Code :

Project2.m (Main 主要執行) :

```
close 'all';
clear 'all';

I = imread('img01.jpg');    %read file
J = imread('img02.jpg');

I_G = rgb2gray(I);  %transform RGB file into Gray-Scale
file
figure(1),
subplot(2, 2, 1)
imshow(I_G)         %print original file
subplot(2, 2, 2)
imhist(I_G)         %print original file's histogram
subplot(2, 2, 3)
II = histeq(I_G);   %doing histogram equalization
imshow(II)          %print equalized file
subplot(2, 2, 4)
imhist(II)          %print equalized file's histogram

figure(2),
subplot(2, 2, 1)
imshow(J)           %print original file
subplot(2, 2, 2)
imhist(J)           %print original file's histogram
subplot(2, 2, 3)
JJ = histeq(J);     %doing histogram equalization
imshow(JJ)          %print equalized file
subplot(2, 2, 4)
imhist(JJ)          %print equalized file's histogram

%/************************************************Sobel
Operator************************************************
/

IS = rgb2gray(I);   %transform RGB file into Gray-Scale
```

```
file
C = double(IS);     %turn the image array into double
precission(Let computing more precise)
for i = 1 : size(C, 1) - 2      %from 1 to Xmax - 2
  for j = 1 : size(C, 2) - 2  %from 1 to Ymax - 2
    %Sobel mask for x-direction:
    %        j, j+1, j+2
    %i     [-1,  -2,  -1]
    %i + 1 [ 0,   0,   0]
    %i + 2 [+1,  +2,  +1]
    Gx = ((C(i + 2, j) + 2 * C(i + 2, j + 1) + C(i + 2, j
+ 2)) - (C(i, j) + 2 * C(i, j + 1) + C(i, j + 2)));

    %Sobel mask for y-direction:
    %        j, j+1, j+2
    %i     [-1,   0,  +1]
    %i + 1 [-2,   0,  +2]
    %i + 2 [-1,   0,  +1]
    Gy = ((C(i, j + 2) + 2 * C(i + 1, j + 2) + C(i + 2, j
+ 2)) - (C(i, j) + 2 * C(i + 1, j) + C(i + 2, j)));

    IS(i, j) = abs(Gx) + abs(Gy);
  end
end

figure(3),
subplot(2, 2, 1)
imshow(I);          %print original file
subplot(2, 2, 2)
imshow(IS);         %print sobeled file

JS = J;
C = double(JS);
for i = 1 : size(C, 1) - 2
  for j = 1 : size(C, 2) - 2
    %Sobel mask for x-direction:
    %        j, j+1, j+2
    %i     [-1,  -2,  -1]
```

```
    %i + 1 [ 0,   0,   0]
    %i + 2 [+1,  +2,  +1]
    Gx = ((C(i + 2, j) + 2 * C(i + 2, j + 1) + C(i + 2, j
+ 2)) - (C(i, j) + 2 * C(i, j + 1) + C(i, j + 2)));

    %Sobel mask for y-direction:
    %        j, j+1, j+2
    %i     [-1,   0,  +1]
    %i + 1 [-2,   0,  +2]
    %i + 2 [-1,   0,  +1]
    Gy = ((C(i, j + 2) + 2 * C(i + 1, j + 2) + C(i + 2, j
+ 2)) - (C(i, j) + 2 * C(i + 1, j) + C(i + 2, j)));

    JS(i, j) = abs(Gx) + abs(Gy);
  end
end

subplot(2, 2, 3)
imshow(J);          %print original file
subplot(2, 2, 4)
imshow(JS);         %print sobeled file
```

程式碼解說：

Histogram Equalization：

使用 matlab 內建的 function：“histeq()”就能進行 Histogram Equalization，並且有用”imhist()”來印出分布情形，另外，處理 RGB 圖片要先將其轉為 Gray-scale，才能使用”histeq()”來進行處理

