REPORT

COL783- ASSIGNMENT 2

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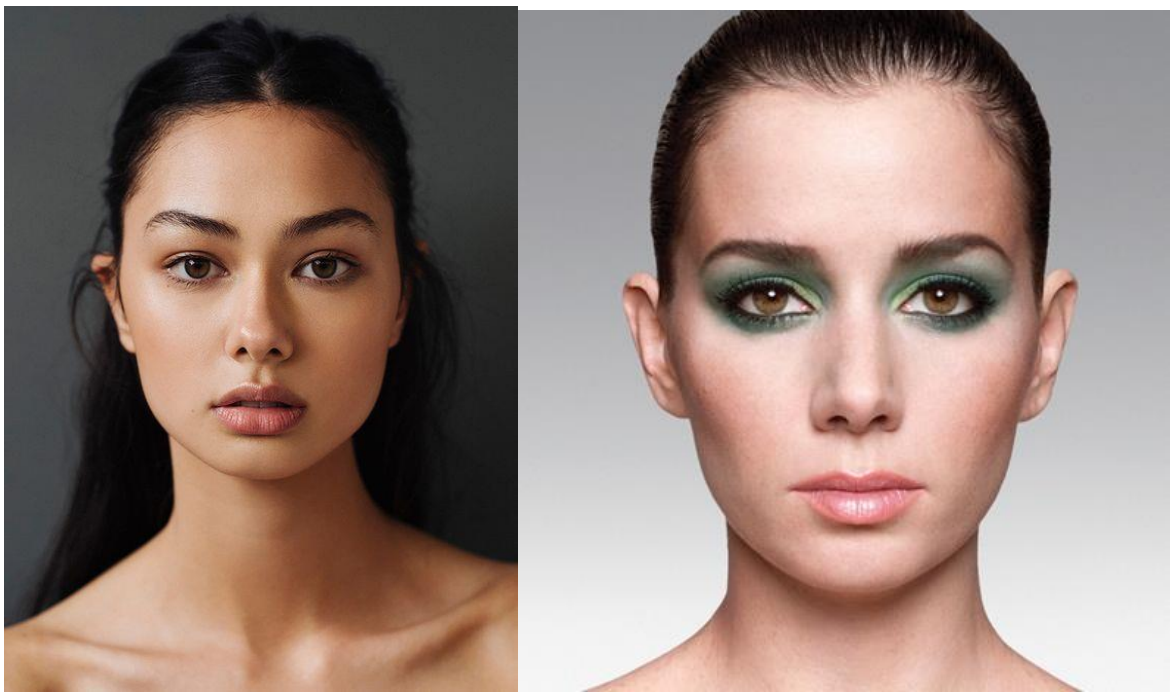
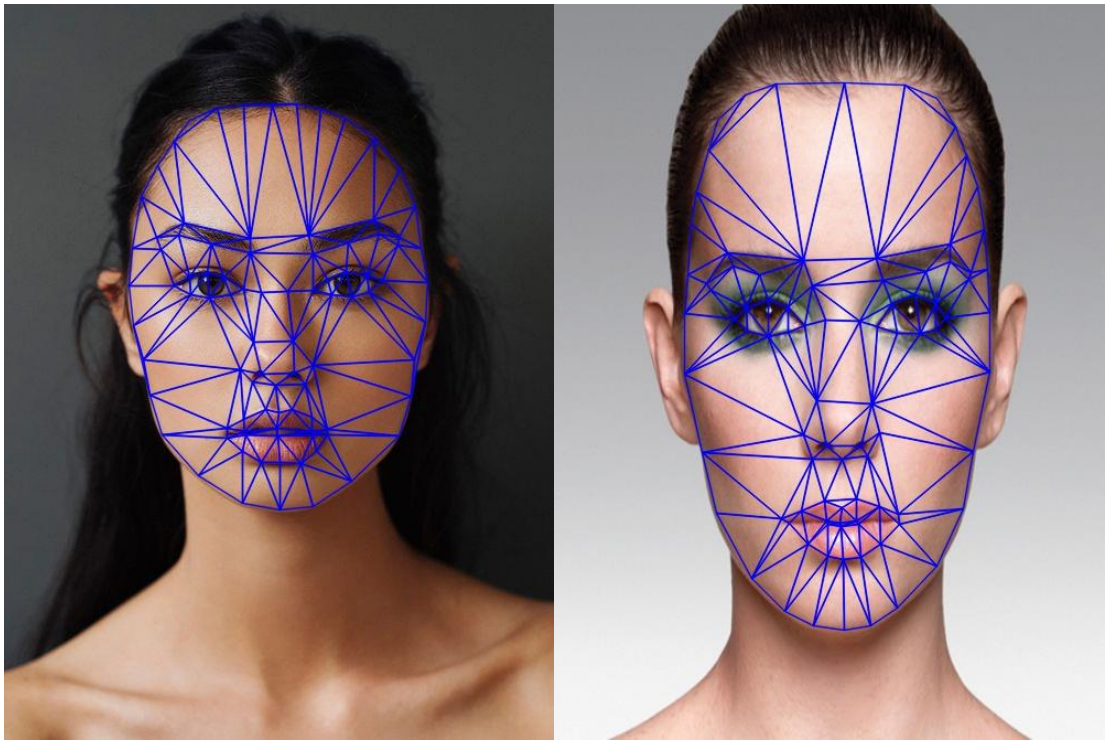
----Digital Face Makeup Transfer from source image to target image----



