Prac 02

For this homework you will have to complete and implement the colour balancing for:

- Gray world algorithm
- Scale-by-max algorithm

You are free to use your own images. Experiment with more images and think about the effect each of the algorithms has on the resulting (balanced) image.

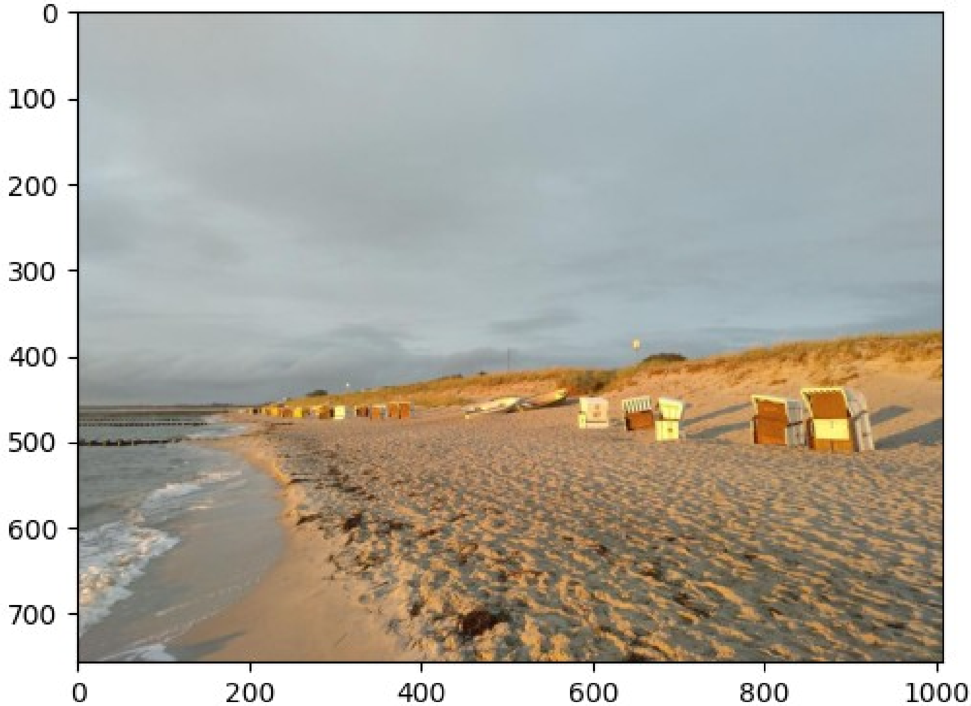
Colour Balancing

In this notebook we will show different type of colour balancing making use of von Kries' hypothesis.

```
import cv2
import numpy as np
from matplotlib import pyplot as plt
plt.rcParams['figure.figsize'] = [15, 20]

images = []

images.append(cv2.cvtColor(cv2.imread('sea.jpg'), cv2.COLOR_BGR2RGB))
images.append(cv2.cvtColor(cv2.imread('tire.png'), cv2.COLOR_BGR2RGB))
images.append(cv2.cvtColor(cv2.imread('kodim05.jpg'),
cv2.COLOR_BGR2RGB))
images.append(cv2.cvtColor(cv2.imread('dark.png'), cv2.COLOR_BGR2RGB))
for i in range(len(images)):
    plt.subplot(len(images)*100+10+i+1), plt.imshow(images[i])
```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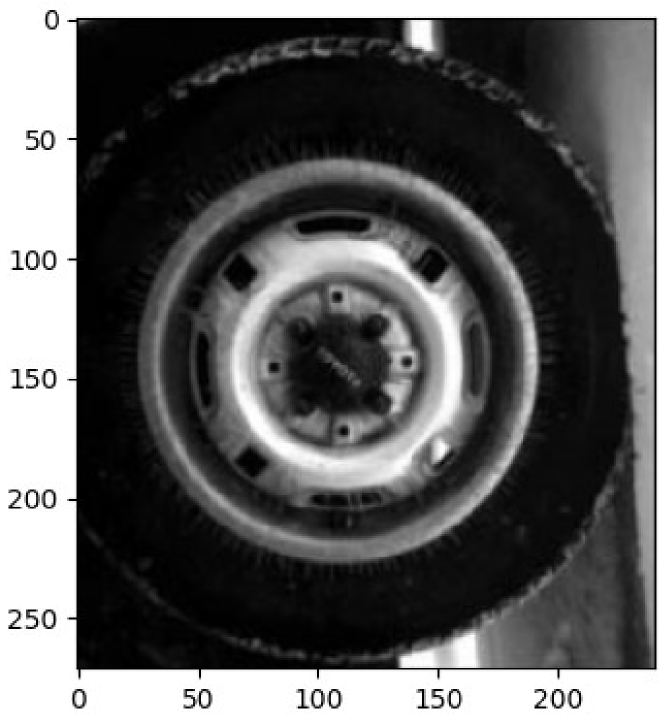
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White patch

