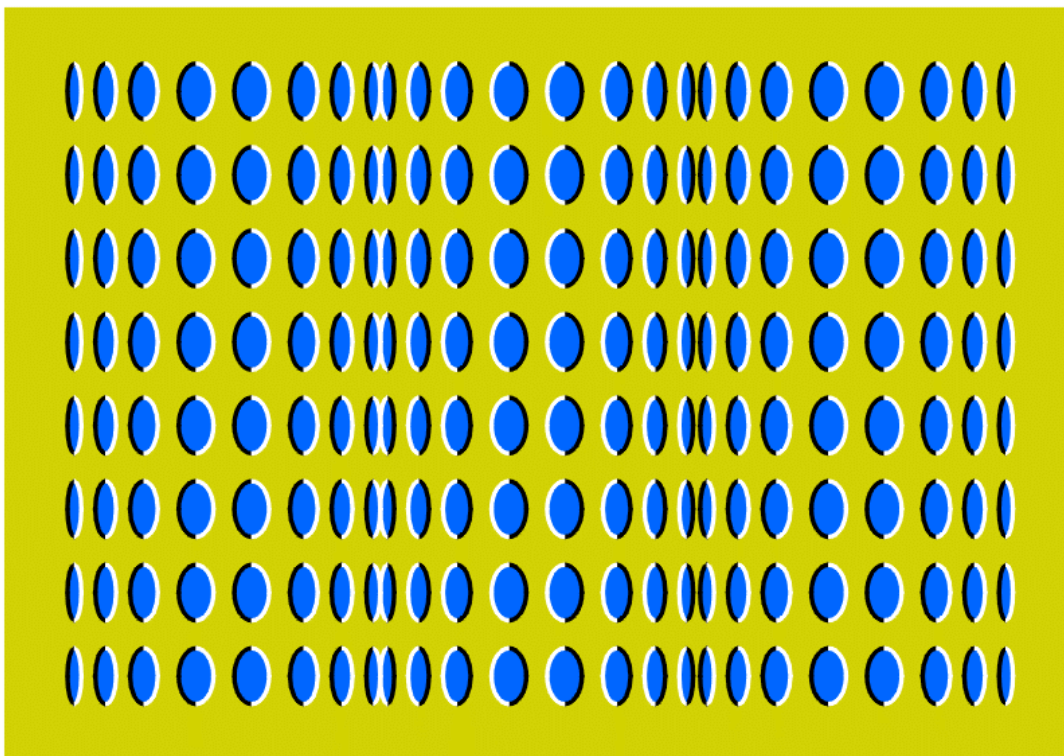# Current subjects in computer science
PATTERN RECOGNITION

PRACTICE 2:

Adquisition of real images of faces:
- **Description of the adquisition system.**
- **Preprocessing with matlab**
- **Normalization**
- **How many pictures?**

The goal of this practice session is to build a database containing facial images of all the students of the seminar. This database will be used in the next practice.

1. Description of the adquisition system: *Image capture using a webcam (videoconference camera)*

A webcam like the one shown in *Figure 1* will be used to take the snapshots.

Focus control

Figure 1: Webcam used in the practice.

To start the capture software (*Figure 2*), you can either press the button on top of the camera or double click on the ***CreativePC-CAM Center Lite*** icon of the Windows desktop.
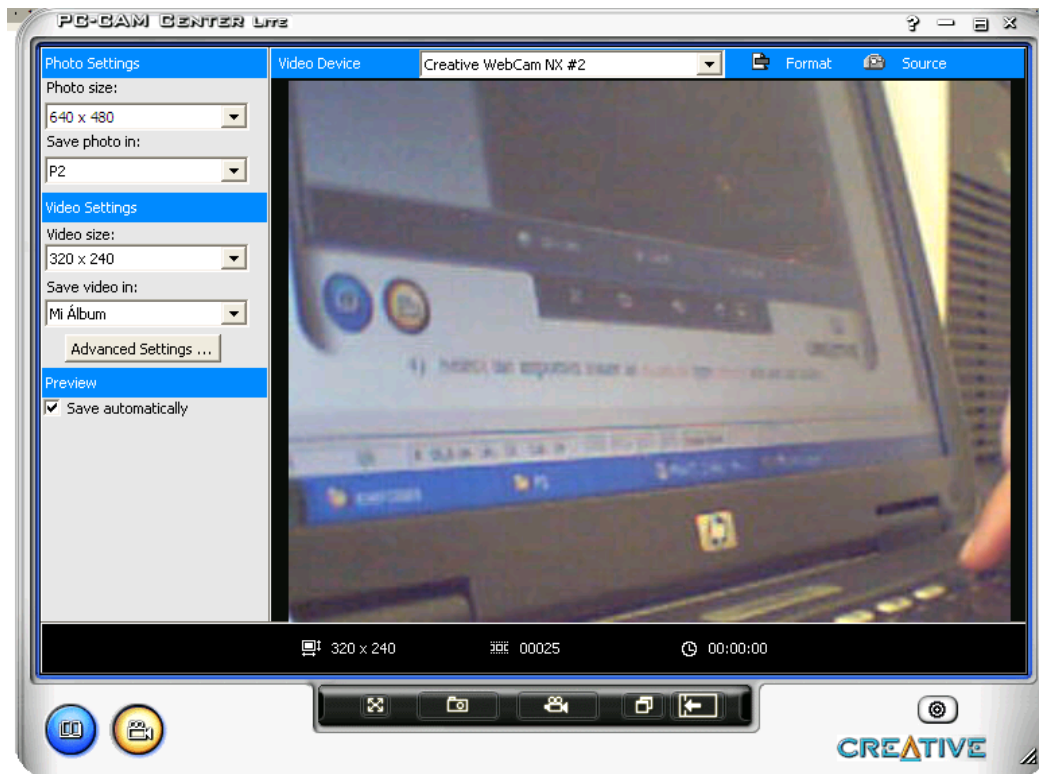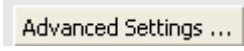
Figure 2: Image capture software.

