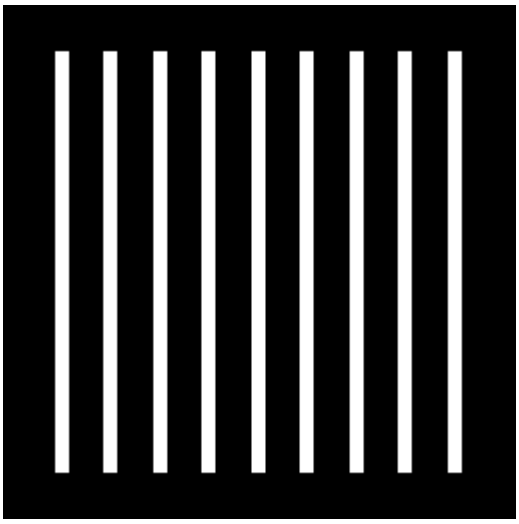
DIP HW3

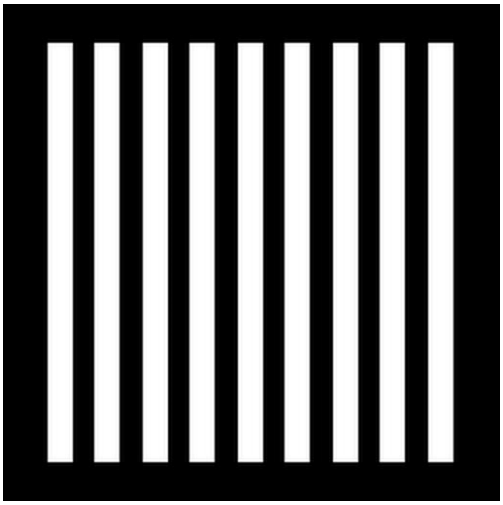
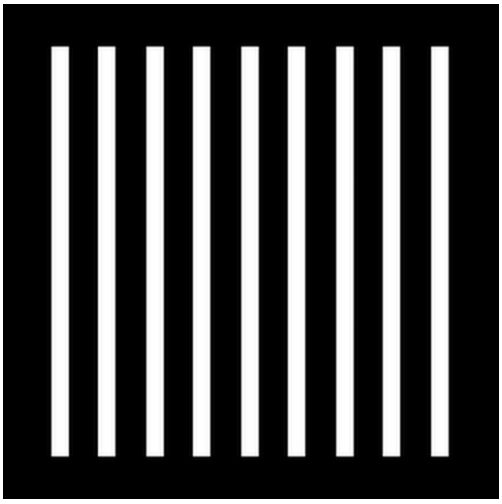
學號：B083040012
姓名：陳柏翰

Q1

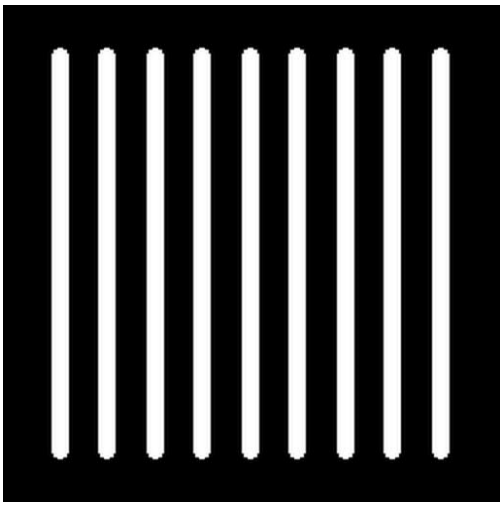
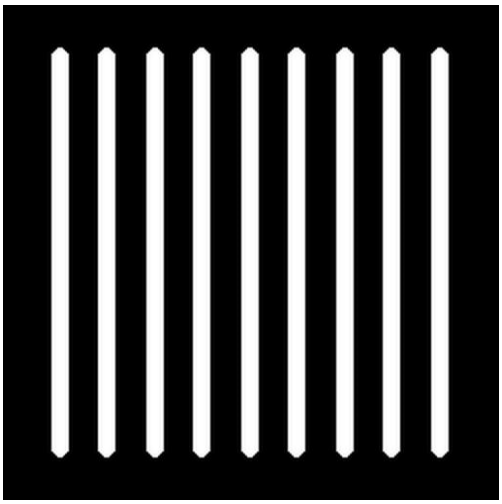
- original image



