BASIC OPERATIONS ON IMAGES

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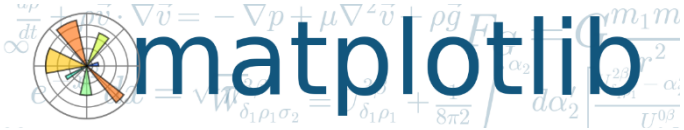
Basic operations on images

KÍCH THƯỚC ẢNH

Bài toán 01 – Kích thước ảnh

- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `Lindsay.tif`. Sau đó xuất kích thước ảnh.

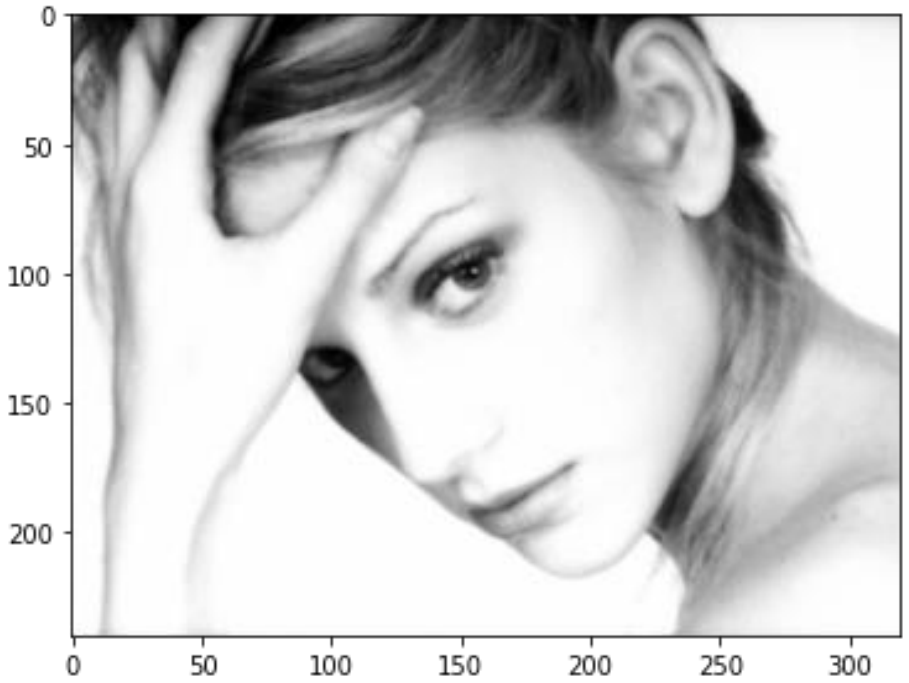
Bài toán 01 – Kích thước ảnh




```
1.import matplotlib.pyplot as plt
2.import numpy as np
3.import cv2
4.img = cv2.imread('lindsay.tif',0)
5.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
6.plt.figure(figsize=(6, 6))
7.plt.imshow(img)
8.print(img.shape)
```

Bài toán 01 – Kích thước ảnh

```
1.  import matplotlib.pyplot as plt
2.  import numpy as np
3.  import cv2
4.  img = cv2.imread('lindsay.tif',0)
5.  img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
6.  plt.figure(figsize=(6, 6))
7.  plt.imshow(img)
8.  print(img.shape)
```




```
(240, 320, 3)
```

Basic operations on images

ACCESSING AND MODIFYING PIXEL

Accessing and Modifying pixel

- Access a pixel value by its row and column coordinates.
- An array of Blue, Green, Red values (BGR image).
- Corresponding intensity (grayscale image).

Accessing and Modifying pixel

- Access and modify all B,G,R values using numpy array methods.
- array.item() and array.itemset() is considered to be better.

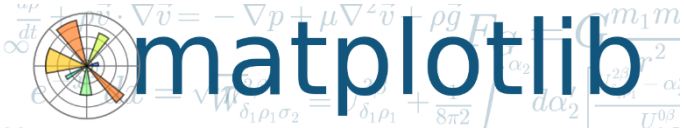
Bài toán 02 – Pixel

- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `Lindsay.tif`. Xuất thông tin của hai điểm ảnh có tọa độ: `[200, 200],[50, 90]`.

