | > 2K | 640 × 480 | [24] |
| M2VTS multimodal face database (Release 1.00) | 37 | 185 | 286 x 350 | [25] |
| NIST Mugshot Identification Database (MID) | 1573 | 3248 | variable size | [26] |
| NLPR Face Database | ≈ 22 | 450 | 256 × 256 | [27] |
| PIE Database, CMU | 68 | 41368 | 640 × 480 | [7] |
| Psychological Image Collection at Stirling (PICS) | 90 | 687 | 336 × 480 | [28] |
| UCD Colour Face Image Database for Face Detection | ≈ 299 | 299 | variable size | [29] |
| UMIST Face Database | 20 | 564 | 576 × 768 | [30] |
| University of Essex, UK, Faces94 | 153 | 153 | 180 × 200 | [31] |
| University of Oulu Physics-Based Face Database | 125 | > 2K | 428 × 569 | [32] |
| The PUT Face Database | 100 | 10K | 2048 × 1536 | [1] |
| VALID Database | 106 | 530 | 360 × 288 | [33] |
| Yale Face Database | 15 | 165 | 320 × 243 | [34] |
| Yale Face Database B | 10 | 5760 | 640 × 480 | [15] |

Before proceeding with the details of the database, we present some summary statistics and properties of the database

- The database contains 389 targets of Arab face images. Some images contain more than one face, but it is the face that contains the central pixel of the image which is considered the defining face for the image. Faces other than the target face should be ignored as "background".
- The database contains images of 79 different Arab celebrities with automatically generated landmarks acquired from the web in wild-life.
- The images are available as (256 by 256) pixel JPG images. Most images are in color, although a few are grayscale only.
- All of the images are the result of detections by the python code which used pretrained Caffe-Model and open cv but have been rescaled and cropped to a fixed size (see Section 4 for details). After running the Caffe-Model detector on our database of images, positive face detections were procced to most images.

## 4. Methodology

The specific details of how the database was constructed are given in this section, the process of building the dataset as mentioned in Fig (1) can be broken into the following steps:

a. download images from web,
b. convert all images to .jpg format,
c. labeling (naming) the detected face,
d. Face Detection,
e. Face Alignment,
f. Face Landmark.

We will describe each of these steps in the following subsections.

**a) download images from web**

As a starting point, we download images for Arab Celebrities in wild-life from web and remove duplicated images, we make sure that database will be variant and contain faces for male and female as in Fig (2)

**b) convert all images to .jpg format**

then we convert all images to .jpg format using (format factory) software.

**c) labeling (naming) the detected face**

then we labeling each image with the real name of the detected face, name of each image is formatting as following (name + number of images for this person) as show in Fig (3).

