

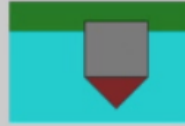
DIP期末复习

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1. 光圈、焦距，对成像、景深的影响
加上棱镜光圈越大，景深越浅
长焦，景深越浅
对小孔成像，光圈越小越好，太小也不行
2. 成像原理
光——CCD（光电传感器）——光转电信号——放大器——ADC——模拟信号转数字信号——DSP（数值信号处理）颜色校正和白平衡——编码至内存
3. 颜色的物理意义是啥？不同波长的光，越红波长越长，越蓝就越短。
4. 眼睛对光的感知能力更强？感受光的细胞更多。
5. 人优先色调Hue，然后是饱和度S，最后是明暗V
6. 解释RGB，CMY，HSV的意思，转换公式不用记
CMY: C青色，M品红，Y黄色
HSV: H色相，S饱和度，V明度
YUV: Y明亮度，U色度，V浓度
7. 考：问设备无关的颜色空间模型，设备相关的颜色模型有哪些？
设备无关：CIE models, CIE XYZ, CIE L*a*b, CIE YUV
设备相关：CMY, HSV, RGB
8. 加色和减色的物理意义？一个越来越亮一个越来越暗
9. RGB、CMY调整H、S、V需要三个通道同时改变。但目前HSV并不是线性的，所以三个通道并不是完全独立的。
10. 考：图像格式，无损压缩，有损压缩举例
无损：bmp(但是支持run length code), png
有损：jpeg（DCT算法），gif
均可：tiff
- 11.



pixels displayed on the screen



pixels stored in .bmp-file

You do not need to turn around the rows manually. The API functions which also display the bitmap will do that for you automatically.

Another important thing is that the number of bytes in one row must always be adjusted to fit into the border of a multiple of four. You simply append zero bytes until the number of bytes in a row reaches a multiple of four

6 bytes that represent a row in the bitmap: A0 37 F2 8B 31 C4

must be saved as: A0 37 F2 8B 31 C4 00 00

12.

Chains: Run length encoding (RLE)

- In binary images, run length coding records only areas that belong to the object in the image; the area is then represented as a list of lists.
- Each row of the image is described by a sublist, the first element of which is the row number.
- Subsequent terms are coordinate pairs; the first element of a pair is the beginning of a run and the second is the end.
- There can be several such sequences in the row.

	0	1	2	3	4	5	6
0							
1		■			■		
2		■	■	■	■		
3							
4							
5			■	■		■	
6							

Run length coding; the code is $\{(11144)(214)(52355)\}$.

11114指1行, 1开始1结束, 4开始4结束

214指2行1开始4结束

二

1. 得到二值图像的方法 (三种境界——0和255、Otsu、局部调整)

Target : minimize variance σ

$$W_f = \frac{N_f}{N}, W_b = \frac{N_b}{N}, W_f + W_b = 1$$

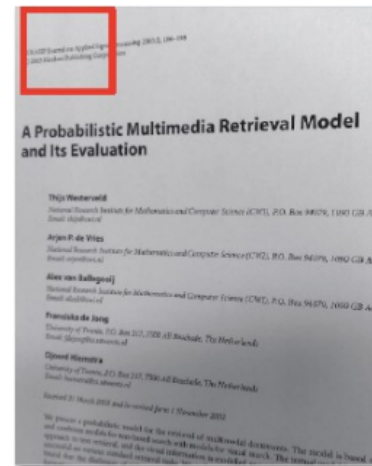
$$\mu = W_f * \mu_f + W_b * \mu_b$$

$$\sigma = W_f(\mu_f - \mu)^2 + W_b(\mu_b - \mu)^2$$

$$\Rightarrow \text{minimize } W_b W_f (\mu_f - \mu_b)^2$$

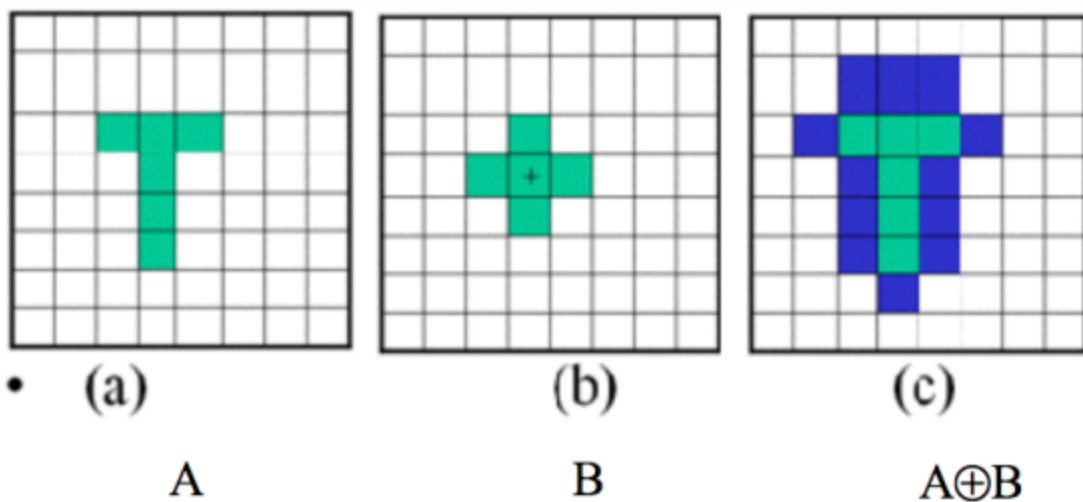
Solution

- Local adaptive operation
 - Set a local window, find its good threshold;
 - Sliding your local window over the whole image.



