Practicum Computational Vision

Practicum 2: Edges and contours (Part II)

This session will exercise linear filters, hybrid images and edge operators.

2.1 Hybrid images construction

Given the images Einstein.jpg and Monro.jpg, build a hybrid image from them and view it at different scales to obtain the visual effect of hybrid images.
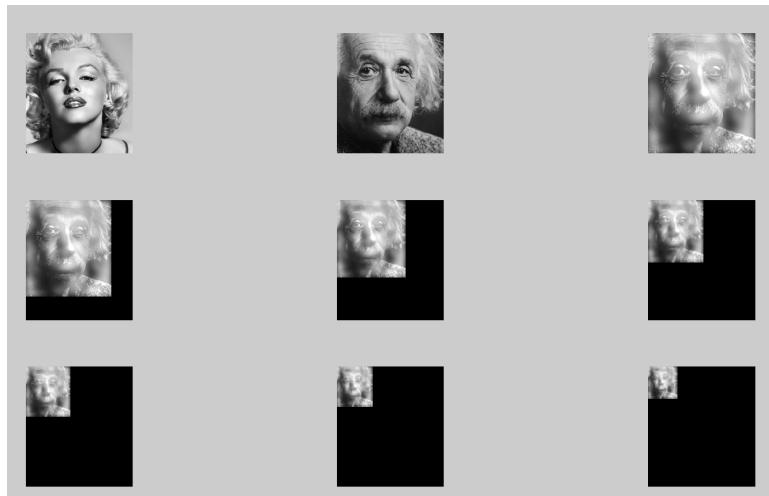

Fig1. Hybrid images

<u>Help</u>: Applying a smoothing on an image I, we are applying a "low-pass" filter. Let us call the remaining image L(I). If we subtract the filtered image from the original image, we obtain the high frequencies H(I) of the original image, i.e. "high-pass" filter:

$$H(I) = I - L(I)$$

A **hybrid image** is constructed by adding the low frequencies ("low-pass") of an image to the high frequencies ("high-pass") of another image:

$$Hybrid(I1, I2) = L(I1) + H(I2)$$

Explore the construction of the hybrid images using different scales of smoothing. Shell the low frequencies and high frequencies be obtained by the same parameter sigma? Interchange the images and show the resulting hybrid image.

(<u>Optional</u>) Build hybrid images from other images. Apply the effect to color images.

2.2 Determine the optimal edges

Read the image "starbuck.jpg" and find its edges. Apply the different operators and find the optimal parameters for each of them. Overlap the edges on the image

as shown in Fig.2 (right). How many ways do you know to obtain the edges of the image?

Fig.2 Original image (left), edges extracted (middle) and overlapping of edges and original image (right)

Which is the best edge detector? Which are the optimal parameters of this operator for this image? Repeat the experiment on 3-4 other images. Discuss if the parameters should be changed. What are the advantages and disadvantages you see when extracting the edges on the different images?

2.3 Enhancing images with edges

Overlapping edges on images are sometimes used in order to enhance the main structures of the images, perceive better the motion of the objects and for other visual effects. Enhance the edges and overlap them on the video Maldives.mp4. Show the video with the extracted contours as movie. Discuss which is the best way to obtain the edges and check which are the best parameters. What advantages and disadvantages do you see on the obtained effect?

Fig.3 Visual effects by enhancing edges in images

Deadline: November, 20, 2015. This part will be delivered as a zipped file with separate functions corresponding to each exercise (ex21,ex22,ex23) together with part I (6.10.2015) and part III (10.11.2015).