OpenCV

matplotlib

Bài toán 02 – Pixel

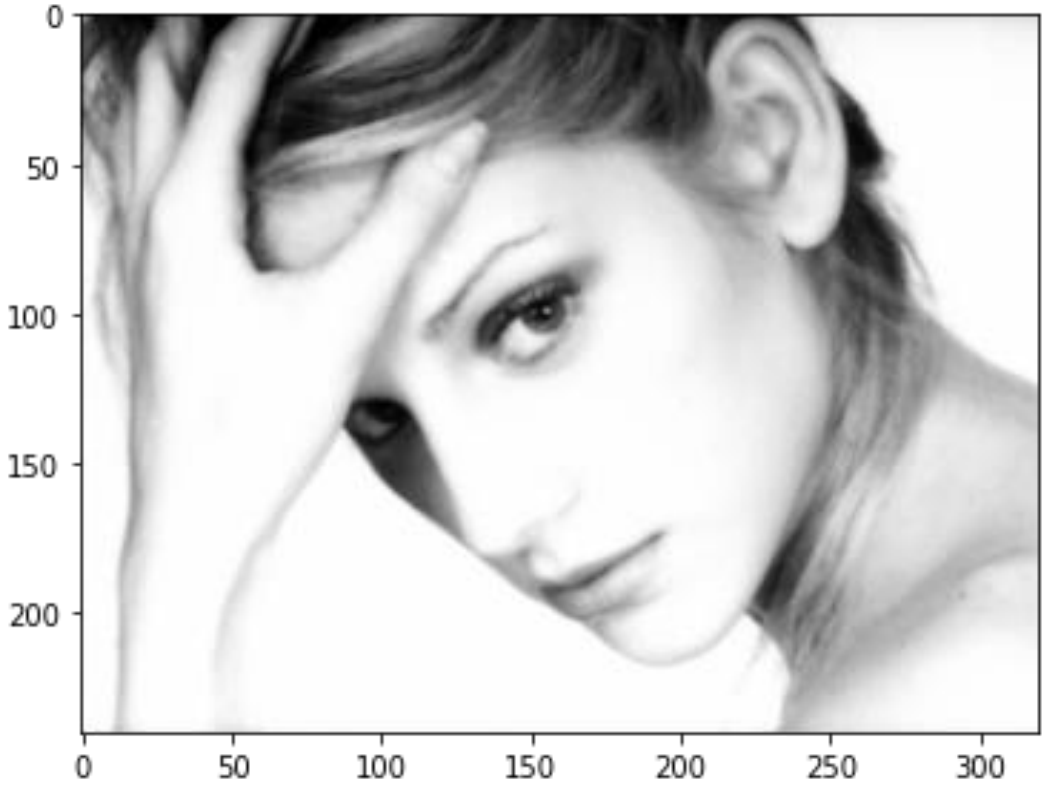



```
11.import matplotlib.pyplot as plt
12.import numpy as np
13.import cv2
14.img = cv2.imread('lindsay.tif',0)
15.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.plt.figure(figsize=(6, 6))
17.plt.imshow(img)
18.px_1 = img[200, 200]
19.px_2 = img[50, 90]
20.print('px1: ', px_1)
21.print('px2: ', px_2)
```

Bài toán 02 – Pixel

```
11. import matplotlib.pyplot as plt
12. import numpy as np
13. import cv2
14. img = cv2.imread('lindsay.tif',0)
15. img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16. plt.figure(figsize=(6, 6))
17. plt.imshow(img)
18. px_1 = img[200, 200]
19. px_2 = img[50, 90]
20. print('px1: ', px_1)
21. print('px2: ', px_2)
```

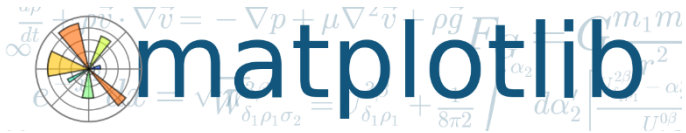
```
px1:  [255 255 255]
px2:  [169 169 169]
```



Bài toán 03 – Thay đổi Pixel

- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `Lindsay.tif`. Thay đổi thông tin của điểm ảnh có tọa độ: `[200,200]` thành `[100,101,102]`.

Bài toán 03 – Thay đổi Pixel




```
11.import matplotlib.pyplot as plt
12.import numpy as np
13.import cv2
14.img = cv2.imread('lindsay.tif',0)
15.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.plt.figure(figsize=(6, 6))
17.plt.imshow(img)
18.px = img[200, 200]
19.print('px: ', px)
20.img.itemset((200, 200,0), 100)
21.img.itemset((200, 200,1), 101)
22.img.itemset((200, 200,2), 103)
23.px = img[200, 200]
24.print('px: ', px)
```

```
px:  [255 255 255]
px:  [100 101 103]
```

Basic operations on images

ACCESSING IMAGE PROPERTIES

Accessing Image Properties

- Image properties include number of rows, columns and channels, type of image data, number of pixels etc.
  - + number of rows, columns and channels using img.shape
  - + type of image data using img.dtype
  - + number of pixels using img.size

Accessing Image Properties

- Shape of image is accessed by img.shape
  - + Image is color: a tuple of number of rows, columns and channels
  - + Image is grayscale: number of rows and columns

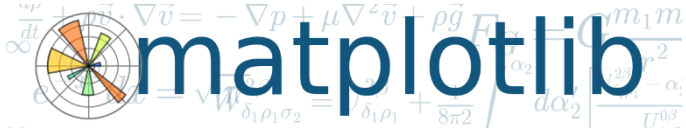
Bài toán 04 – Thuộc tính cơ bản

- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `Lindsay.tif`. Thể hiện thông tin cơ bản của ảnh.

