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Digital Makeup

Face Morphing with Feature Transfer

Subject Image

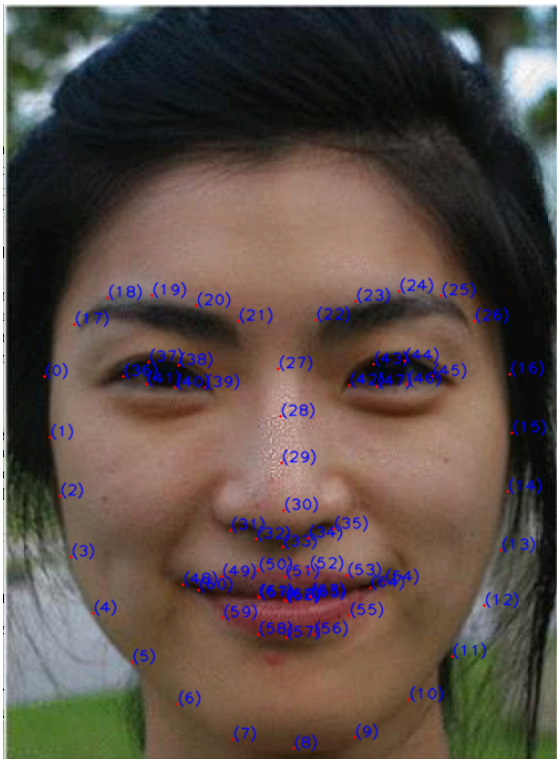
Target Image

The makeup transfer happens in the following pipelined stages :

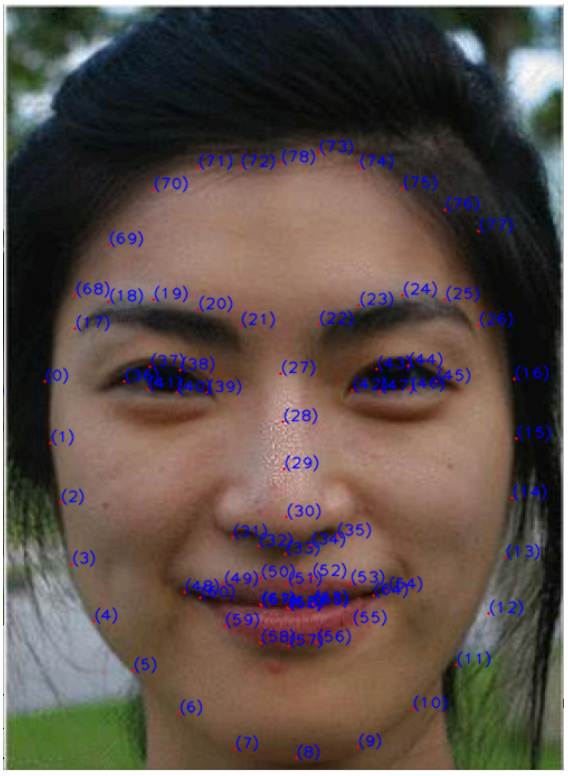
- Facial Alignment
- Layer Decomposition and Masking
- Color Transfer and Skin Detail Transfer
- Highlight and Shading Transfer
- Lip Makeup

Facial Alignment

"dlib" framework provides 68 feature points on the face



Points from DLIB



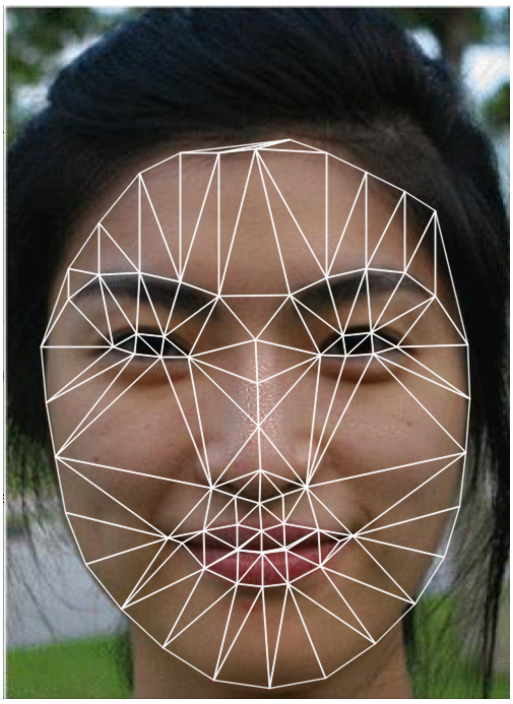
Forehead points added

The 11 forehead points are obtained by extending the points on eyebrows and top of the nose until a large gradient is observed (due to hairline).

