

## Assignment 2 Report: Digital Makeup

In this assignment, we aim to transfer makeup from one image to another.



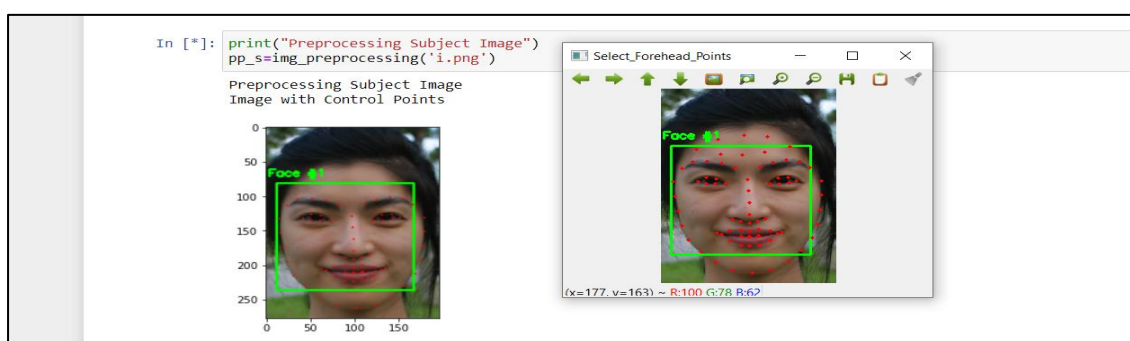
Make up Image



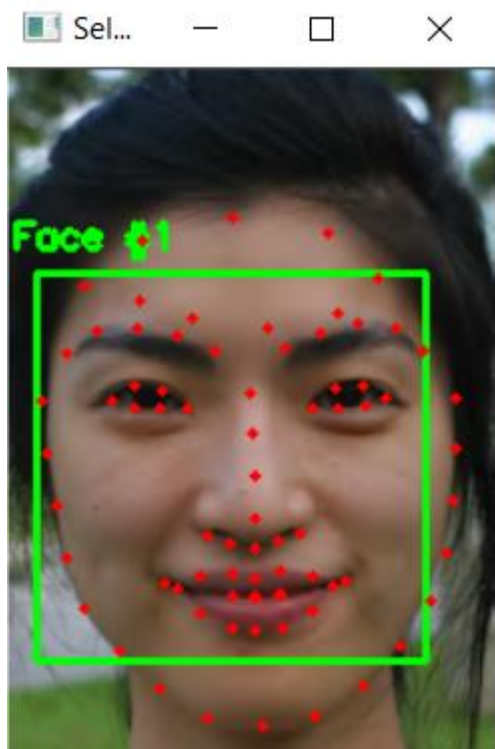
Subject Image

### Warping

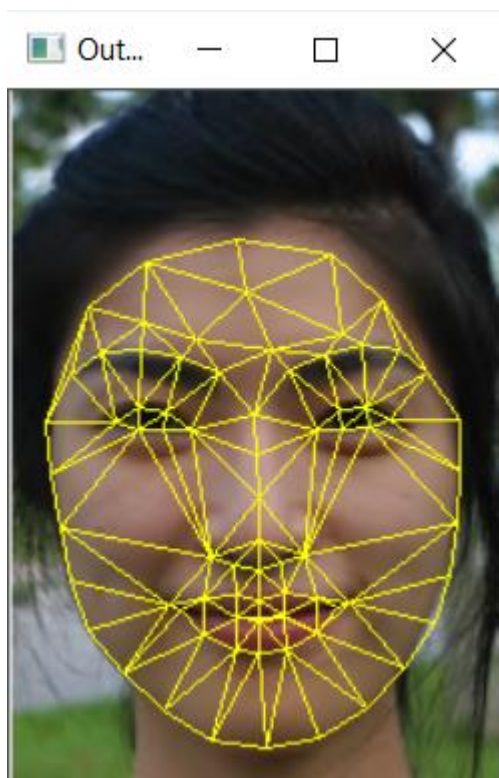
We warp the example image similar to the subject image. We start with warping the image so as to dimensionally align the faces to ensure similar spatial placement of corresponding features in subject and example image. We do this by first selecting 68 control points for both the images using **DLIB Face landmark detector**. This however doesn't contain any points in the forehead region. So additional 10 forehead points were selected manually using a **visual interface** developed using **OpenCV**.



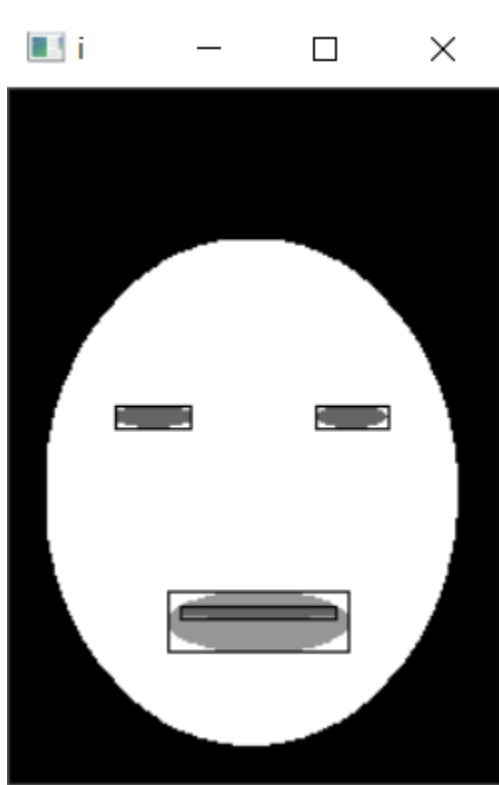
Then triangles were created on the image using **Delaunay Triangulation**. This was done using the OpenCV function **cv2.subdiv2**. We then created a region locator matrix, same dimensions as the source image, to identify different regions. Note that this method is different from the one described in the **digital\_face\_makeup.pdf**. Different regions were defined by the regions enclosed by specific control points. Rest of the control points are for skin region. **cv2.ellipse** and **cv2.rectangle** were used to mask these regions with appropriate intensities. Finally, warping was completed using barycentric coordinates.