OpenCV

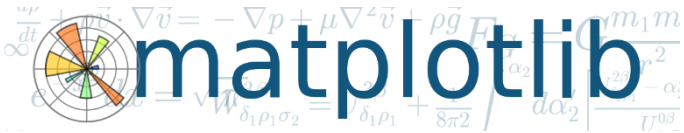
matplotlib

Bài toán 04 – Thuộc tính cơ bản




```
11.import matplotlib.pyplot as plt
12.import numpy as np
13.import cv2
14.img = cv2.imread('lindsay.tif',0)
15.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.plt.figure(figsize=(6, 6))
17.plt.imshow(img)
18.print('Shape image color: ', img.shape)
19.print('Total number of pixels: ', img.size)
20.print('Image datatype: ', img.dtype)
```

Bài toán 04 – Thuộc tính cơ bản




```
11.import matplotlib.pyplot as plt
12.import numpy as np
13.import cv2
14.img = cv2.imread('lindsay.tif',0)
15.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.plt.figure(figsize=(6, 6))
17.plt.imshow(img)
18.print('Shape image color: ', img.shape)
19.print('Total number of pixels: ', img.size)
20.print('Image datatype: ', img.dtype)
```

```
Shape image color:  (240, 320)
Total number of pixels:  76800
Image datatype:  uint8
```

Basic operations on images

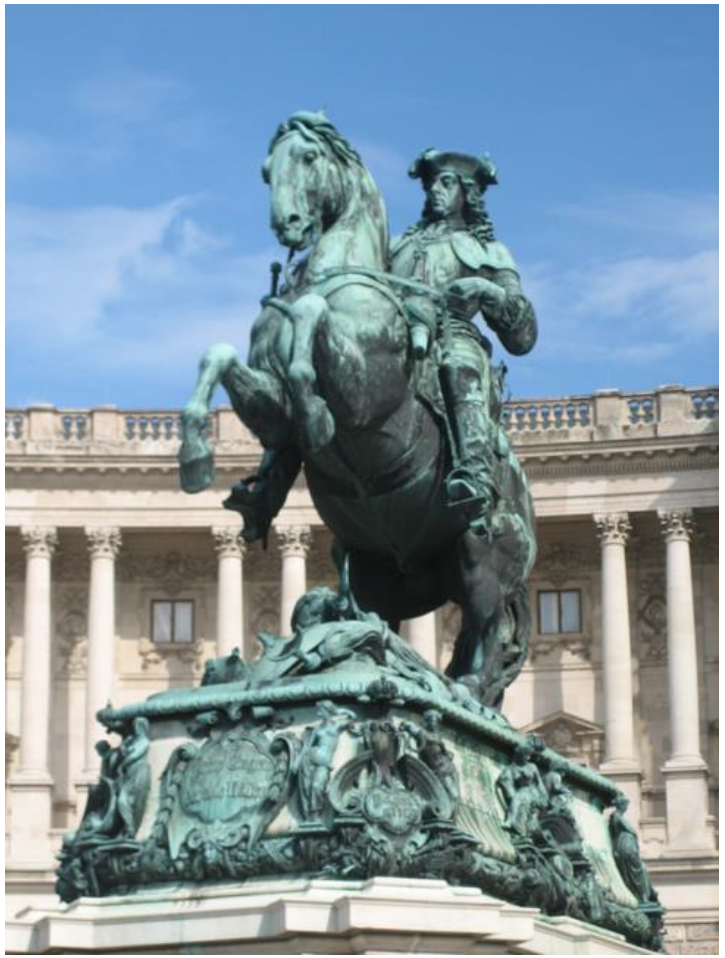
SPLITTING AND MERGING IMAGE CHANNELS

Splitting and Merging Image Channels

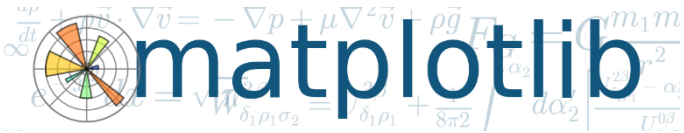
- The B,G,R channels of an image can be split into their individual planes.
- The individual channels can be merged back together to form a BGR image.