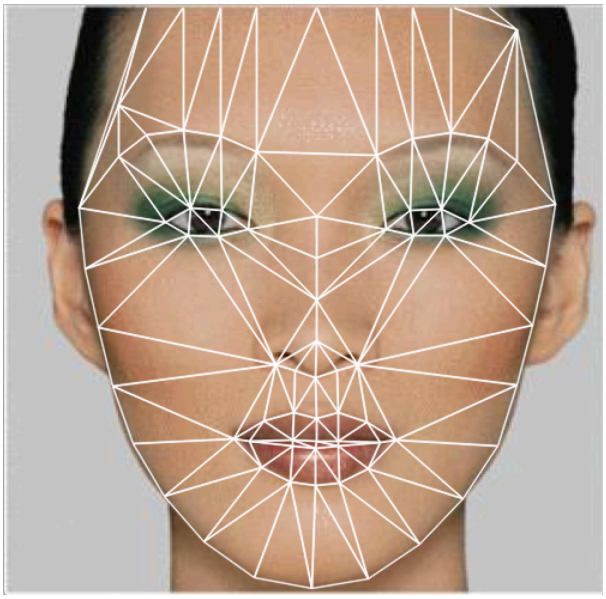
We also allow manual edit of points, if required.

Facial alignment occurs through warping of target face to subject face by using these facial points.

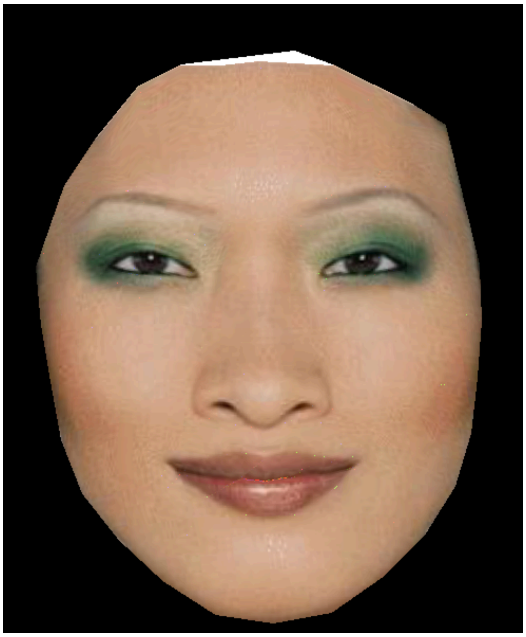
Warping implemented by Delaunay Triangulation



Delaunay Triangulation of Subject



Delaunay Triangulation of Target



Target to Subject Warp

Layer Decomposition and Masking

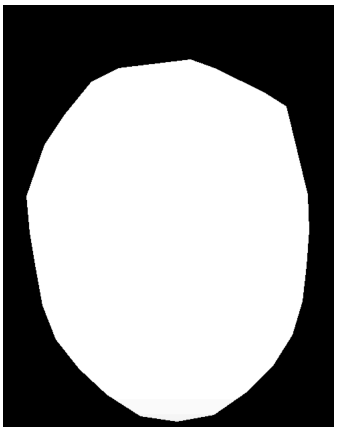
- Image is decomposed into color(C) and lightness(L) channels.
- L = base + detail
  - base = Bilateral_Filter(L)
  - detail = L - base

Skin base represents face structure and overall texture, whereas skin detail represents the finer details which get concealed by foundation and powder application.

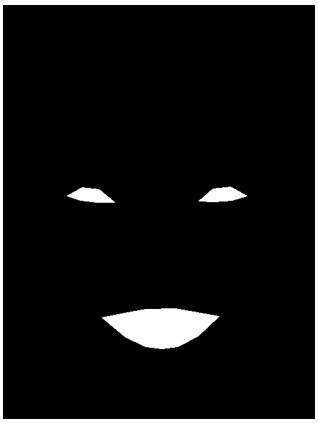
Desired Mask :