(Target) (Source)

Step 1: Resized the source image to match the shape of the target image. Manually selected 91 points of facial features including face boundary, eyes, lips, eyebrows and nose. Used the points on the target image to warp the source image using Delaunay Triangulation (triangle method as explained in class). Used these points to form a smoothed beta and a C function for marking the feature points on a matrix.

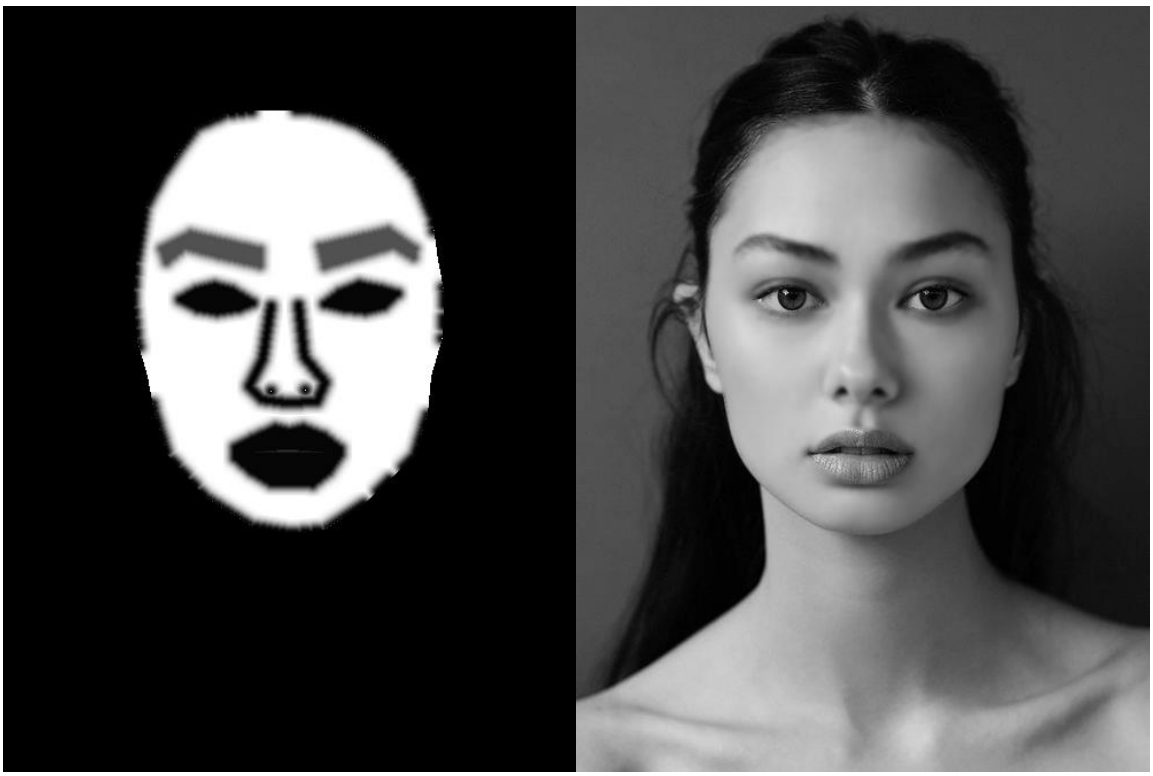


Since we take all the 91 points manually, we have to be very careful while choosing them. Libraries like dlib simply were not providing enough accuracy in point selection.

(warped source Image)