Bài toán 05 – Splitting

- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `statue.png`. Tách kênh màu R, G, B của ảnh, sau đó hiển thị ảnh từng kênh.

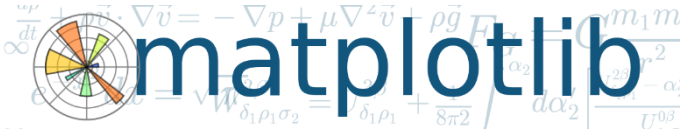


Bài toán 05 – Splitting




```
11.  import matplotlib.pyplot as plt
12.  import numpy as np
13.  import cv2
14.  img = cv2.imread('statue.png', 1)
15.  img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.  plt.figure(figsize=(6, 6))
17.  plt.imshow(img)
18. R,G,B = cv2.split(img)
19. print(type(R), R.shape, R.size)
20. print(R)
21. print(type(G), G.shape, G.size)
22. print(G)
23. print(type(B), B.shape, B.size)
24. print(B)
```

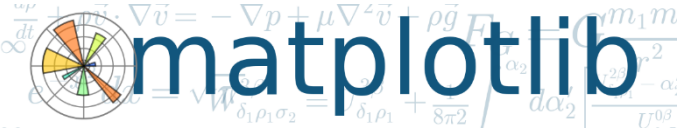
Bài toán 05 – Splitting




```
11.  import matplotlib.pyplot as plt
12.  import numpy as np
13.  import cv2
14.  img = cv2.imread('statue.png', 1)
15.  img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.  plt.figure(figsize=(6, 6))
17.  plt.imshow(img)
18.  R,G,B = cv2.split(img)
19.  print(type(R), R.shape, R.size)
20.  print(R)
21.  print(type(G), G.shape, G.size)
22.  print(G)
23.  print(type(B), B.shape, B.size)
24.  print(B)
```

```
R <class 'numpy.ndarray'> (648, 486) 314928
[[ 99 101  99 ...  84  84  85]
 [ 98  97 101 ...  86  85  85]
 [ 99  98  99 ...  84  85  80]
 ...
 [169 175 177 ... 191 192 191]
 [104 102 105 ... 170 185 193]
 [ 90  88  89 ... 161 166 179]]
```

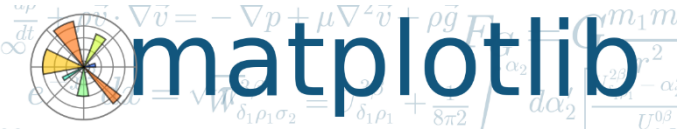
Bài toán 05 – Splitting




```
11.  import matplotlib.pyplot as plt
12.  import numpy as np
13.  import cv2
14.  img = cv2.imread('statue.png', 1)
15.  img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.  plt.figure(figsize=(6, 6))
17.  plt.imshow(img)
18.  R,G,B = cv2.split(img)
19.  print(type(R), R.shape, R.size)
20.  print(R)
21.  print(type(G), G.shape, G.size)
22.  print(G)
23.  print(type(B), B.shape, B.size)
24.  print(B)
```

```
G <class 'numpy.ndarray'> (648, 486) 314928
[[149 151 152 ... 134 135 133]
 [151 151 151 ... 134 133 133]
 [152 152 152 ... 135 134 132]
 ...
 [151 156 158 ... 173 175 174]
 [ 88  89  90 ... 153 168 176]
 [ 77  75  76 ... 149 150 162]]
```

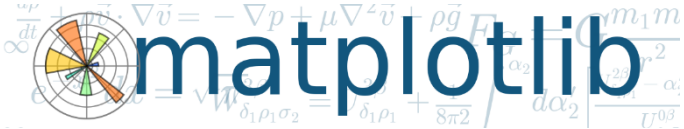
Bài toán 05 – Splitting




```
11.  import matplotlib.pyplot as plt
12.  import numpy as np
13.  import cv2
14.  img = cv2.imread('statue.png', 1)
15.  img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.  plt.figure(figsize=(6, 6))
17.  plt.imshow(img)
18.  R,G,B = cv2.split(img)
19.  print(type(R), R.shape, R.size)
20.  print(R)
21.  print(type(G), G.shape, G.size)
22.  print(G)
23.  print(type(B), B.shape, B.size)
24.  print(B)
```

```
B <class 'numpy.ndarray'> (648, 486) 314928
[[205 207 206 ... 191 189 187]
 [206 207 207 ... 189 188 187]
 [208 207 207 ... 189 190 188]
 ...
 [122 128 131 ... 164 160 158]
 [ 63  62  62 ... 140 153 161]
 [ 68  65  64 ... 132 133 146]]
```

