

Part 1: (50%) Histogram of an Image

程式碼:

```
function varargout = hw01_01(varargin)

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                  'gui_Singleton',   gui_Singleton, ...
                  'gui_OpeningFcn', @hw01_01_OpeningFcn, ...
                  'gui_OutputFcn',  @hw01_01_OutputFcn, ...
                  'gui_LayoutFcn',  [], ...
                  'gui_Callback',    []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT


% --- Executes just before hw01_01 is made visible.
function hw01_01_OpeningFcn(hObject, eventdata, handles, varargin)
% Choose default command line output for hw01_01
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% --- Outputs from this function are returned to the command line.
function varargout = hw01_01_OutputFcn(hObject, eventdata, handles)
```

```
% Get default command line output from handles structure
```

```
varargout{1} = handles.output;
```

```
% --- Executes on button press in pushbutton1.
```

```
function pushbutton1_Callback(hObject, eventdata, handles)
```

```
filename = uigetfile({'*.64*', '.64 files'});
```

```
fid = fopen( filename, 'r');
```

```
% 讀取檔案，為 64*64 char
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        F(i, j) = fscanf(fid, '%c\n', 1);
```

```
    end
```

```
end
```

```
% char 轉換成 ASCII code，0~9 一組、A~V 一組，
```

```
% 可以對照 32 位元和 ASCII，產生兩組規律
```

```
I = uint8(F);
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        % 0~9
```

```
        if I(i, j) >= 48 && I(i, j) <= 57
```

```
            I(i, j) = I(i, j) - 48;
```

```
        % 10~31
```

```
        elseif I(i, j) >= 65 && I(i, j) <= 86
```

```
            I(i, j) = I(i, j) - 55;
```

```
        end
```

```
        if I(i, j) > 31
```

```
            I(i, j) = 31;
```

```
        end
```

```
    end
```

```
end
```

```
% histogram
```

```

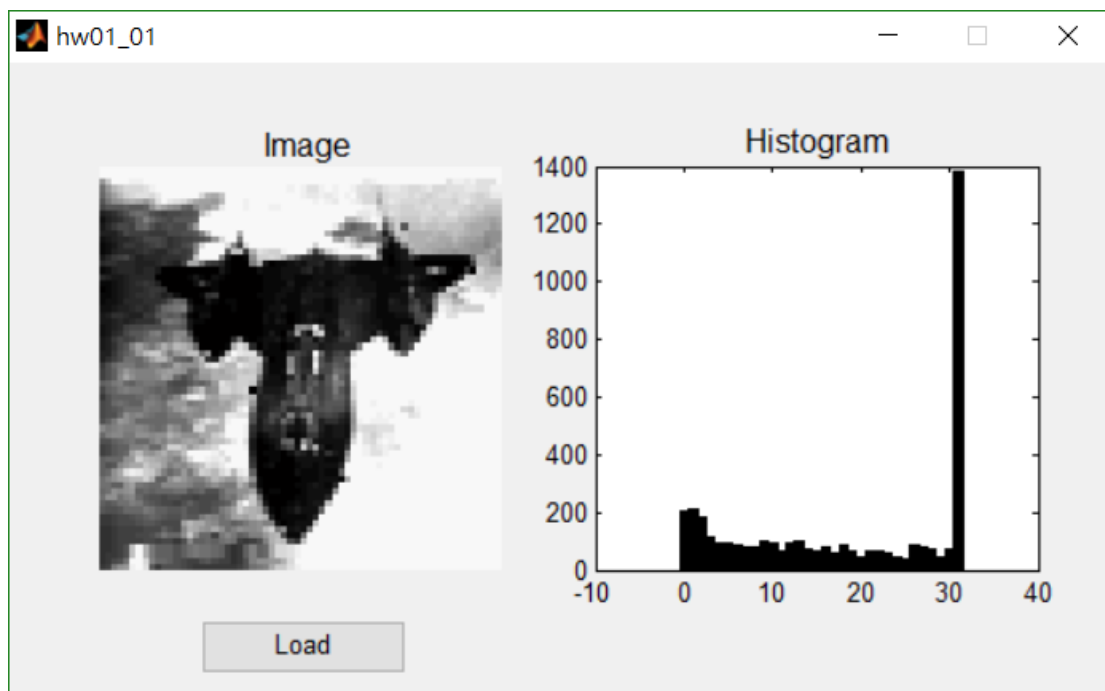
H = zeros(1, 32);
for i = 1:64
    for j = 1:64
        H( I(i, j)+1 ) = H( I(i, j)+1 ) + 1;
    end
end

% imshow, histogram plot
axes(handles.axes1); imshow(I*8);
x = 0:31;
axes(handles.axes2); bar(x, H, 'FaceColor', [0 0 0], 'BarWidth', 1);

fclose(fid);