- 7x7 arithmetic mean & 3x3 arithmetic mean filter

- 7x7 median & 3x3 median filter

Q2

(a)

- original image by RGB model

(b)

- red component

- green component

- blue component

(c)

- for the conversion of RGB <–> HSI model,I use the geometric derivation algorithm (details below)

$$R,G,B \in [0,255]$$

$$(\mathrm{R}',\mathrm{G}',\mathrm{B}') = (\mathrm{R},\mathrm{G},\mathrm{B})/255$$

$$\theta = \arccos\left(\frac{\mathrm{R}'-\mathrm{G}'+\mathrm{R}'-\mathrm{B}'}{2\sqrt{(\mathrm{R}'-\mathrm{G}')^2+(\mathrm{R}'-\mathrm{B}')(\mathrm{G}'-\mathrm{B}')}}\right)$$

$$H = \begin{cases} \theta & \mathrm{B}' \le \mathrm{G}' \\ 2\pi-\theta & \mathrm{B}' > \mathrm{G}' \end{cases}$$

$$I = \frac{\mathrm{R}'+\mathrm{G}'+\mathrm{B}'}{3}$$

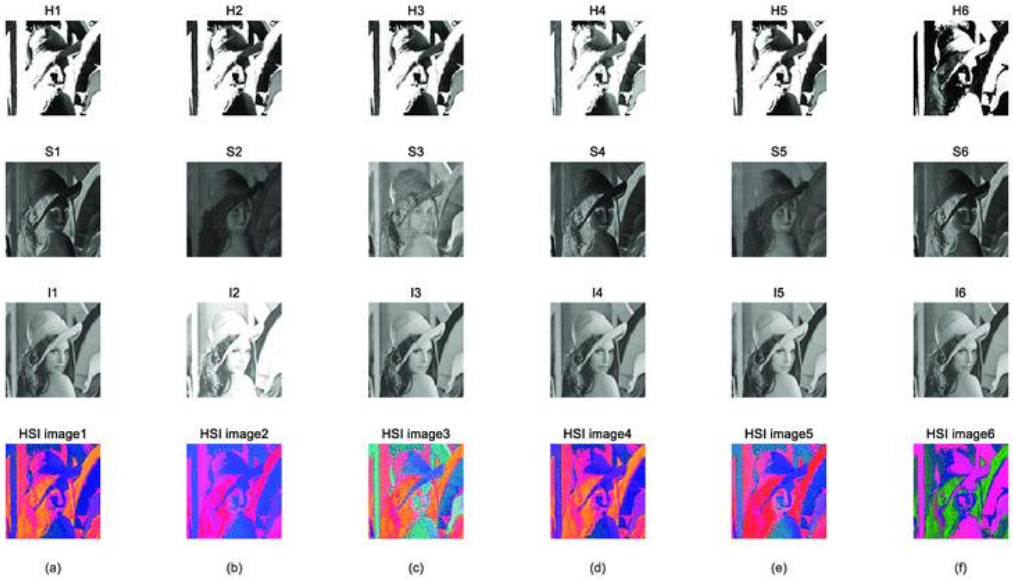
$$S = 1-\frac{3\min\{\mathrm{R}',\mathrm{G}',\mathrm{B}'\}}{\mathrm{R}'+\mathrm{G}'+\mathrm{B}'}$$

$$H \in [0,1], H = 2\pi H$$

$$RG\text{扇区}\left(H \in \left[0, 2\pi/3\right)\right)\begin{cases} B = I(1-S) \\ R = I\left[1+\dfrac{S\cos H}{\cos\left(\pi/3 - H\right)}\right] \\ G = 3I - R - B \end{cases} \qquad GB\text{扇区}\left(H \in \left[2\pi/3, 4\pi/3\right)\right)\begin{cases} H = H - 2\pi/3 \\ R = I(1-S) \\ G = I\left[1+\dfrac{S\cos H}{\cos\left(\pi/3 - H\right)}\right] \\ B = 3I - R - G \end{cases}$$

$$BR\text{扇区}\left(H \in \left[4\pi/3, 2\pi\right)\right)\begin{cases} H = H - 4\pi/3 \\ G = I(1-S) \\ B = I\left[1+\dfrac{S\cos H}{\cos\left(\pi/3 - H\right)}\right] \\ R = 3I - G - B \end{cases}$$

- for the result in slide/textbook,I think authors used a different algorithm to convert the color model,so my result is not look exactly like the result in slide
- here are the results from different algorithm (reference)



From left to right: (a) Geometric derivation algorithm, (b) Coordinate transformation method, (c) Segment definition method, (d) Bajon approximation algorithm, (e) Standard module arithmetic method, and (f) S-SC algorithm.

