Report: Assignment 2

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Warping

Dictionaries are made for each subject and example image with the points labeled and their corresponding coordinates. Points are chosen using the points shown by Sir in one of the lectures while explaining the warping of the face of a woman and the face of a tiger. To warp the face area, these points are taken, and apart from that, points are decided manually for warping the ear and hair area with the four extreme points to set the background.
An array ‘triangles’ is created and each triangle of the triangle mesh is added to this array so which is later used to warp the triangles individually.
When warping a triangle, the corresponding triangle is simultaneously added to a white-initialized image so that when all the triangles are warped, the whole warped image has been formed.
The results of warping are shown below:

Subject image

Example image

Warped image:

Changed image: 

We can see in the example image has shifted a little bit to the left as the subject image is on the left side.

Layer decomposition

Firstly, the images are converted to lab space using the cv2 module's functions. Then the lightness layer is separated from it and the bilateral filter is applied to it to create the largescale layer. After this, the largescale layer is subtracted from the lightness layer to create the detail layer of the images which is used to give texture to the subject image. Similarly, the colors are obtained by using the a and b channels from the lab space.

Makeup transfer

First we decomposed the the subject's face and the example's face into 6 different regions using the get_frontal_face_detector() which are { **left_eye, right_eye, mouth, lips, skin, left_eyebrow, right_eyebrow },** we have ignored the forehead in detector because it is not specifically used in any function else in this the direct alpha beta values are passed.

Color transfer :-

-> In this we have created a mask around the eyes and cavity and then we will see the final subject image and if the pixel lies in this area then we will blend the subject image color and example image color with alpha = 0.8

Lip color :-

-> In this we have created a mask around the lips and then we will see the final subject image and if the pixel lies in this area then we will pass the alpha beta values of the wrapped example image

Highlights :-

-> In this we will look at the complete image and if there is drastic change in the luminous level then we will give the values of the pixel of the example image else keep it same.

Layer composition

All the new channels l, a, and b are now used together to form a new image that has the face of the woman in the subject image but the makeup of the example image. This lab space image is then converted to BGR space and the final image is saved.

XDog

The formula used to apply XDog on the subject image is:

$$S_{\sigma,k,p}(x) = \frac{D_{\sigma,k,p}(x)}{\tau - 1} = G_{\sigma}(x) + p \cdot D_{\sigma,k}(x)$$
$$= (1 + p) \cdot G_{\sigma}(x) - p \cdot G_{k\sigma}(x)$$

Then this sharpened image is multiplied by the original image and then the resultant is thresholded using the following thresholding function:

$$T_{\varepsilon,\varphi}(u) = \begin{cases} 1 & u \geq \varepsilon \\ 1 + \tanh(\varphi \cdot (u - \varepsilon)) & \text{otherwise.} \end{cases}$$

After applying xdog on subject image,