```

結果呈現:



Part 2: (50%) Arithmetic Operations of an Image Array

程式碼:

```
function varargout = hw01_02(varargin)

% Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                  'gui_Singleton',   gui_Singleton, ...
                  'gui_OpeningFcn', @hw01_02_OpeningFcn, ...
                  'gui_OutputFcn',  @hw01_02_OutputFcn, ...
                  'gui_LayoutFcn',  [], ...
                  'gui_Callback',    []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
% End initialization code - DO NOT EDIT


% --- Executes just before hw01_02 is made visible.
function hw01_02_OpeningFcn(hObject, eventdata, handles, varargin)

handles.Add = 5;
handles.Multi = 1.5;

% Choose default command line output for hw01_02
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);
```

```
% --- Outputs from this function are returned to the command line.  
function varargout = hw01_02_OutputFcn(hObject, eventdata, handles)
```

```
% Get default command line output from handles structure  
varargout{1} = handles.output;
```

```
% --- Executes on button press in pushbutton1.  
function pushbutton1_Callback(hObject, eventdata, handles)
```

```
filename = uigetfile({'*.64*', '.64 files'});
```

```
fid = fopen( filename, 'r');
```

```
% 讀取檔案，為 64*64 char
```

```
for i = 1:64  
    for j = 1:64  
        F(i, j) = fscanf(fid, '%c\n', 1);  
    end  
end
```

```
% char 轉換成 ASCII code，0~9 一組、A~V 一組，
```

```
% 可以對照 32 位元和 ASCII，產生兩組規律
```

```
handles.I = uint8(F);  
for i = 1:64  
    for j = 1:64  
        % 0~9  
        if handles.I(i, j) >= 48 && handles.I(i, j) <= 57  
            handles.I(i, j) = handles.I(i, j) - 48;  
        % 10~31  
        elseif handles.I(i, j) >= 65 && handles.I(i, j) <= 86  
            handles.I(i, j) = handles.I(i, j) - 55;  
        end  
        if handles.I(i, j) > 31  
            handles.I(i, j) = 31;  
        end  
    end  
end
```

```

end
fclose(fid);

handles.output = hObject;
guidata(hObject, handles);

% --- Executes on button press in pushbutton2.
function pushbutton2_Callback(hObject, eventdata, handles)

filename = uigetfile({'*.64*', '.64 files'});

fid = fopen( filename, 'r');

% 讀取檔案，為 64*64 char
for i = 1:64
    for j = 1:64
        F(i, j) = fscanf(fid, '%c\n', 1);
    end
end

% char 轉換成 ASCII code，0~9 一組、A~V 一組，
% 可以對照 32 位元和 ASCII，產生兩組規律
handles.J = uint8(F);
for i = 1:64
    for j = 1:64
        % 0~9
        if handles.J(i, j) >= 48 && handles.J(i, j) <= 57
            handles.J(i, j) = handles.J(i, j) - 48;
        % 10~31
        elseif handles.J(i, j) >= 65 && handles.J(i, j) <= 86
            handles.J(i, j) = handles.J(i, j) - 55;
        end
        if handles.J(i, j) > 31
            handles.J(i, j) = 31;
        end
    end
end
end
fclose(fid);