- merged HSI component of the RGB color image

- **hue** component of the RGB color image

- **saturation** component of the RGB color image

- **intensity** component of the RGB color image

(d)

- color complements using RGB model

(e)

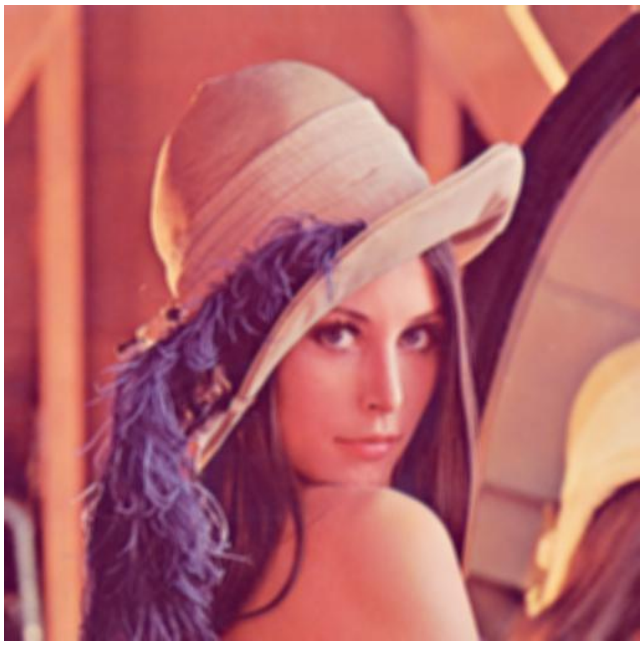
- 5x5 average kernel

```
       [[1,1,1,1,1],
        [1,1,1,1,1],
1/25 *   [1,1,1,1,1],
        [1,1,1,1,1],
        [1,1,1,1,1]]
```

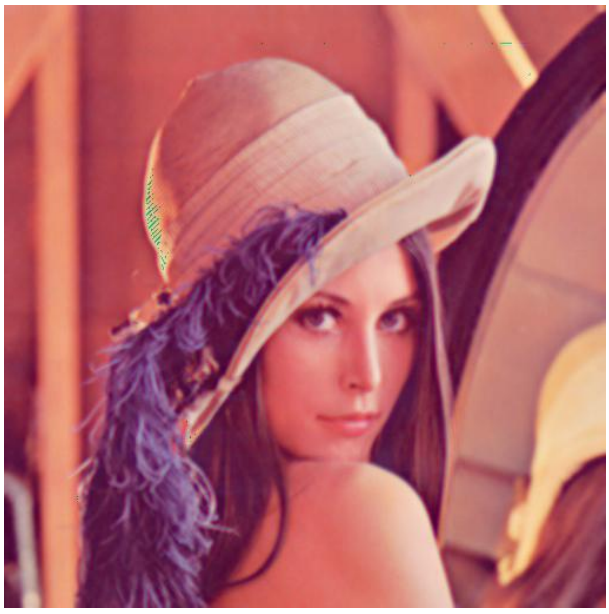
- laplacian kernel

```
[[0, 1,0],
 [1,-4,1],
 [0, 1,0]]
```

- by using RGB model(original/smoothing/sharpening)