To capture the image, you should press the image capture button [image] of the application's main window.

Camera focus can be adjusted by turning the ring around the camera lens (*Figure 1*).

Captured images are automatically saved in the folder selected as album. As the images will be furher processed using Matlab, an easy-to-access album should be used. You should create a folder (e.g. D:\CSCS\PR\P2) and associate such folder to an album, as follows:

1) Create the folder *C:\CSCS\PR\P2.*

2) Press button [image] in the application.

3) Import a folder using the button [Import Album].

4) Select the imported folder as album type photo and add the folder D:\CSCS\PR\P2

5) Choose **bmp** image format from [Advanced Settings ...]

2. Preprocessing with Matlab

Once the images have been captured (in **bmp** format) it is necessary to extract from them the face area and discard the background. This process can be carried out by using the Matlab function **trim_face.m**

```
function trim_face(file_in, name_out,tx,ty)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% function trim_face(file_in, name_out,tx,ty)
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%file_in ---> input image name (Image001.bmp)
%name out --> output image name without the extension, e.g.: face1_1
%tx  --> trimmed image width, e.g.:92
%ty --> trimmed image high, e.g.:112

image=imread(file_in); %reading the input image
figure(1)
imshow(image)  %visualization of the image
[cx,cy]=ginput(1)  %center image capture (NOSE)
clear new
new=image((cy-ty):(cy+ty),(cx-tx):(cx+tx),:); %new image

file_out1=sprintf('%s.jpg',name_out) %name of new image
file_out2=sprintf('%s.pgm',name_out)
imwrite(new,file_out1) %save new image in color in JPG format
imwrite(new,file_out2)%save new image in grayscale in PGM format


figure(2)  %visualization of the new image in both formats
imshow(file_out1)
figure(3)
imshow(file_out2)
```

Such function is used as follows:

>> trim_face('Image001.bmp','face1_1',120,150)

