Lab02

Histogram Equalization (30%)
Otsu threshold (20%)
Connected component (50%)

1. 彩色圖片直方圖等化(30%)

- 計算輸入圖的直方圖
- 計算直方圖的累計表
- 用直方圖累計表完成各強度的映射

Intensity (r)	No. of Pixels	Axx Sum of P	Output value	Quantized Output(s)
0	20	0.2	0.2*7=1.4	1
1	5	0.25	0.25*7=1.75	2
2	25	0.5	0.5*7=3.5	4
3	10	0.6	0.6*7=4.2	4
4	15	0.75	0.75*7=5.25	5
5	5	0.8	0.8*7=5.6	6
6	10	0.9	0.9*7=6.3	6
7	10	1	1.0*7=7	7
Total	100			

input

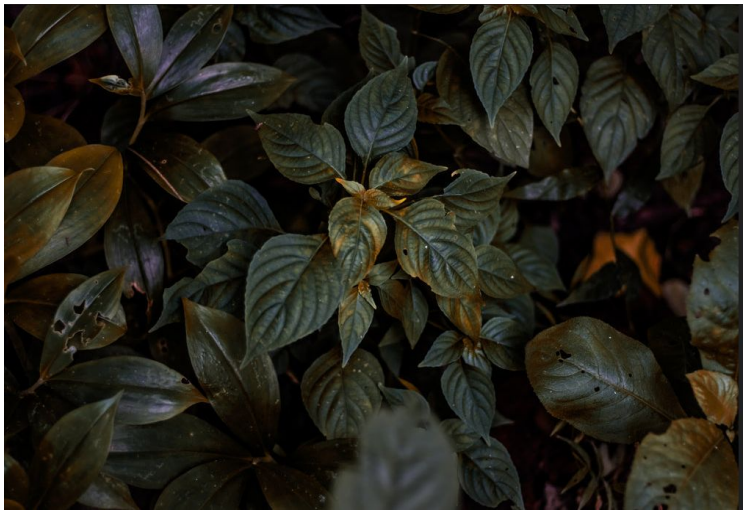
bad output

good output

1-a 分別對BGR三個顏色作直方圖等化 (10%)

顏色會跑偏

input



output

1-b 先將圖片轉成HSV格式後對V做直方圖等化(20%)

hint: cv2.cvtColor()

output

$$h = \begin{cases} 0^\circ & \text{if } max = min \\ 60^\circ \times \frac{g-b}{max-min} + 0^\circ, & \text{if } max = r \text{ and } g \geq b \\ 60^\circ \times \frac{g-b}{max-min} + 360^\circ, & \text{if } max = r \text{ and } g < b \\ 60^\circ \times \frac{b-r}{max-min} + 120^\circ, & \text{if } max = g \\ 60^\circ \times \frac{r-g}{max-min} + 240^\circ, & \text{if } max = b \end{cases}$$

$$s = \begin{cases} 0, & \text{if } max = 0 \\ \frac{max-min}{max} = 1 - \frac{min}{max}, & \text{otherwise} \end{cases}$$

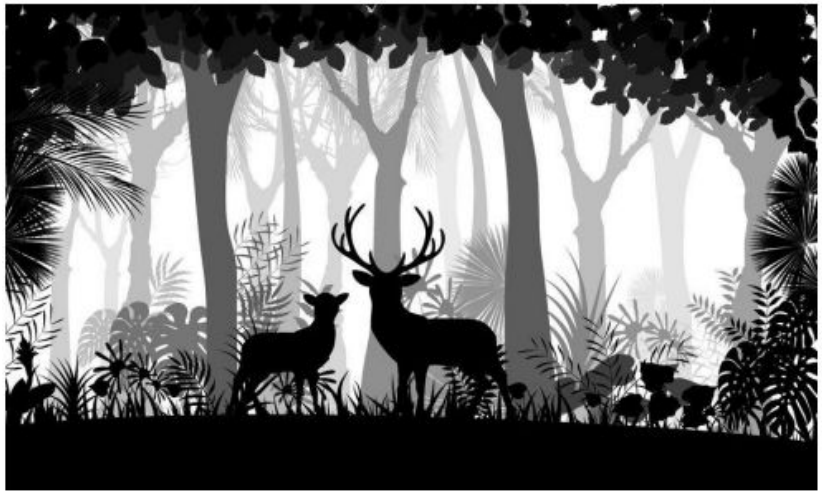
$$v = max$$

2. Otsu Threshold (20%)

- 先計算影像的直方圖。
- 把直方圖強度大於閾值的像素分成一組,把小於閾值的像素分成另一組。
- 分別計算這兩組的組內變異數,並把兩個組內變異數相加。
- 將 0 ~ 255 依序當作閾值來計算組內變異數和,總和值最小的就是結果閾值。

2. Otsu Threshold (20%)

Input :



Output :

3. Connected Component (50%)

- Two-Pass Algorithm:

Pass 1:

• Perform label assignment and label propagation.

• Construct the equivalence relations between labels when two different labels propagate to the same pixel.

• Apply resolve function to find the transitive closure of all equivalence relations.

Pass 2:

• Perform label translation

Connected Component

- 對做完Otsu threshold的圖片找出connected components
- 不同區域塗上不同顏色(顏色沒有限制)