

COMP 9517
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Assignment 1

Task 1

1. Read one COLOR_BGR image and one GRAY image.
2. Use the split function in the OpenCV to split the COLOR_BGR image into imgB, imgG and imgR.(Three one-band images with only Blue, Green or Red).
3. Use two for-loop to operate each pixel.
4. As requested, use the addweighted function in OpenCV to get the calculated pixel value. This part is divided in two steps. The first is that combine the img_R and img_G with corresponding weight 0.299 and 0.587. The second is that combine the img_I which is the result of the first step and imgB. With corresponding weight 1 and 0.114.
5. Write the resultant image into img_I.

The result image is the grayscale image that calculate the pixel value of each point as required. In the calculation part, after the number is exceeded with cv2.addweighted, it will not overflow and will become only the maximum value (255), but number will overflow by numpy.



Res_1_dog

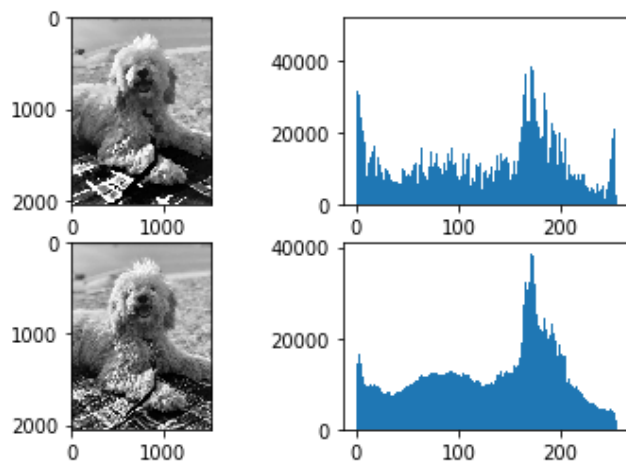


Res_1_rail

Task 2

1. `img_I` is the GRAY image. `img_J` is the new image which all pixel value is zero.
`reflect_img` is the padding image of the `img_I` which use the reflect as the padding way
2. Use two for-loop to operate each pixel.
3. Use ROI to choose the operated area in the `reflect_img` and use `cv2. calcHist` to analysis the ROI.
4. Convert hist array into a list, use the `max` and `index` function to Find the max value (the value in the y-axis in the intensity histogram, also the most frequent), then replace the value to the center point in the window.

With size of window growth, Images are becoming more generalized. The difference between pixel value in a window is getting smaller and smaller, and it is easy to form a bright or dark area with a large area. The picture seems to be less sharpe. In `res2_rail_5x5`, the outline of the window is still relatively clear. But the pixel value in a window is close to the same, this phenomenon is especially obvious when the window size is 17.



The first line is the result graph and the second line is the original image.

According to the histogram, the pixel value distribution of the original image is more smooth, and the pixel value of the result is more concentrated.



`Res2_dog_5x5`



`Res2_rail_5x5`



Res2_dog_17x17



Res2_rail_17x17

As shown in the figure, when the size of the window is 29×29 , the pixels in the same window is approaching the same. The area will become as the color block and most part is light or dark. Through the comparison between dog and rail, the more distinct the color (The frequency of the color change is high or the color change is greatly different from the two neighboring colors.), the greater the degree of change.



Res2_dog_29x29



Res2_dog_29x29

Task 3

1. `img_G` is the original image
`img_J` is the result of the task 2 and operated with the same window size
`reflect_imgG` and `reflect_imgJ` is the padding image which pad 30 pixel in four directions using the reflect way
`img_B` is the copy of the `img_G` and also the result of the task 3
2. Sum the same pixel value's B, G, R in each window
Calculate the average b,g,r and assign values to the corresponding points in `img_B`

Maybe the size of the original image is too large, so the oil painting effect of the thumbnail is not obvious. So the size of the window changes from 5, 11, 17 to 5,17,29.

When the window size is 29*29, the effect is more significant, mainly reflected in:

- The number of color type is less than the original image
- Unnatural transition between color block and color block, and sudden change in color depth
- The edges of the color blocks are not neat, the gradual process between the whole areas is more obvious

For example, in the rail diagram, as the window size increases, a window becomes a uniform color block because of the huge color difference between the window and the adjacent wall. And two color-blocks with similar colors will have a progressive color connection, which is also the characteristics of oil painting.



Res3_dog_5x5



Res3_rail_5x5



Res3_dog_17x17



Res3_rail_17x17



Res3_dog_29x29



Res3_rail_29x29