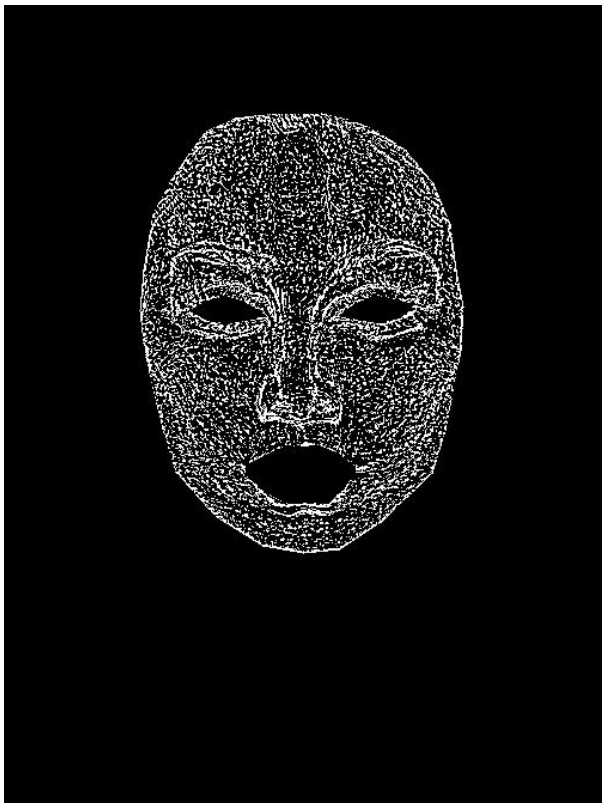
Step 2: Implemented bilateral filtering (edge preserving smoothness) on the L channel of both the target and warped source image. Subtracted the L* channel obtained from the L* channel of the original images. We have now obtained the skin details of both the images. Transferred

the skin details from the warped image to the target image by linearly adding both the skin details.



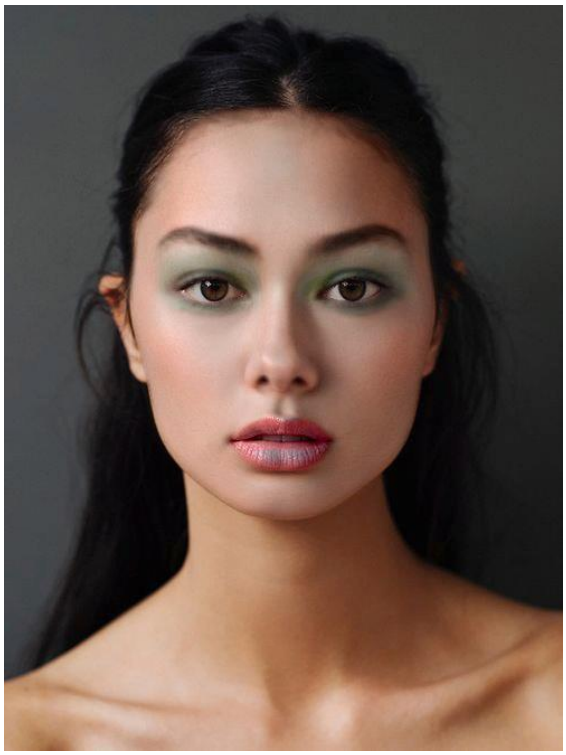
Beta function Smoothed target

The beta function implemented runs 4 loops and thus takes about 4 mins to complete. The smoothing is very subtle and the beta function retains its main form.