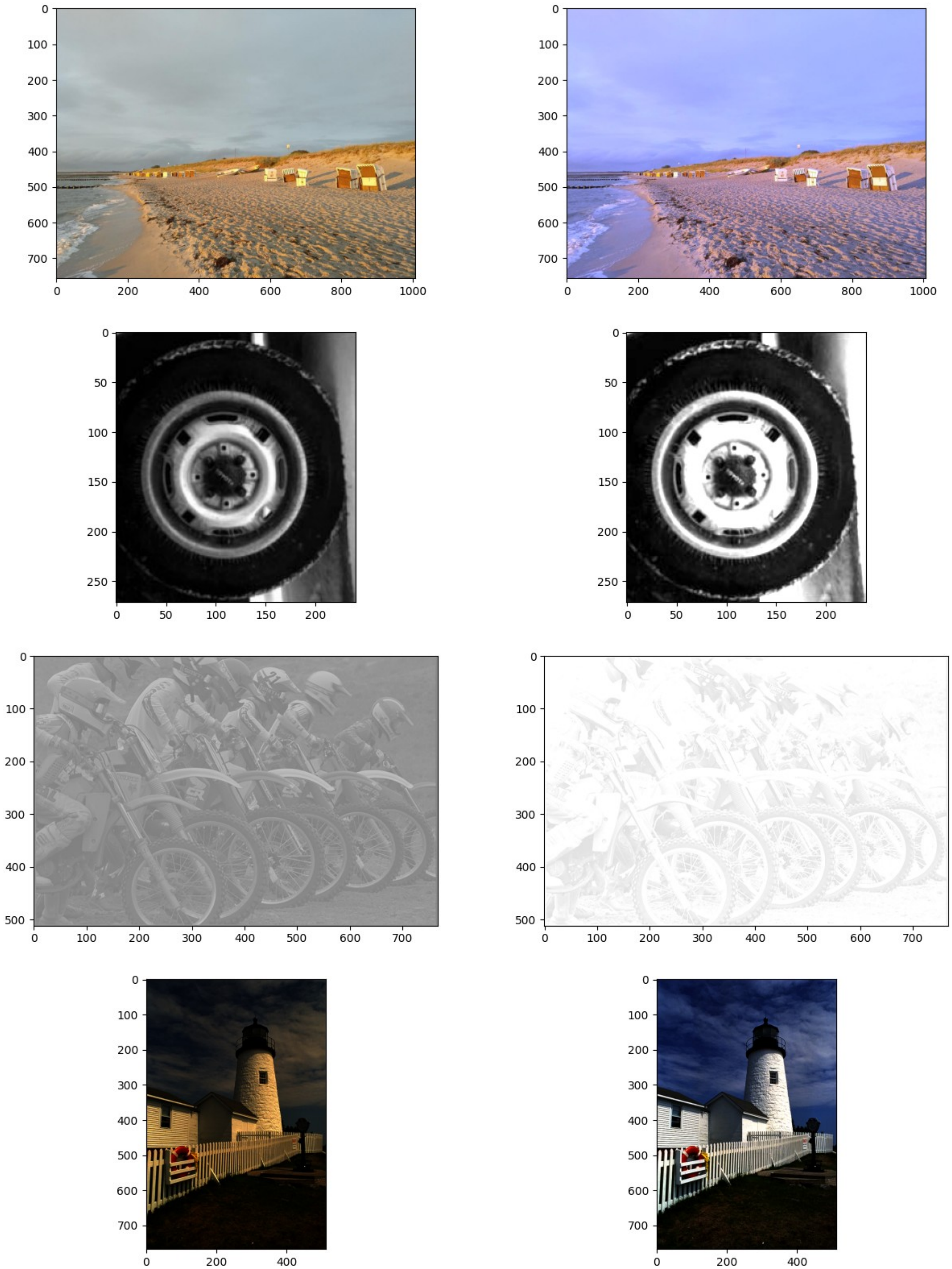
In white patch algorithm we choose a group of pixels we know they should be white. We then scale the resulting image colour channels by this white patch.

```
# Define white patch and the coefficients
row, col = [455, 91, 34, 412], [687, 91, 460, 78]
for i in range(len(images)):
    white = images[i][row[i], col[i], :]
    coeffs = 255.0/white

    # Apply white balancing and generate balanced image
    balanced = np.zeros_like(images[i], dtype=np.float32)
    for channel in range(3):
        balanced[..., channel] = images[i][..., channel] *
coeffs[channel]

    # White patching does not guarantee that the dynamic range is
preserved, images must be clipped.
    balanced = balanced/255
    balanced[balanced > 1] = 1

    plt.subplot(len(images)*100+20+i*2+1), plt.imshow(images[i])
    plt.subplot(len(images)*100+20+i*2+2), plt.imshow(balanced)
```