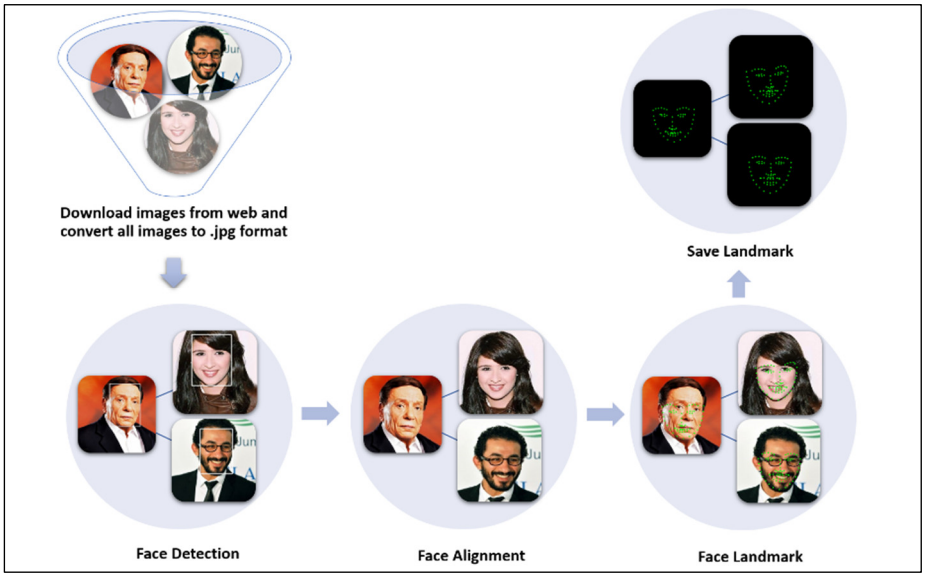


**Fig. (1)** Steps of creating Landmarked Face Database for Arab Celebrities.

**Fig. (2)** Downloaded images from web for Arab Celebrities.

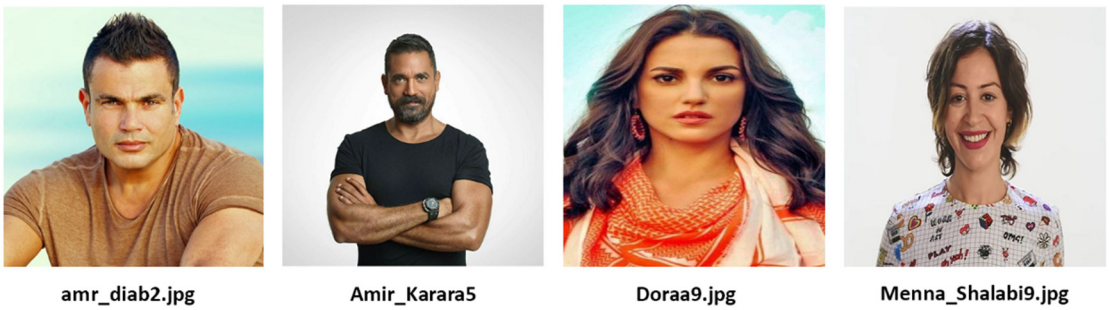


**Fig. (3)** Labeling (naming) the detected face.

**d) Face Detection**

We apply face detection using Caffe-Model [36] with open cv to extract faces from images then store it in 256 × 256 pixels images, Fig (4) show process of face detects.

**e) Face Alignment**

After face detection process some faces cropped in corner of image not centered, so we do face alignment manually for this image as in Fig (5)


**Fig. (4)** Detect and crop face image.

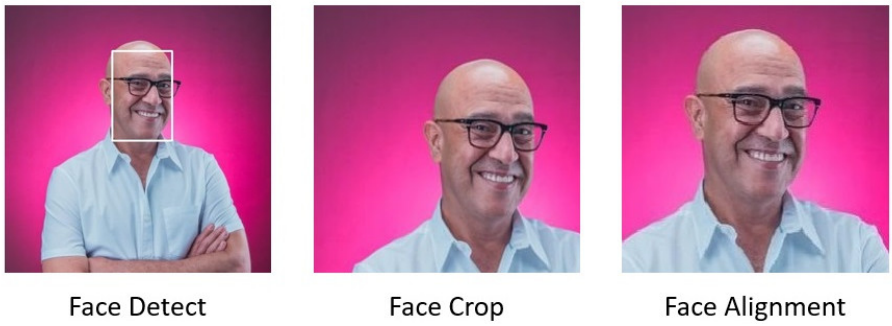


**Fig. (5)** Detect, crop and alignment face image.

**f) Face Landmark**

The image containing face and eyes were automatically marked using neural network known as Face Alignment Network **(FAN)** [37] to generate landmarks as ground truth landmarks on each image in order to supply data for evaluation of face and eyes detection algorithms and to provide precise face alignment required by many face recognition methods. Coordinates and dimensions of those regions were stored in files in the txt format.

A set of 68 landmark points was defined to provide information on accurate position of facial features (e.g. the eyes corners, the mouth corners as in (fig.6)). Each image in the database was supplied with a file containing automatically marked locations of all visible landmarks. Additionally, those points form polylines representing following contours:

- face outline (17 points),
- nose outline (9 points),
- eyes outlines (12 points),
- eyebrows outlines (10 points),
- mouth outlines (inner and outer - 20 points).

## 5. Potential uses of the database

Some potential applications of the presented database have been presented throughout this paper. To summarize,


**Fig. (6)** Save face landmark for face images that detected.

the following activities could benefit from using the Arab Celebrities Face Database:

- evaluation face recognition to pose variations,
- evaluation of face and facial features localization algorithms,
- evaluation performance of face frontalization,
- evaluation performance of face inpainting algorithms,
- evaluation of face recognition algorithms using image sequences as input,
- evaluation of the performance of face rotation algorithms.

These of course are not the only possible applications of the presented database. The availability of such an extensive database of color, plausible resolution face images can contribute to the development of new algorithms related to the face images processing. Already existing techniques can also profit from applying to this database.

## 6. Conclusion and future work

We have introduced a novel database of colored and gray, plausible face images which contains 389 images of 79 Arab celebrities with automatically generated landmarks acquired from the web in wild-life. Many different adaptations, tests, and experiments have been left for the future to make the database contain more images for more individuals of Arab faces and increase resolutions of face image. We hope that other researchers will find the database useful Hence, the database developed to help researchers in of human face recognition. The database is publicly available for the research purposes only to receive the database please contact one of the authors.

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