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1 from PIL import Image
2 import numpy as np
3 import matplotlib.pyplot as plt
4
5 im = Image.open("Lenna.jpg").resize((255,255))
6 arr = np.array(im.copy())
7
8 arrMinus40 = arr.copy()
9 arrMinus20 = arr.copy()
10 arrPlus40 = arr.copy()
11 arrPlus40 = arr.copy()
12 keys = np.arange(256)
13 histOri = np.zeros((256), dtype= np.uint32)
14 histMinus40 = np.zeros((256), dtype= np.uint32)
15 histMinus20 = np.zeros((256), dtype= np.uint32)
16 histPlus20 = np.zeros((256), dtype= np.uint32)
17 histPlus40 = np.zeros((256), dtype= np.uint32)
18
19
20 for y in range(arr.shape[0]):
21     for x in range(arr.shape[1]):
22         akum = (int(arr[y,x,0])+int(arr[y,x,1])+int(arr[y,x,2]))
23         tmp = max(min(int(akum/3),255),0)
24         arr[y,x] = [tmp,tmp,tmp]
25         tmpMin20 = max(tmp-20,0)
26         tmpMin40 = max(tmp-40,0)
27         arrMinus20[y,x]=[tmpMin20,tmpMin20,tmpMin20]
28         arrMinus40[y,x]=[tmpMin40,tmpMin40,tmpMin40]
29         tmpPlus20 = min(tmp+20,255)
30         tmpPlus40 = min(tmp+40,255)
31         arrPlus40[y,x]=[tmpPlus20,tmpPlus20,tmpPlus20]
32         arrPlus40[y,x]=[tmpPlus40,tmpPlus40,tmpPlus40]
33         histOri[tmp] = histOri[tmp]+1
34         histMinus20[tmpMin20] = histMinus20[tmpMin20]+1
35         histMinus40[tmpMin40] = histMinus40[tmpMin40]+1
36         histPlus20[tmpPlus20] = histPlus20[tmpPlus20]+1
37         histPlus40[tmpPlus40] = histPlus40[tmpPlus40]+1
38
39
40 fig = plt.figure(1)
41 plt.bar(keys,histOri)
42 fig.canvas.draw()
43 dataOri = np.frombuffer(fig.canvas.tostring_rgb(), dtype=np.uint8)
44 dataOri = dataOri.reshape(fig.canvas.get_width_height()[::-1] + (3,))
45 histImageOri = Image.fromarray(dataOri).resize((255,255))
46 histNpOri = np.array(histImageOri)
47
48 figMinus20 = plt.figure(2)
49 plt.bar(keys,histMinus20)
50 figMinus20.canvas.draw()
51 dataMinus20 = np.frombuffer(figMinus20.canvas.tostring_rgb(), dtype=np.uint8)
52 dataMinus20 = dataMinus20.reshape(figMinus20.canvas.get_width_height()[::-1] + (3,))
53 histImageMinus20 = Image.fromarray(dataMinus20).resize((255,255))
54 histNpMinus20 = np.array(histImageMinus20)
55
56 figMinus40 = plt.figure(3)
57 plt.bar(keys,histMinus40)
58 figMinus40.canvas.draw()
59 dataMinus40 = np.frombuffer(figMinus40.canvas.tostring_rgb(), dtype=np.uint8)
60 dataMinus40 = dataMinus40.reshape(figMinus40.canvas.get_width_height()[::-1] + (3,))
61 histImageMinus40 = Image.fromarray(dataMinus40).resize((255,255))
62 histNpMinus40 = np.array(histImageMinus40)
63
64
65 figPlus20 = plt.figure(4)
66 plt.bar(keys,histPlus20)
67 figPlus20.canvas.draw()
68 dataPlus20 = np.frombuffer(figPlus20.canvas.tostring_rgb(), dtype=np.uint8)
69 dataPlus20 = dataPlus20.reshape(figPlus20.canvas.get_width_height()[::-1] + (3,))
70 histImagePlus20 = Image.fromarray(dataPlus20).resize((255,255))
71 histNpPlus20 = np.array(histImagePlus20)
72
73 figPlus40 = plt.figure(5)

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74 plt.bar(keys,histPlus40)
75 figPlus40.canvas.draw()
76 dataPlus40 = np.frombuffer(figPlus40.canvas.tostring_rgb(), dtype=np.uint8)
77 dataPlus40 = dataPlus40.reshape(figPlus40.canvas.get_width_height()[::-1] + (3,))
78 histImagePlus40 = Image.fromarray(dataPlus40).resize((255,255))
79 histNpPlus40 = np.array(histImagePlus40)
80
81 histStack = np.hstack((histNpMinus40,histNpMinus20,histNpOri,histNpPlus40,histNpPlus40))
82 imageStack = np.hstack((arrMinus40,arrMinus20,arr,arrPlus40,arrPlus40))
83
84 Image.fromarray(np.vstack((histStack,imageStack))).show()
```