(skin details)

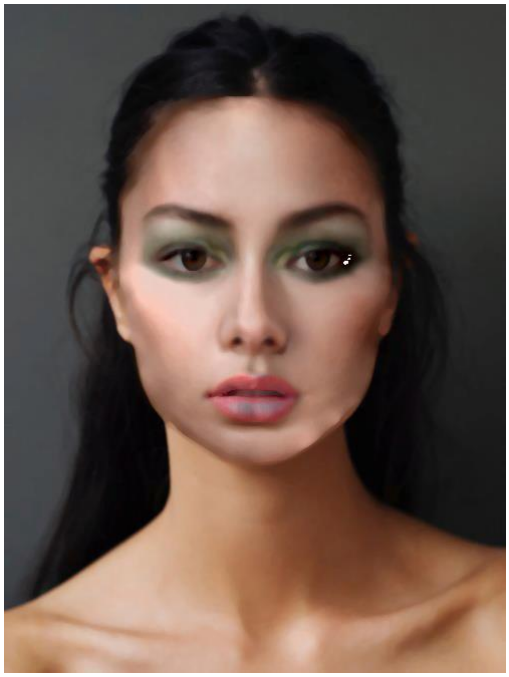
Step 3: Implemented colour transfer (i.e., blended the colour of the source image into the target image by linearly adding the a* and b* channels.)



(output after colour transfer)

The colour transfer is such that the eye and mouth cavity region is untouched but the colour on the remaining face is linearly combined from the source and the target.

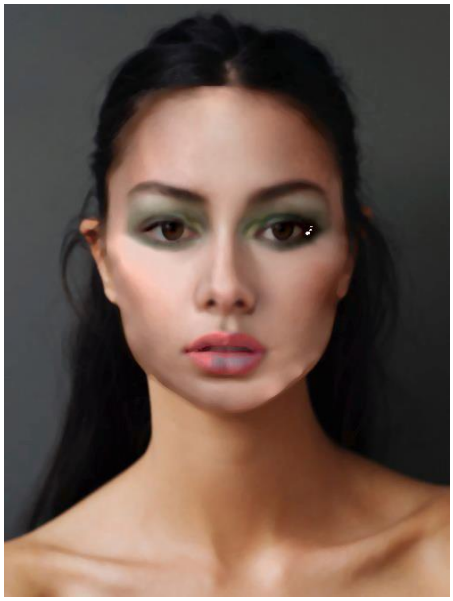
Step 4: Convolved x and y gradient kernels of Is and Es, then applied the if-condition as given in the paper to form the resultant mixed-gradient matrix. Took the points belonging to skin from this and made a linear array (B). Took the sum of x and y gradient convolutions of this resultant to get Laplacian of image. Formed Laplacian operator (A) by using Dirichlet-Boundary condition. Used function ‘cg’ from SciPy to solve Ax=B for x. Replaced points from x in target image and applied median filter at boundary (to remove boundary error).



(after shading transfer)

The shading transfer was difficult to implement and is very sensitive to the values input in Lx=B to solve for x. One big reason for this less than perfect output is that the solution of the equations accn to the boundary layer was not precise. We applied luminance remapping with respect to original points in order to get the correct intensities. Thresholding below 0 and above 255 was also done.

Step 5: In lip makeup part, I need to fill each pixel of resultant image from reference image guided by the subject image. For each pixel, I need to find the corresponding pixel which is as close and as similar to that pixel. Minimization of the gaussian expression yields the adequate position of the pixel to fill. We can fill the a* and b* channel using this pixel which we computed earlier using the minimization of this term.



(after lip make-up transfer)

This function iterates over all the lip points in two for loops, so quite some time (2-3 mins) is required to complete.

In the end we can see that we have avoided transfer of eye colour. The skin texture and structure have been changed to match that of the source image.

X-DoG: First we find an image which is a difference between the image convolved with a gaussian kernel of standard deviation σ and the same image convolved with gaussian kernel of standard deviation of k*σ. Then we threshold every pixel using the tanh function and appropriate ϕ, ϵ parameters as mentioned in the x-dog paper.