Sobel operator：

首先利用”double()”來將 array 轉成 double type 以提高精準度，之後再用迴圈來進行計算，Gx、Gy 的計算就是利用附圖的矩陣來做運算，最後再利用框起來的公式做運算，得到經過 Sobel Operator 運算後的圖片

$$\nabla f(x,y) = \left|\frac{\partial f(x,y)}{\partial x}\right| + \left|\frac{\partial f(x,y)}{\partial y}\right|$$

$$\frac{\partial f(x,y)}{\partial x} = \sum_{s=-1}^{1}\sum_{t=-1}^{1} g_x(s,t) f(x+s, y+t)$$

$$\frac{\partial f(x,y)}{\partial y} = \sum_{s=-1}^{1}\sum_{t=-1}^{1} g_y(s,t) f(x+s, y+t)$$

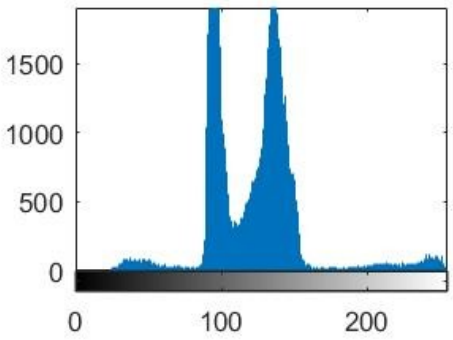
g_x: *horizontal edge*

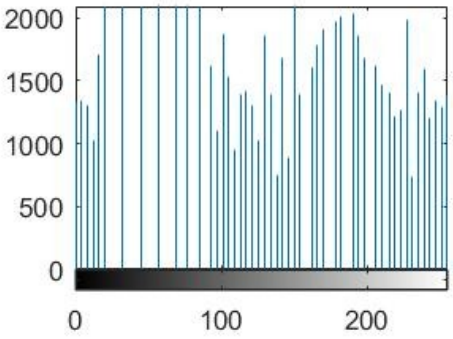
−1	−2	−1
0	0	0
1	2	1

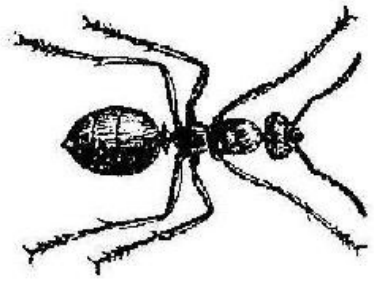
g_y: *vertical edge*

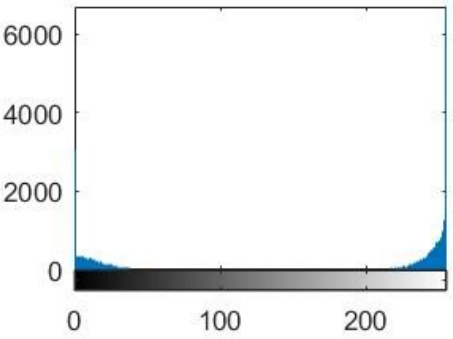
−1	0	1
−2	0	2
−1	0	1

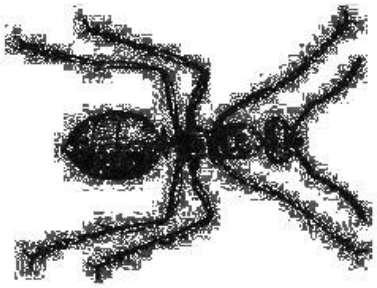
Result :

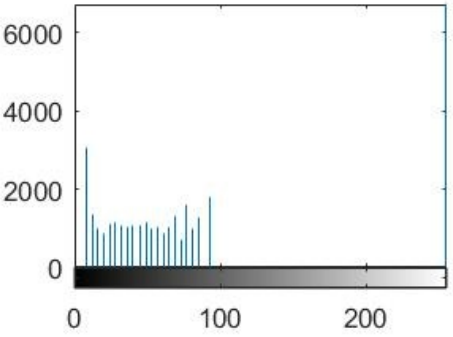







6000
4000
2000
0
0
100
200




6000
4000
2000
0
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