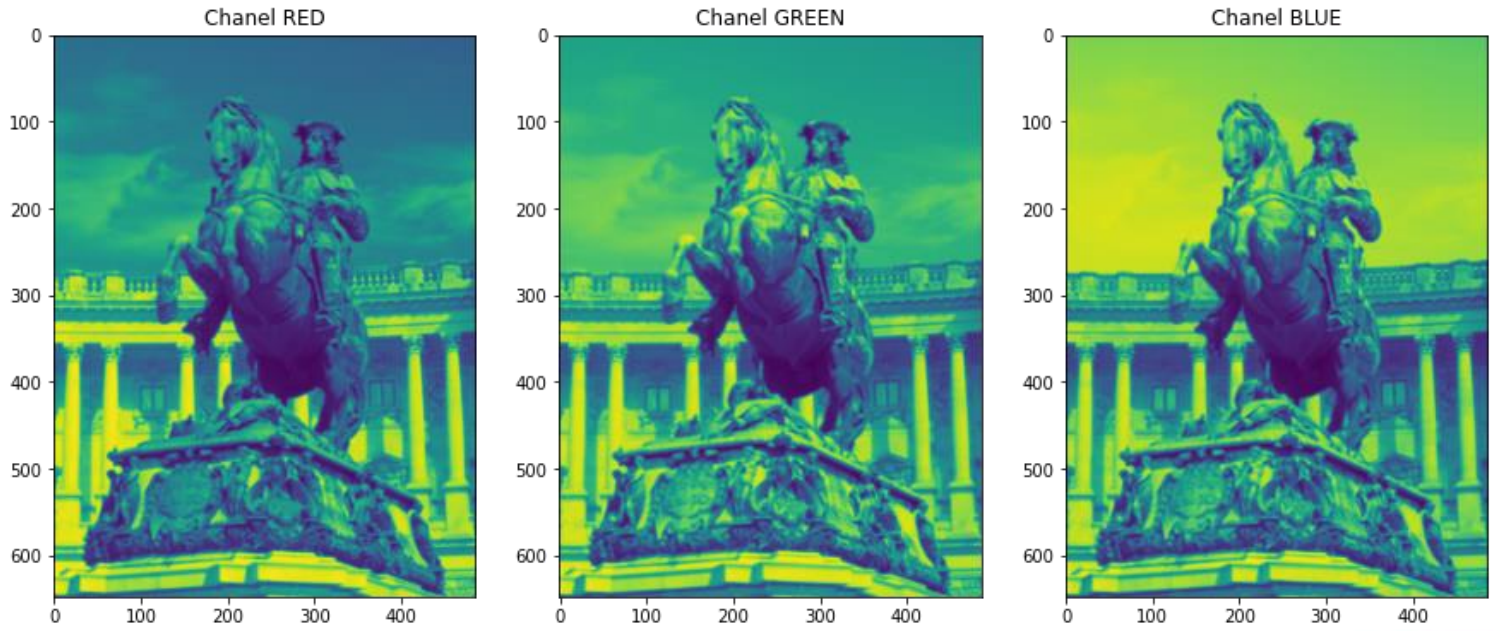
Bài toán 05 – Splitting




```
11.    import matplotlib.pyplot as plt
12.    import numpy as np
13.    import cv2
14.    img = cv2.imread('statue.png', 1)
15.    img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.    plt.figure(figsize=(6, 6))
17.    plt.imshow(img)
18.    R,G,B = cv2.split(img)
19.    print(type(R), R.shape, R.size)
20.    print(R)
21.    print(type(G), G.shape, G.size)
22.    print(G)
23.    print(type(B), B.shape, B.size)
24.    print(B)
25.plt.figure(figsize=(15,15))
26.plt.subplot(1,3,1),plt.imshow(R, interpolation = 'bicubic')
27.plt.title('Chanel RED')
28.plt.subplot(1,3,2),plt.imshow(G, interpolation = 'bicubic')
29.plt.title('Chanel GREEN')
30.plt.subplot(1,3,3),plt.imshow(B, interpolation = 'bicubic')
31.plt.title('Chanel BLUE')
```

