

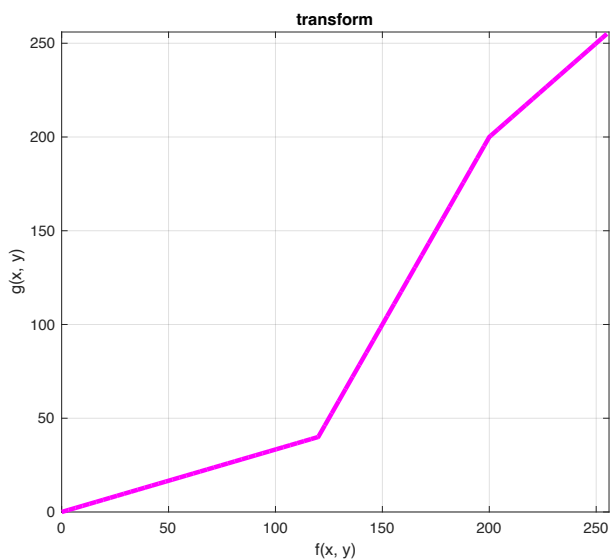
# Digital Image Processing - HW1

杜睿 教学班1294

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## 1 Problem 1

Please give the transform equation, which can reduce the gray range  $[0, 120]$  to  $[0, 40]$ , and change the gray range  $[120, 200]$  to  $[40, 200]$ , and the gray range  $[200, 255]$  to  $[200, 255]$ . Then please give the MATLAB function code to complete the contrast enhancement [1]. They both are uint8 class.

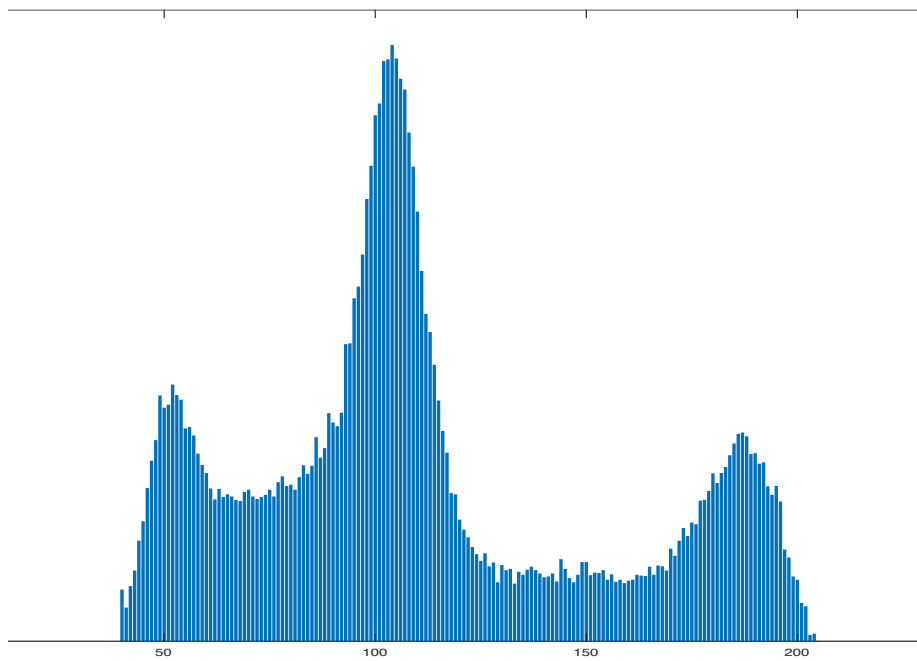


```
1 img=imread('bubbles.tif')
2 imshow(img)
3
4 g=@(f) (f≥0&f<120).*f./3 + (f≥120&f<200).*(2.*f-200) + ...
        (f≥200&f<256).*f
5
6 converted=uint8(g(double(img)))
7 imshow(converted)
```

## 2 Problem 2

Please give the self-defining code of an m-file with MATLAB program language, which can show the 256 gray levels' histogram of an input image **without** using the image processing function 'imhist'. The result is a row vector. Let the image is 'rice.tif' with uint8 class data in the current folder.

```
1 I=imread('rice.tif')
2 G=selfhist(I,256)
3 figure,bar(0:255,G)
4
5 function G=selfhist(I,T)
6 G=zeros(1,T);
7 for K = 0:255
8     G(K+1)=sum(sum(I==K));
9 end
10 end
```



### 3 Problem 3

1. 设一幅图像具有如下表所示的概率分布，对其进行直方图均衡化。

灰度级	0	1	2	3	4	5	6	7
对应概率分布	0.14	0.22	0.25	0.17	0.10	0.06	0.03	0.03

答：直方图均衡化过程如下表：

序号	运 算	步骤和结果							
1	列出原图像灰度级 $i$	0	1	2	3	4	5	6	7
2	各灰度级概率分布（直方图） $P(i)$	0.14	0.22	0.25	0.17	0.10	0.06	0.03	0.03
3	计算累计直方图 $P_j = \sum_{k=0}^j P(k)$	0.14	0.36	0.61	0.78	0.88	0.94	0.97	1.00
4	计算变换后的灰度值： $j = INT[(L-1)P_j + 0.5]$	1	3	4	5	6	7	7	7
5	确定映射对应关系( $i \rightarrow j$ )	0 $\rightarrow$ 1	1 $\rightarrow$ 3	2 $\rightarrow$ 4	3 $\rightarrow$ 5	4 $\rightarrow$ 6	5,6,7 $\rightarrow$ 7		
6	计算新直方图 $P(j)$	0	0.14	0	0.22	0.25	0.17	0.10	0.12

jjj

### References

- [1] L. Zhang, H. Zhao, Q. Meng, Y. Chen, M. Liu, and L. Xie, "Beijing zkj-npu speaker verification system for voxceleb speaker recognition challenge 2021," *ArXiv*, vol. abs/2109.03568, p. null, 2021.