Gray world

This algorithm assumes that a scene, on average, is gray.

```
for i in range(len(images)):

    img = images[i]
    # Compute the mean values for all three colour channels (red, 
green, blue)
    red, green, blue = cv2.split(img)
    mean_r = np.mean(red)
    mean_g = np.mean(green)
    mean_b = np.mean(blue)

    # Compute the coefficients kr, kg, kb
    # Note: there are 3 coefficients to compute but we only have 2 
equations.
    # Therefore, you have to make an assumption, fix the value of one 
of the
    # coefficients and compute the remining two
    # Hint: You can fix the coefficient of the brightest colour 
channel to 1.
    max_mean = max(mean_r, mean_g, mean_b)
    kr = max_mean / mean_r
    kg = max_mean / mean_g
    kb = max_mean / mean_b

    # Apply color balancing and generate the balanced image
    balanced = np.zeros_like(img, dtype=np.float32)
    balanced[..., 0] = red * kr
    balanced[..., 1] = green * kg
    balanced[..., 2] = blue * kb
    balanced = np.clip(balanced, 0, 255).astype(np.uint8)

    # Show the original and the balanced image side by side
    plt.subplot(len(images)*100+20+i*2+1), plt.imshow(images[i])
    plt.subplot(len(images)*100+20+i*2+2), plt.imshow(balanced)
```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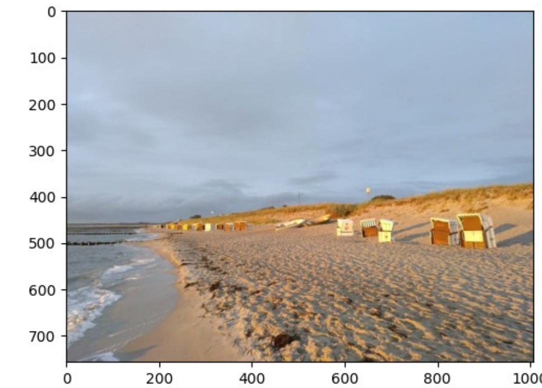
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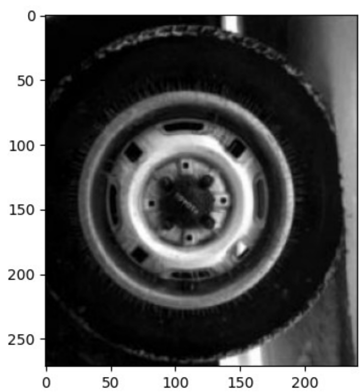
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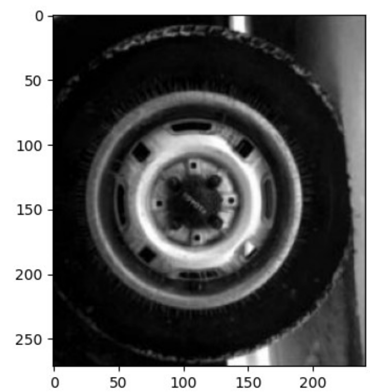
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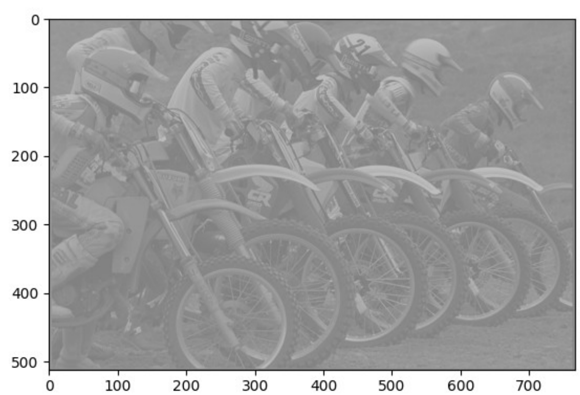
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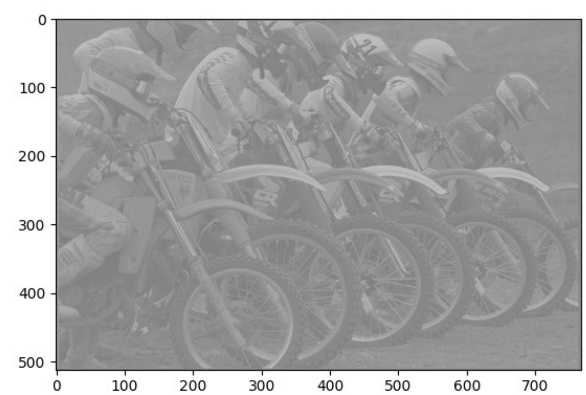
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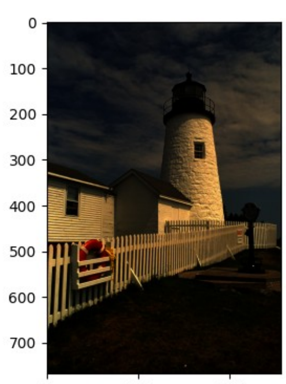
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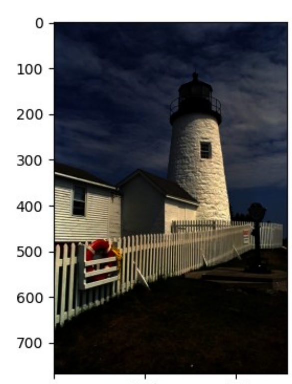
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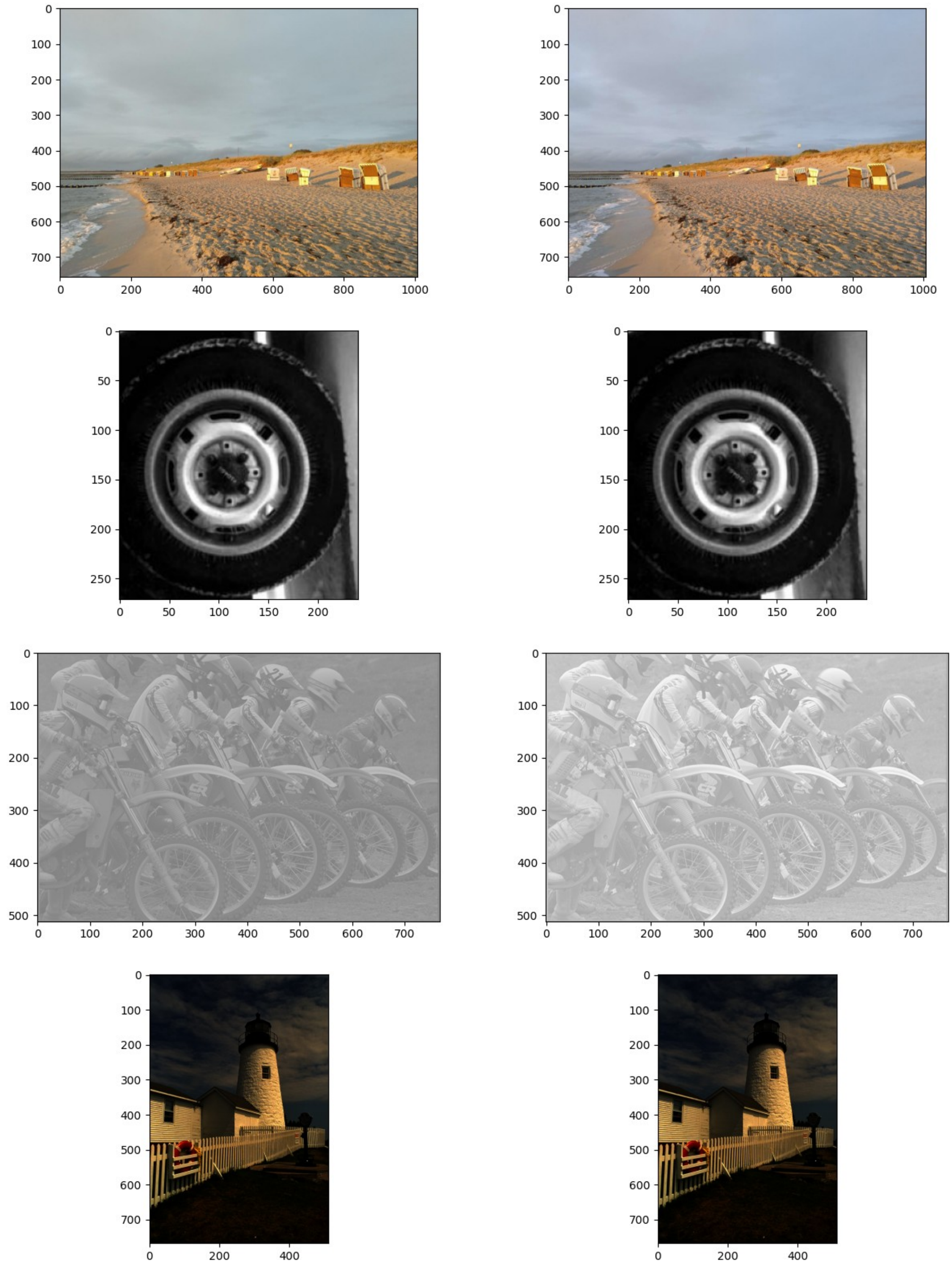
Scale-by-max

This is a straightforward algorithm that scales each colour channel by its maximum value. Note that it is sensitive to noise and saturations.

```
for i in range(len(images)):

    img = images[i]

    # Compute the maximum values for all three colour channels (red, 
green, blue)
    red, green, blue = cv2.split(img)


    max_r = np.max(red)
    max_g = np.max(green)
    max_b = np.max(blue)

    # Apply scale-by-max balancing and generate the balanced image
    balanced = np.zeros_like(img, dtype=np.float32)
    balanced[..., 0] = np.floor(red.astype(np.float32) *255 / max_r)
    balanced[..., 1] = np.floor(green.astype(np.float32) * 255 / 
max_g)
    balanced[..., 2] = np.floor(blue.astype(np.float32) * 255/ max_b)
    balanced = np.clip(balanced, 0, 255).astype(np.uint8)

    plt.subplot(len(images)*100+20+i*2+1), plt.imshow(images[i])
    plt.subplot(len(images)*100+20+i*2+2), plt.imshow(balanced)
```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0 200 400 600 800 1000
0 50 100 150 200 250
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