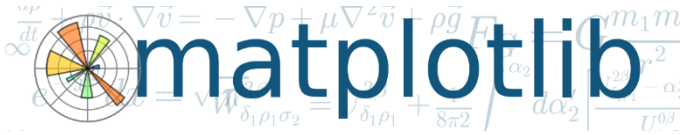
Bài toán 05 – Splitting

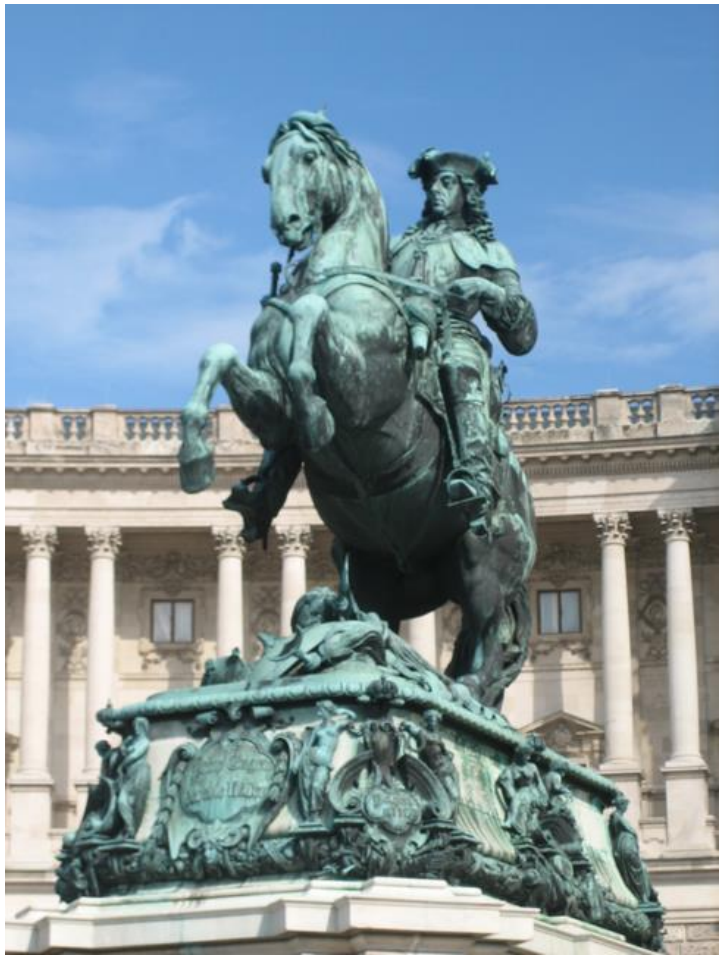
```
11.  import matplotlib.pyplot as plt
12.  import numpy as np
13.  import cv2
14.  img = cv2.imread('statue.png', 1)
15.  img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.  plt.figure(figsize=(6, 6))
17.  plt.imshow(img)
18.  R,G,B = cv2.split(img)
19.  print(type(R), R.shape, R.size)
20.  print(R)
21.  print(type(G), G.shape, G.size)
22.  print(G)
23.  print(type(B), B.shape, B.size)
24.  print(B)
25.  plt.figure(figsize=(15,15))
26.  plt.subplot(1,3,1),plt.imshow(R, interpolation = 'bicubic')
27.  plt.title('Chanel RED')
28.  plt.subplot(1,3,2),plt.imshow(G, interpolation = 'bicubic')
29.  plt.title('Chanel GREEN')
30.  plt.subplot(1,3,3),plt.imshow(B, interpolation = 'bicubic')
31.  plt.title('Chanel BLUE')
```



Bài toán 06 – Merging Image Channels

- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `statue.png`. Tách kênh màu R, G, B của ảnh, sau đó gộp lại và hiển thị ảnh kết quả.



