Assignment 2

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1   Introduction

Using color manipulation or color transfer effectively can make images more detailed or eye-catching. In this assignment, I tried to transfer colors from target image to source image through Reinhard color transfer method. Then I tried the same method by dividing the images into regions to find best matching regions hoping to get better results compared to the first. Also different region sizes are included on the results.

2   Experiment

2.1   Part 1

In this part, steps on below were followed.
Both images'
1- color spaces were converted BGR to lab format.
2- channels were splitted as l, a, b.
3- mean and std were calculated by channel for source image.
4- calculated values' subtract from original channel values for source image.
5- new channel statements were calculated using std and mean values of target image. (formulas on pdf or scale_img function)
6- new channel values were adjusted if the values not in range 0, 255
7- channels were merged to reach solid image.

We can infer that target images decrease the values of source image' channels by looking the objects, sky and water regions. Also saturation of the target images effect the source image can be inferred by means of the sky and red tones vividness (especially sample 3).

2.2   Part 2

In this part, we need to divide both images into regions to find a similarity between different regions of both images. Then we transfer colors considering those similarities.

1- Dividing scales are defined as 25, 49 and 100 pixels.
2- Both images' dimensions are adjusted by the scale to divide properly.
3- Each region of the source image is compared to all regions of the target image.
4- Best result indices (which regions are) are matched by using SSD.
5- Part 1 phases are applied the matched regions using that indices.

RESULTS
source image - target image - part1 result (respectively)
25 pixels scale - 49 pixels scale - 100 pixels scale (respectively)

Results of image 11

If we specify the scale minor, image integrity is distorted. If we specify major then color transfer can not be as good as the minor one. So we need to meet in the middle. Even though we meet the middle the image integrity is the main problem of diving image into regions. So this method needs to be arranged or we need extra methods to smooth the image out.

For all that we can observe the color transfer quality by looking the eye color difference between part 1 result and part 2 results. Even in 100 pixel scale the eye color much better than part 1 result.

Results of image 3

In these results we can see that if we specify the scale minor, similarity regions might be irrelevant because of the multitude of buildings and their windows.

Scaling 25 pixel shows that the image is intertwined because of both the minority and the image complexity. As the scale grows, lighter parts of the source image are starting to show similarity to the skies so it turn into blueish.

Results of image 1
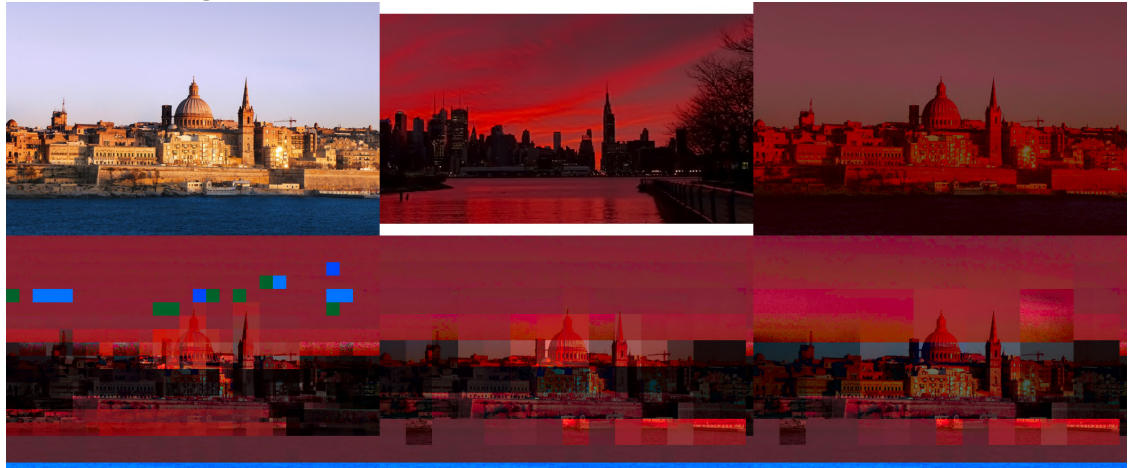
In this source image, we can observe 3 different specific area as sky, buildings and the sea. So dividing regions might be logical in theory at first but sharp transition parts like sky to building or building the sky increases the distortion.

Nevertheless, in the 100 pixels scale there is a good part of distinction. Building details and the sky just above the buildings are much better than part 1 result. However, the integrity emerges again and part 1 result beats the rest. Therefore good combination of these or some additions are needed.

2.3 General Concept
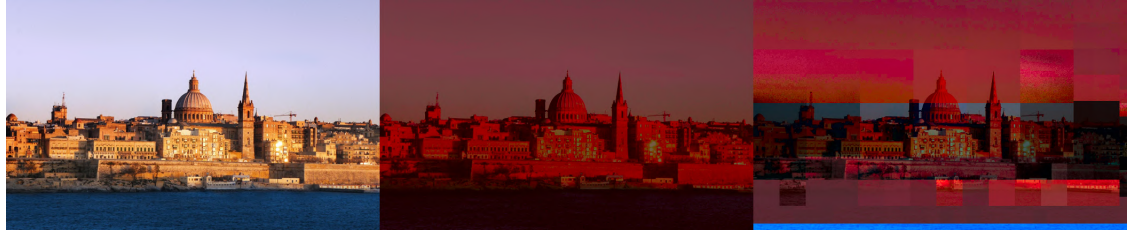
In the images above, clearly seen that without regions the image more integrated but middle regions in the last picture got the colors appropriate. However, regions' borders distort all the image annoyingly.
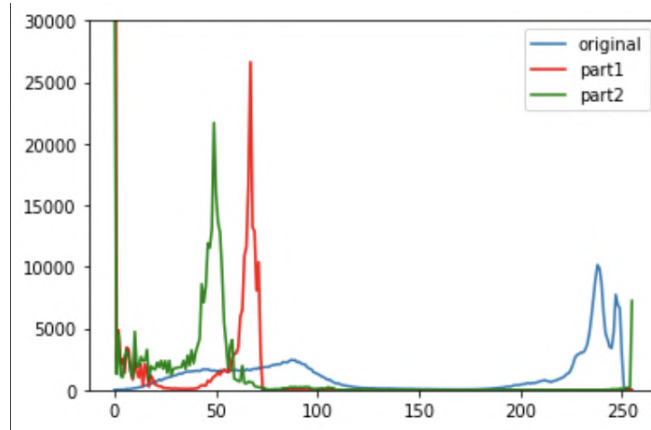
In the graph above, original image has much more light range than the others because of the sky part. Also sea region of part1 image is the darkest area and shows itself on 0-30 range. Side regions of part2 image is the same range with the sea region of part1 image. The peak points of part1 and part2 images represent the sky regions and difference between them can be seen clearly both on graph and first glance.

2.4 Conclusion

Applying only part 1 methods quite satisfying except a few inputs. When more specific transfers are required then part 2 methods can step in on condition that applying extra smoothing techniques.