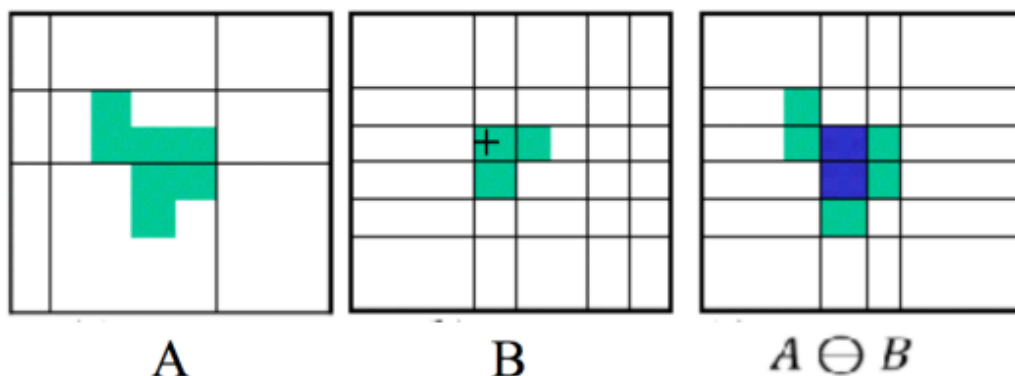
2. 形态学操作

Dilation



Erosion

Erosion: structure element 范围内有0就是0



All pixels that cannot cover B are removed.

应用：提取边界，填洞，提取结构

Opening

先erosion再dilation

Closing

先dilation再erosion

3.

☐ 亮度变化，**logarithm algorithm**，必须掌握

L代表亮度，对于RGB来说应该可以直接用3通道？

$$L_d = \frac{\log(L_w + 1)}{\log(L_{max} + 1)}$$

4.

灰度划分，为什么是256个灰度级而不是128，weber's law，2%人眼差不多能分别出2%以上的灰度差别，再低难以分辨。由设备极限决定。

5. 直方图的含义

2. Histogram--Concept

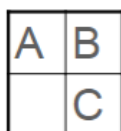
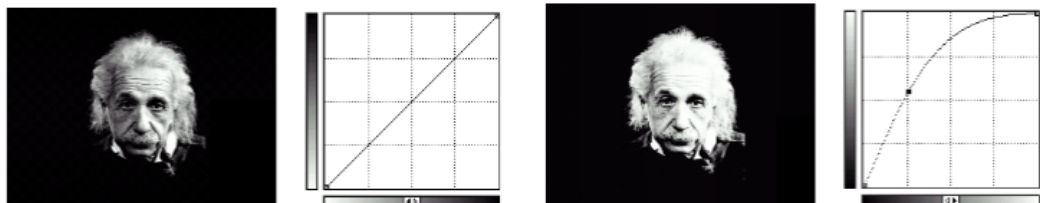
Grayscale histogram is a kind of **statistical graph**, which indicates the proportions of the number of pixels of different gray levels in the total number of pixels of the given image.

6. 可以使用局部均衡化来增强局部

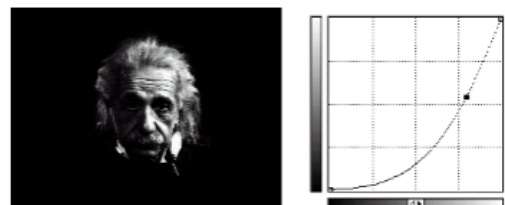
为啥均衡化之后还是不太均衡？离散情况下会有很多掉到同一个灰度集，导致并不是非常均衡