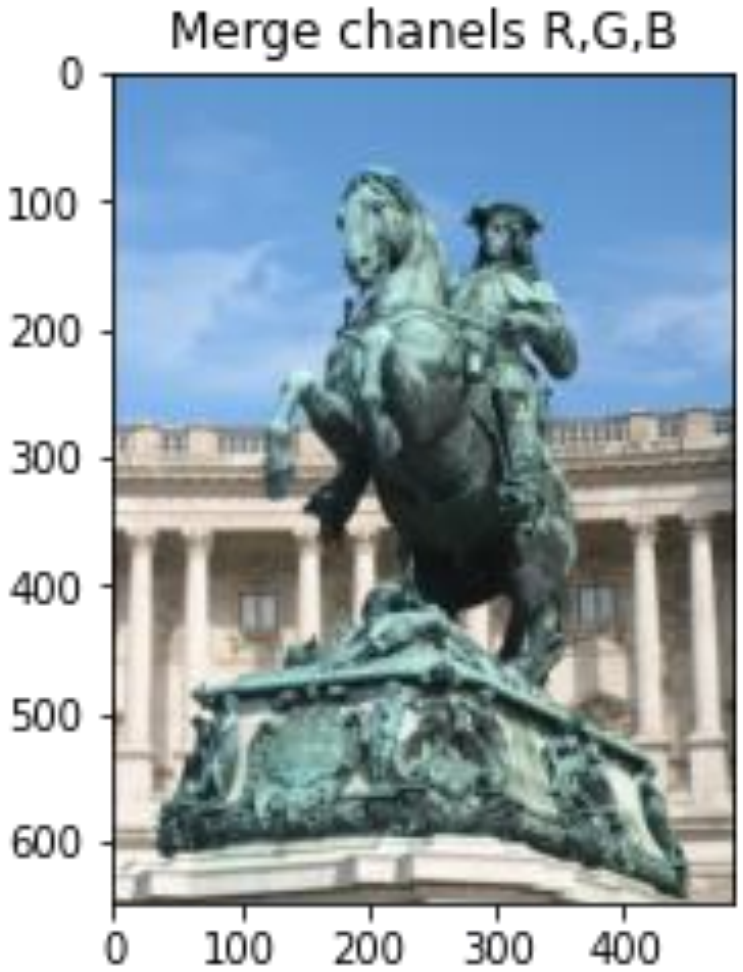


Bài toán 06 – Merging Image Channels


```
11.import matplotlib.pyplot as plt
12.import numpy as np
13.import cv2
14.img = cv2.imread('statue.png', 1)
15.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.plt.figure(figsize=(6, 6))
17.plt.imshow(img)
18.R,G,B = cv2.split(img)
19.img = cv2.merge((R, G, B))
20.plt.figure(figsize=(6,6))
21.plt.subplot(1,2,1),plt.imshow(img)
22.plt.title('Merge chanels R,G,B')
```

Bài toán 06 – Merging Image Channels

```
11.import matplotlib.pyplot as plt
12.import numpy as np
13.import cv2
14.img = cv2.imread('statue.png', 1)
15.img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
16.plt.figure(figsize=(6, 6))
17.plt.imshow(img)
18.R,G,B = cv2.split(img)
19.img = cv2.merge((R, G, B))
20.plt.figure(figsize=(6,6))
21.plt.subplot(1,2,1),plt.imshow(img)
22.plt.title('Merge chanels R,G,B')
```



Basic operations on images

MAKING BORDERS FOR IMAGES (PADDING)

Making Borders for Images (Padding)

- Use `cv2.copyMakeBorder()` to create a border around the image, something like a photo frame.

OpenCV

matplotlib

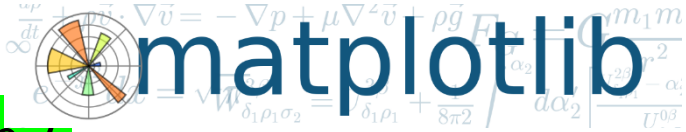
Making Borders for Images (Padding)

- This function takes following arguments:
  - + **src:** input image
  - + **top**, **bottom**, **left**, **right:** border width in number of pixels in corresponding directions
  - + Flag defining what kind of border to be added
    - `cv2.BORDER_CONSTANT`
    - `cv2.BORDER_REFLECT`
    - `cv2.BORDER_REFLECT_101 or cv2.BORDER_DEFAULT`
    - `cv2.BORDER_REPLICATE`
    - `cv2.BORDER_WRAP`
  - + **value:** Color of border if border type is `cv2.BORDER_CONSTANT`

Bài toán 07 – Making Borders

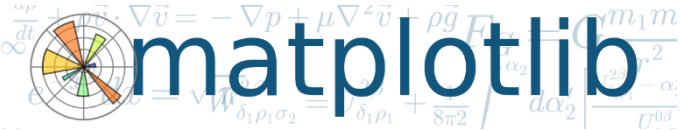
- Bài toán: viết chương trình đọc và hiển thị ảnh có tên `Lindsay.tif`. Thực hiện making borders, sau đó hiển thị ảnh kết quả.