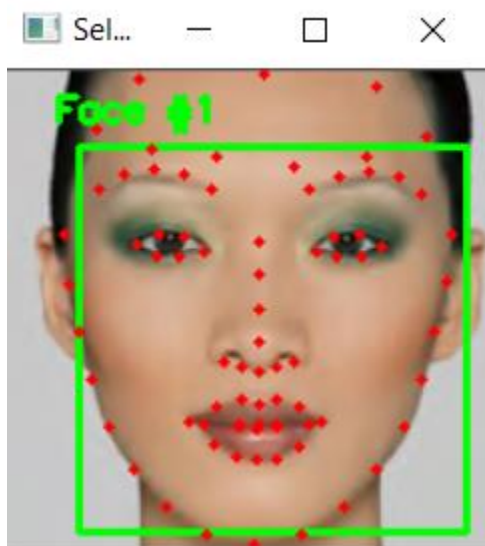
**Control Point Detection**



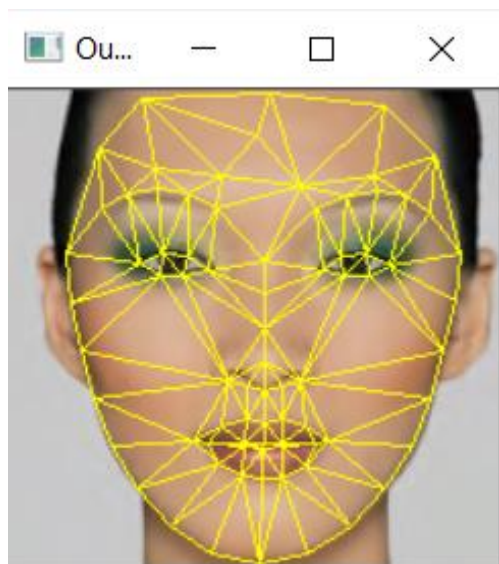
**Delaunay Triangulation**



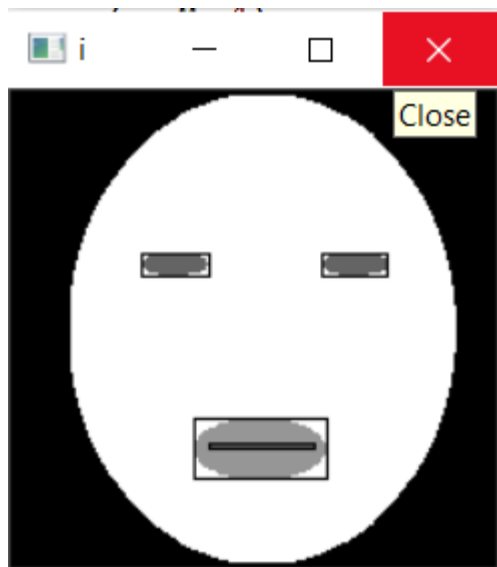
Masking different regions for transfer



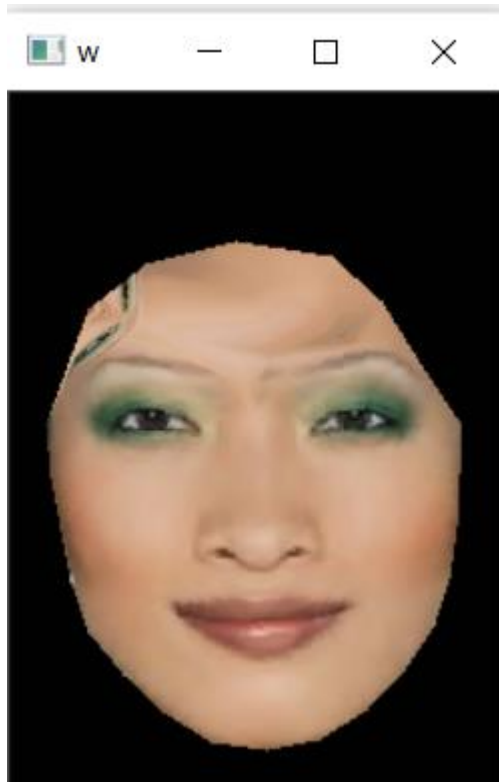
Control Point Detection



**Delaunay triangulation**



**Masking different regions**



**Final Warped image**

## Transfer

The images were then converted into LAB form so as to split intensity(L) and coloured components(A,B). The intensity region was used to find the face structure layer using bilateral filtering. The skin detail layer was also found by subtracting face structure layer from L layer. The final skin detail layer was found by simple linear interpolation of subject and example layers, with 0 and 1 as the weights correspondingly.

Colour transfer was done using alpha blending, for regions other than eyes and lips.

Processes following this such as Face structure layer transfer using Poisson image editing were told to be omitted as it gave blurry results



**Final Transfer Image**

XDoG was also implemented to extend the assignment



**Xdog Subject**



**Make up on Xdog**