- Eyes - Untouched
- Lips - Pixel transfer
- Blue - Blending and makeup transfer

Whole face



Eyes and Mouth



Color and Detail Transfer

Color Transfer (alpha-blending) coefficient = .8

Subject skin detail coef. = 0, Target skin detail coef. = 1

Highlight and Shading Transfer

base = gaussian + laplacian

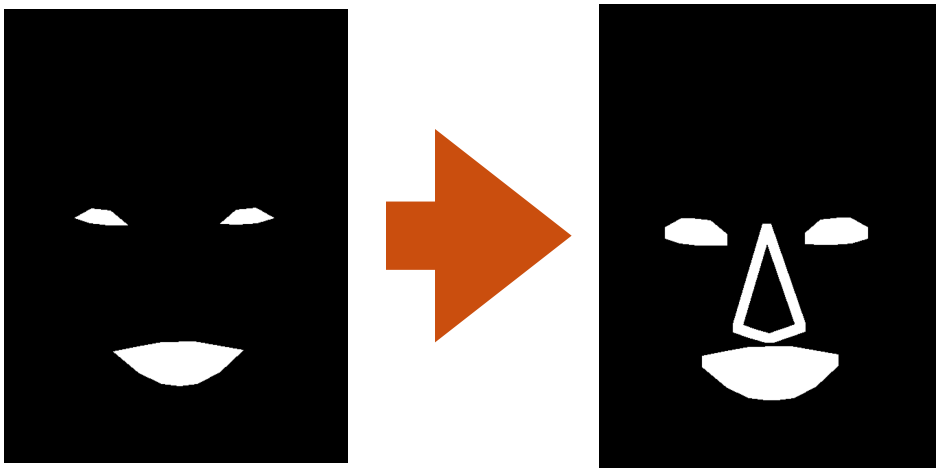
- gaussian = (next gaussian pyramid level of base) * (magnified by 2)
- laplacian = base - gaussian

This step of transfer happens in the laplacian layer. So details of cheek and forehead and transferred from the target to the source (i.e. foundation and powder effect)

Mask used -

- Eyes and mouth are dilated
- Contours of the nose

- We only want to transfer the laplacian around cheeks, forehead, etc., not around the eyes, mouth or nose since they contain the characteristic features of the subject.



Left: Original base layer of subject, Right: Base layer after transfer

Lip Makeup

First the target image (E) is warped and the luminance is remapped to equalize it with the luminance channel of the subject image (I).

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l_E = (l_I_std / l_E_std * (l_E - l_E_mean)) + l_I_mean
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Just like color transfer algorithm done in the previous assignment, the best match is found using the gaussian function in distance and luminance value (as mentioned in the assignment).

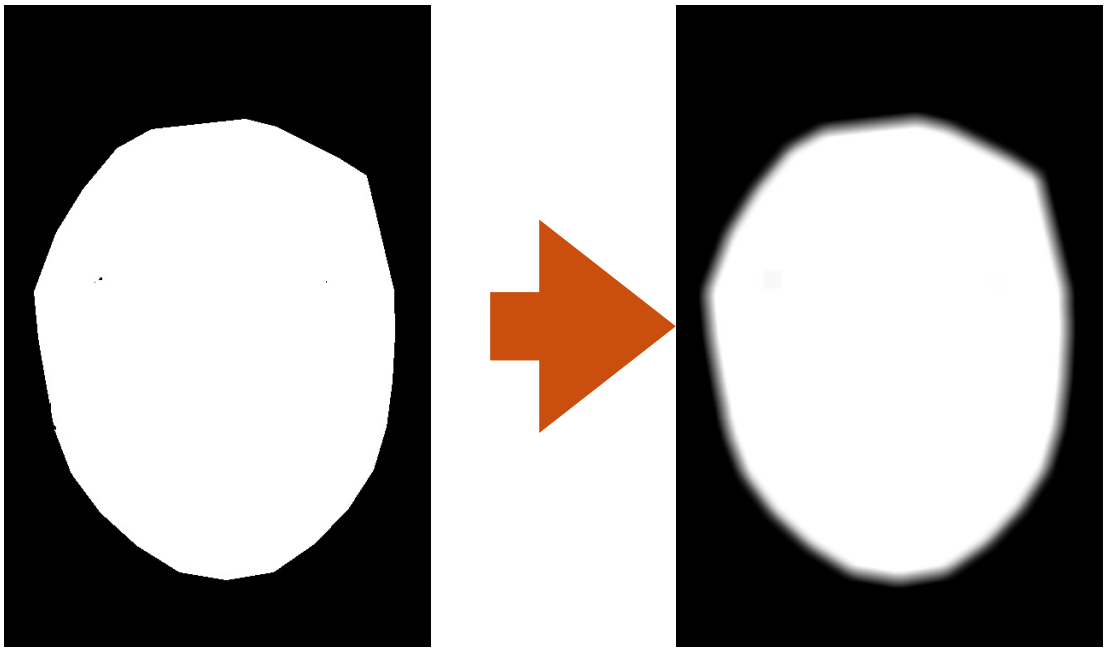
Left: Prior to Lip makeup transfer, Right: After Transfer

Random Sampling: To reduce the completion time random samples were used instead of matching with all the pixels in the target image. Also a threshold value is used to find an acceptable match. Reducing the threshold gives the result faster but becomes slightly inaccurate.

Reducing sharp edges

After the makeup procedure is complete some shortcomings are clearly visible. The most prominent one is the presence of sharp edges on the face borders.

To remove them, the new face was laid over the original image with a fading border.



Final Result

Left: Before overlay blur, Right: Final Result after the overlay blur