Bài toán 07 – Making Borders



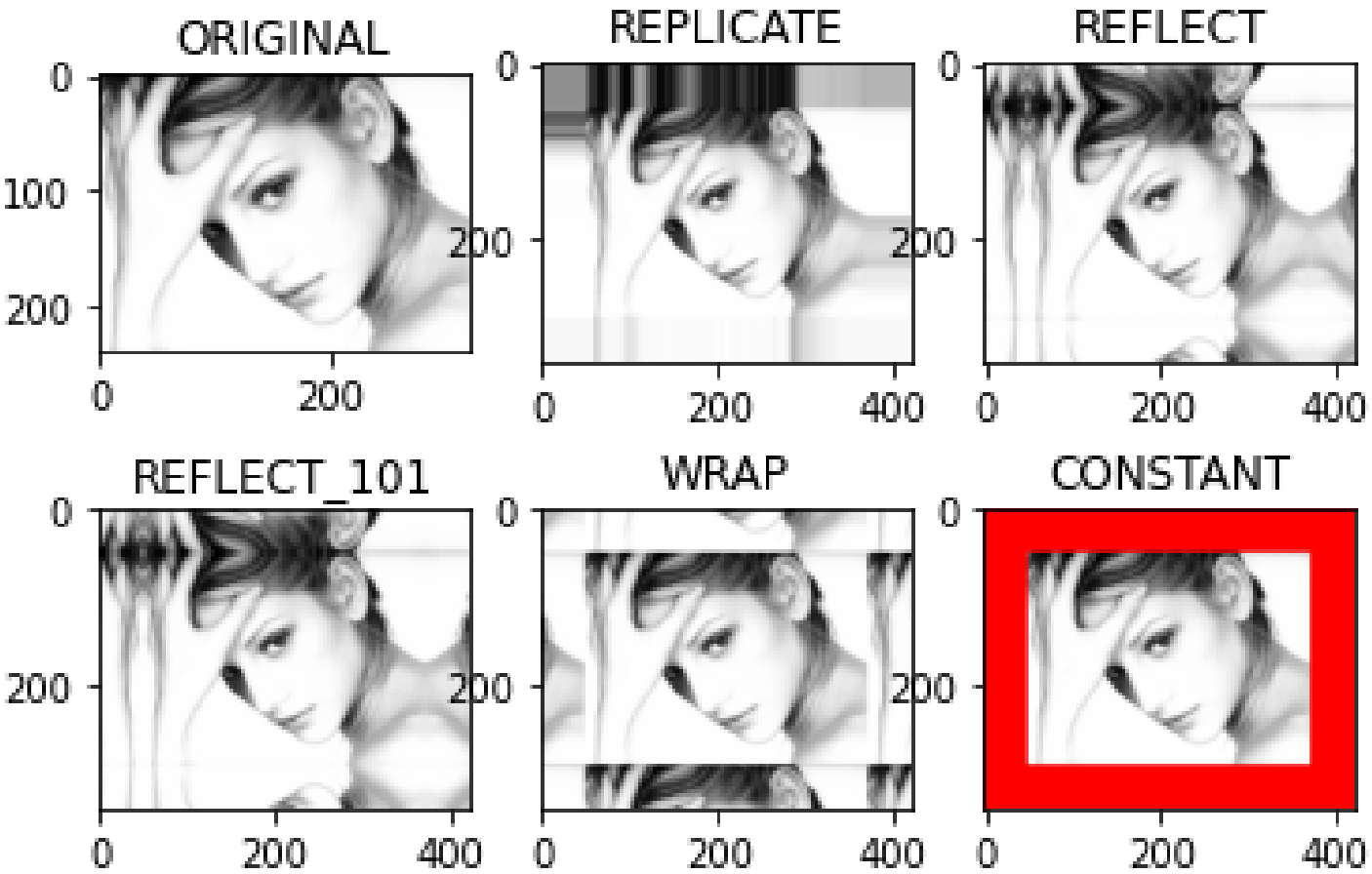

```
11. import matplotlib.pyplot as plt
12. import numpy as np
13. import cv2
14. img = cv2.imread('lindsay.tif', 1)
15. replicate = cv2.copyMakeBorder(
    img,50,50,50,50,cv2.BORDER_REPLICATE)
16. reflect = cv2.copyMakeBorder(
    img,50,50,50,50,cv2.BORDER_REFLECT)
17. reflect101 = cv2.copyMakeBorder(
    img,50,50,50,50,cv2.BORDER_REFLECT_101)
```

Bài toán 07 – Making Borders




```
11.  import matplotlib.pyplot as plt
12.  import numpy as np
13.  import cv2
14.  img = cv2.imread('lindsay.tif', 1)
15.  replicate = cv2.copyMakeBorder(
         img,50,50,50,50,cv2.BORDER_REPLICATE)
16.  reflect = cv2.copyMakeBorder(
         img,50,50,50,50,cv2.BORDER_REFLECT)
17.  reflect101 = cv2.copyMakeBorder(
         img,50,50,50,50,cv2.BORDER_REFLECT_101)
18.wrap = cv2.copyMakeBorder(
     img,50,50,50,50,cv2.BORDER_WRAP)
19.constant= cv2.copyMakeBorder(
     img,50,50,50,50,cv2.BORDER_CONSTANT,valu
e=[255,0,0])
```

Bài toán 07 – Making Borders



OpenCV

matplotlib

Chúc các bạn học tốt

Thân ái chào tạm biệt các bạn

ĐẠI HỌC QUỐC GIA TP.HCM

ĐẠI HỌC CÔNG NGHỆ THÔNG TIN TP.HCM

TOÀN DIỆN – SÁNG TẠO – PHỤNG SỰ