

EE569 Digital Image Processing (Fall 2011)

A. Face Warping

After filling in the hole, you now have two images: YOUNG_MAN and TIGER, each of size 500 x 400. Before conducting facial morphing, the coordinates of key feature points on each face need to be properly aligned. **Please select proper control points for the alignment of facial features.** The control points will divide the image into different triangular regions, and spatial warping will be conducted in each sub-region.

If the feature (e.g. eye, nose, lips) you select is located at (x_m, y_m) in the YOUNG_MAN image and (x_t, y_t) in the TIGER image, then after spatial warping they should be both align at $((x_m+x_t)/2, (y_m+y_t)/2)$. Fig. 2 shows the warping process for the feature "eye-center-point" ("ECP" – the middle point between two eyes).

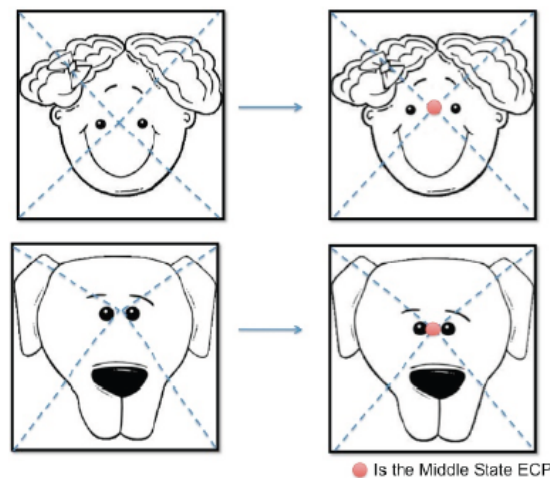


Figure 2: Illustration of using eye-center-point as control point for spatial warping

Describe the details of your selected control points in your report. This should include what types of feature you have selected and the total number of control points. Print out your result for both images after facial warping.

B. Face Morphing

After performing face warping, the key feature points of both images are well aligned. To complete facial morphing, the next step is to do cross-dissolving between the two images, which is described as following:

$$I_{out}(i, j) = (1 - \alpha) \cdot I_{man}(i, j) + \alpha \cdot I_{tiger}(i, j)$$
$$0 \leq \alpha \leq 1$$

Increasing the value of α from 0 to 1, you will see the gradual transformation from YOUNG_MAN to TIGER. Please print out the intermediate image for $\alpha = 0.2, 0.5$ and 0.8 , and discuss your morphing result. Is the transformation smooth and reasonable? Why? How could the morphing result be further improved?

C. Back to 27

Time, which changes people, does not alter the image we have retained of them (see Fig. 3).

Your implemented morphing algorithm should be robust enough to easily handle other morphing tasks. Please use the control points (same feature, but different coordinates) to conduct morphing from an old man (man_old.raw) to his facial portrait taken several decades ago (man_young.raw). Please print out the intermediate image for $\alpha = 0.2, 0.5$ and 0.8 .

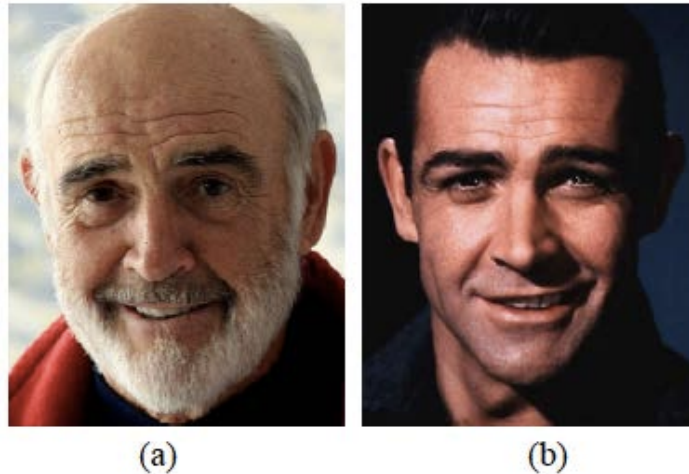


Figure 3: Component image for Problem 1(d): (a) man_old.raw, (b) man_young.raw

D. Video Morphing

In this additional problem, you are encouraged to improve the facial morphing result using your own approach. You may freely choose the subjects for morphing. You can morph your preferred subject (e.g. your own photo) with any other person/animal/object or any “thing” that your imagination allows. Be Creative!

Make a short video out of the facial morphing results. The length of your video is preferred to be within 10~15 seconds. The top 5-10 videos will be granted 5 bonus points and showcased during lecture/discussion.

HINT: Using software such as ImageJ, you can create a morphing video out of your images. In ImageJ, you may simply open all files in the folder (“Import” > “Raw” > choose any image in the folder > check “Open all files in Folder”), and save it as an AVI file.