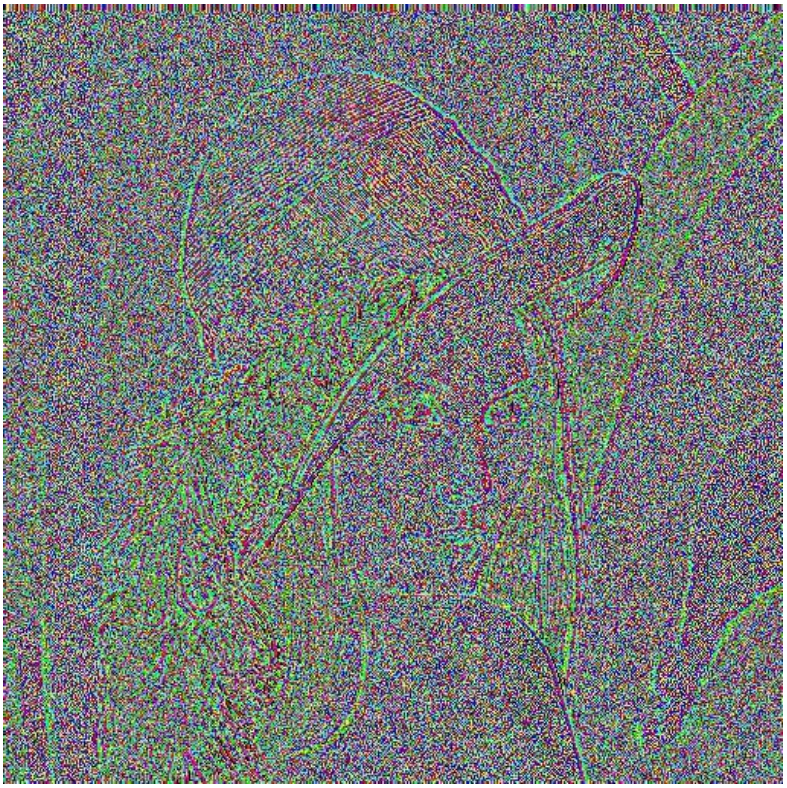


- by using HSI model(original/smoothing/sharpening)
    - transform the I component,leaving H and S components unchanged

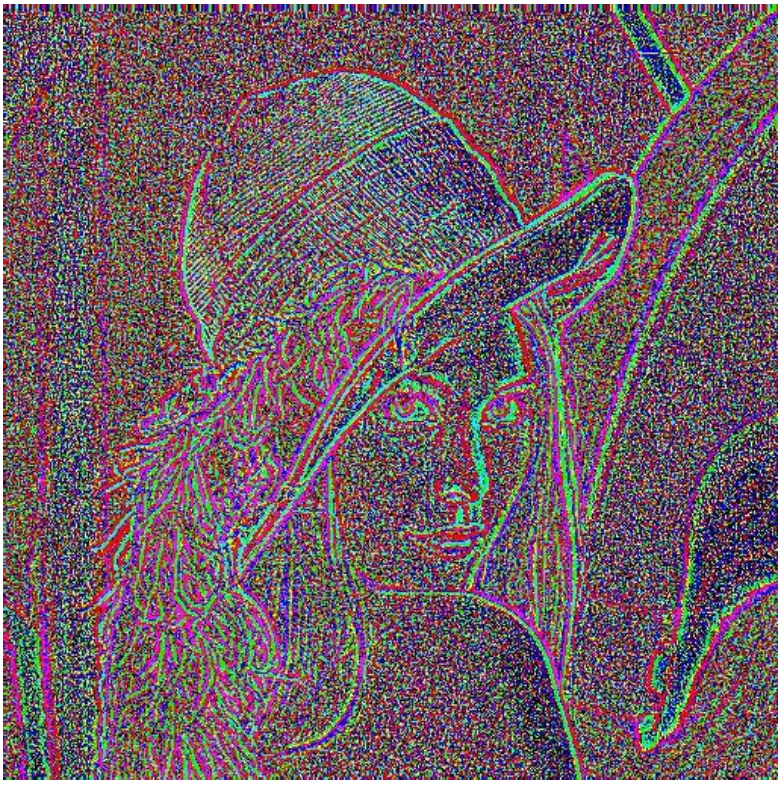


Difference b/w RGB Model & HSI Model

- difference of sharpening



- difference of smoothing



(f)

- in this problem,I use **hue component** (150~156) to select the region of feathers
    - then reducing the saturation(to 0) and reinforcing the intensity(to 255) to highlight the selected region
    - simultaneously reinforcing rhe saturation(to 255) to hind the information in unselected area
- there is the result