解释直方图对应的图片！线性：一次函数、contrast stretching、log和指数

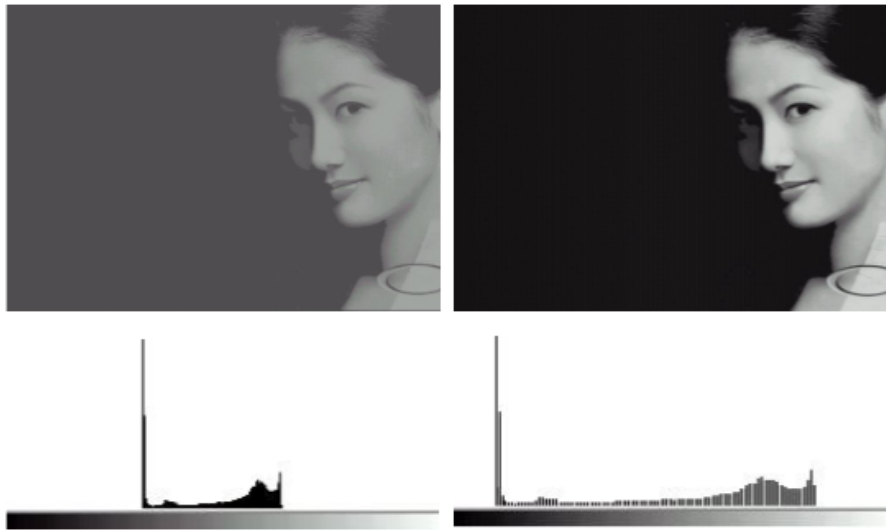
Histogram transform: 1) Luminance adjustment



A: Original image
B: Luminance increasing
C: Luminance decreasing

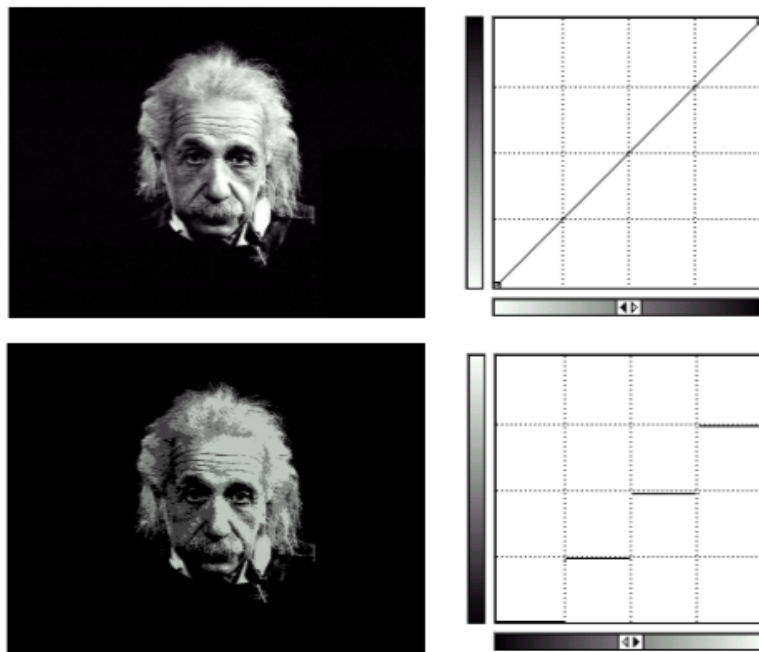


Histogram transform: 2) Contrast adjustment



(a) Original image (b) Contrast stretching

Histogram transform: 3) Color quantization



7.

直方图均值化
让色彩分布变得更平均



1. 最近邻插值
2. 双线性插值
3. warp图形的扭曲，只改变像素的位置

- Morph is not warp (geometric transformation)
- Morph is a kind of morphological changing, which makes an image change to another image gradually.
- Morph handles both the location and the intensity of a pixel.
- The beginning image and end image are two key frames. Other frames between the two key frames are generated automatically.

Morph几何变形和颜色变化，综合。有起始帧和结束帧，中间是用插值的方法

Warp只是几何变化，没有灰度

4. 表情比例图！为啥加上会表情更丰富？表情重定向的**步骤和方法**，不懂可以找老师！

Input: Images A A' B

Step1: Mark feature points

Step2: For each feature point v_b in B , warp it:

$$v_{b'} = v_b + v_{a'} - v_a$$

Let B_g be the warped image of B

Step3: Align A , A' with B_g by image warping.

Step4: Compute ratio image: $\Re = \frac{A'}{A}$

Step5: $B' = \Re \cdot B_g$

5. 一维卷积

6.

均值滤波（高斯滤波）要掌握

simple mean 全是1，

weighted mean，中间是4，上下左右是2，角上是1

最后都要除以总值

ample

$\frac{1}{9} \times$

1	1	1
1	1	1
1	1	1

$\frac{1}{16} \times$

1	2	1
2	4	2
1	2	1

7. 锐化：二阶拉普拉斯算子

0	-1	0
-1	4	-1
0	-1	0

-1	-1	-1
-1	8	-1
-1	-1	-1

8. 双边滤波

掌握General Idea这张PPT! Space Domain和Intensity Domain加权求和!

$$BF[I]_p = \frac{1}{W_p} \sum_{q \in S} \underset{\uparrow}{G_{\sigma_s}(\|p - q\|)} G_{\sigma_r}(\|I_p - I_q\|) I_q$$

■ space σ_s : spatial extent of the kernel, size of the considered neighborhood.

■ intensity σ_r : amplitude extent of an edge

sigma r 一般设为图像对角线的2%这么大

sigma s 一般设为gradient的均值或中位值?

可以保边! 不可以保梯度!

中值滤波边会出现锯齿状