After calling the function, the computer will display the image and will wait for a mouse click: you should click approximately on the nose area of the image, so that all the new, trimmed images will have the nose in their centres. Two trimmed images will be automatically created: one of them in **jpeg** format and the other one in **pgm** format. The size of the images (width and heigth) is selected when calling the function (third and fourth parameters). *Figure 3* shows how you should click on an image.
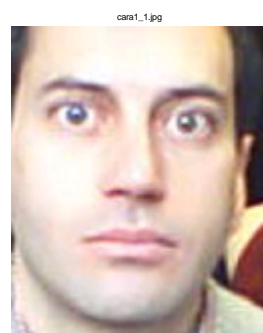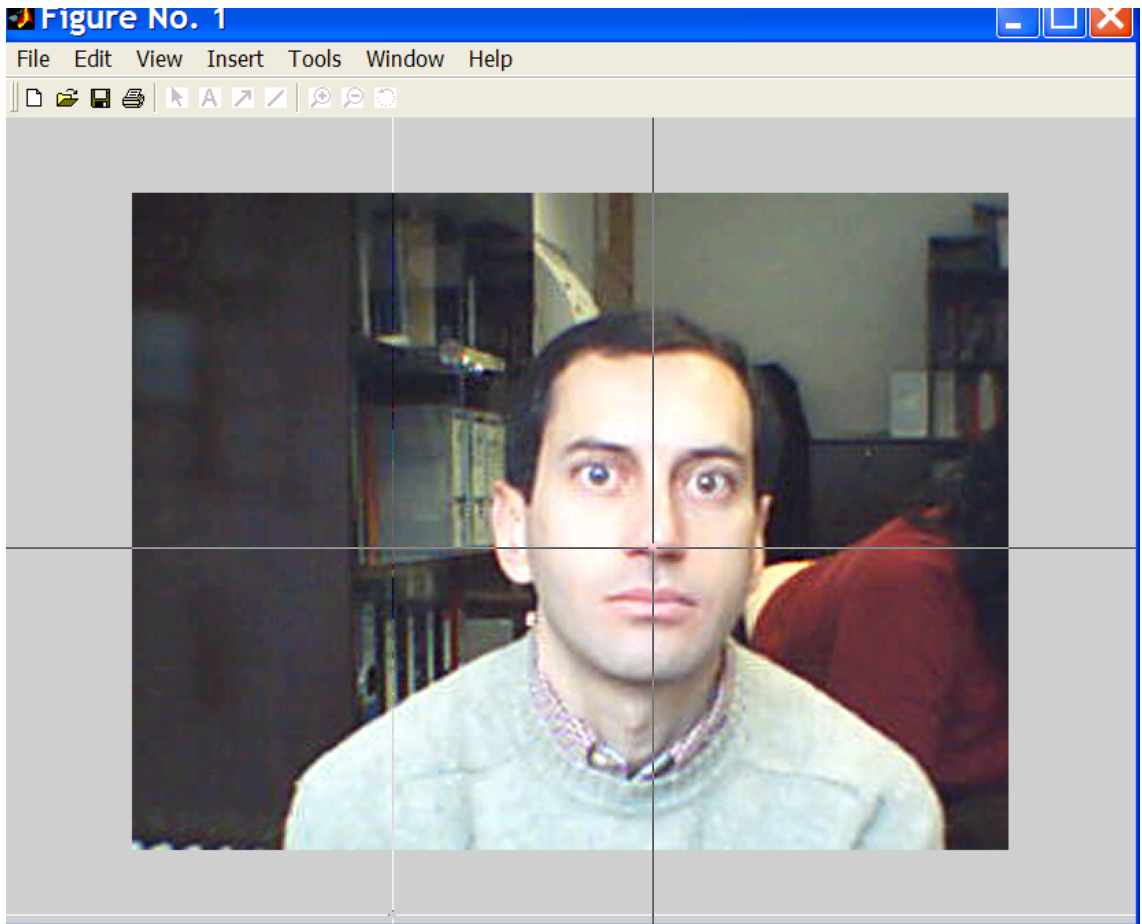
Figura 3: Initial image and nose-centered trimmed images.

2.1. Normalization

In order to build a database as uniform as possible, all the images will be captured at the same distance (70 cm.).
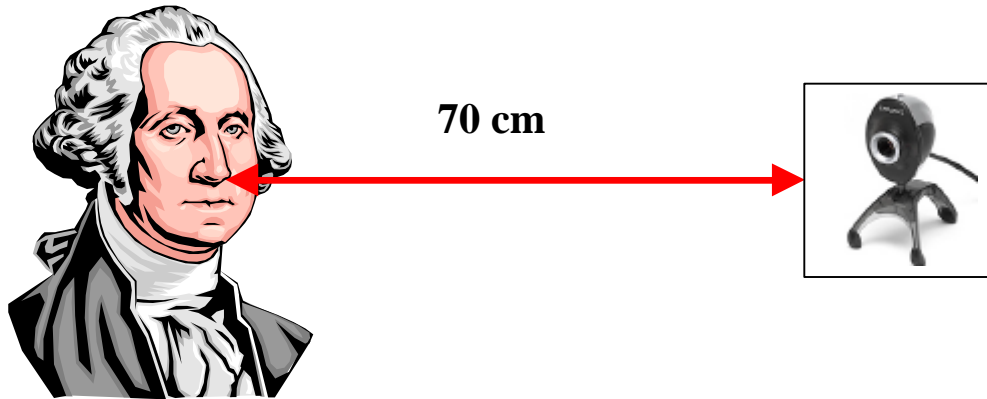

Figura 4: Normalization

And, in order to keep such uniformity, the size of the trimmed images (third and fourth parameters of the function) will always be **120** x **150**.

2.2. How many images per student?

20 images will be captured per student, in two different scenarios:

- First scenario:
  - **10 images with white background**, numbered from **1** to **10**.
- Second scenario:
  - **10 images with non-uniform background and/or occlusions** (partial face occlusions due to sunglasses, scarfs, caps, etc.), numbered from **11** to **20.**

Each processed (captured and trimmed) image will be labelled as **faceA_B**, where **A** corresponds to the student number and **B** to the image number (e.g. student #1 will have the following images: face1_1, face1_2, ..., face1_20).

Important: facial expression or gesture should be slightly different between images of the same student (smiling, serious, looking upwards or downwards, etc.)

Final images (trimmed) will be saved in the previously created folder (e.g. *D:\CSCS\PR\P2*) and afterwards they will be uploaded to the seminar web page following instructions that will be given during the practice.