```

```
handles.output = hObject;  
guidata(hObject, handles);
```

```
% --- Executes on button press in pushbutton3.
```

```
function pushbutton3_Callback(hObject, eventdata, handles)
```

```
% histogram
```

```
H = zeros(1, 32);
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        H( handles.I(i, j)+1 ) = H( handles.I(i, j)+1 ) + 1;
```

```
    end
```

```
end
```

```
% imshow, histogram plot
```

```
axes(handles.axes1); imshow(handles.I*8);
```

```
x = 0:31;
```

```
axes(handles.axes6); bar(x, H, 'FaceColor', [0 0 0], 'BarWidth', 1);
```

```
handles.output = hObject;
```

```
guidata(hObject, handles);
```

```
% --- Executes on button press in pushbutton4.
```

```
function pushbutton4_Callback(hObject, eventdata, handles)
```

```
% Add or subtract a constant value to each pixel in the image
```

```
I1 = handles.I;
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        I1(i, j) = handles.I(i, j) + handles.Add;
```

```
    end
```

```
end
```

```
% histogram
```

```
H1 = zeros(1, 32);
```

```

for i = 1:64
    for j = 1:64
        % 若加上像素後大於 31，使其等於 31
        if I1(i, j) > 31
            I1(i, j) = 31;
        end
        H1( I1(i, j)+1 ) = H1( I1(i, j)+1 ) + 1;
    end
end

axes(handles.axes2); imshow(I1*8);
x = 0:31;
axes(handles.axes7); bar(x, H1, 'FaceColor', [0 0 0], 'BarWidth', 1);

handles.output = hObject;
guidata(hObject, handles);

% --- Executes on button press in pushbutton5.
function pushbutton5_Callback(hObject, eventdata, handles)

% Multiply a constant to each pixel in the image.

I2 = handles.I;
for i = 1:64
    for j = 1:64
        I2(i, j) = round( handles.I(i, j)*handles.Multi );
    end
end

% histogram
H2 = zeros(1, 32);
for i = 1:64
    for j = 1:64
        % 若加上像素後大於 31，使其等於 31
        if I2(i, j) > 31
            I2(i, j) = 31;
        end
    end
end

```



```

        H2( I2(i, j)+1 ) =    H2( I2(i, j)+1 ) + 1;
    end
end

axes(handles.axes3); imshow(I2*8);
x = 0:31;
axes(handles.axes8); bar(x, H2, 'FaceColor', [0 0 0], 'BarWidth', 1);

handles.output = hObject;
guidata(hObject, handles);

% --- Executes on button press in pushbutton6.
function pushbutton6_Callback(hObject, eventdata, handles)

I3 = uint8( zeros(64) );
for i = 1:64
    for j = 1:64
        I3(i, j) = handles.J(i, j)*0.5 + handles.I(i, j)*0.5;
    end
end

% histogram
H3 = zeros(1, 32);
for i = 1:64
    for j = 1:64
        % 若加上像素後大於 31，使其等於 31
        if I3(i, j) > 31
            I3(i, j) = 31;
        end
        H3( I3(i, j)+1 ) =    H3( I3(i, j)+1 ) + 1;
    end
end

axes(handles.axes4); imshow(I3*8);
x = 0:31;
axes(handles.axes9); bar(x, H3, 'FaceColor', [0 0 0], 'BarWidth', 1);

handles.output = hObject;

```

```
guidata(hObject, handles);
```

```
% --- Executes on button press in pushbutton7.
```

```
function pushbutton7_Callback(hObject, eventdata, handles)
```

```
paddle = uint8( zeros( 66 ) );
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        paddle(i+1, j+1) = handles.I(i, j);
```

```
    end
```

```
end
```

```
paddle2 = uint8( ones( 66 ) );
```

```
for i = 2:65
```

```
    for j = 2:65
```

```
        paddle2(i, j) = paddle(i, j) - paddle(i, j-1);
```

```
    end
```

```
end
```

```
I4 = uint8( ones( 64 ) );
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        I4(i, j) = paddle2(i+1, j+1);
```

```
    end
```

```
end
```

```
% histogram
```

```
H4 = zeros(1, 32);
```

```
for i = 1:64
```

```
    for j = 1:64
```

```
        % 若加上像素後大於 31，使其等於 31
```

```
        if I4(i, j) > 31
```

```
            I4(i, j) = 31;
```

```
        elseif I4(i, j) < 0
```

```
            I4(i, j) = 0;
```

```
        end
```

```
        H4( I4(i, j)+1 ) = H4( I4(i, j)+1 ) + 1;
```

```
    end
```

```
end
```

```
axes(handles.axes5); imshow(I4*8);
```

```
x = 0:31;
```

```
axes(handles.axes10); bar(x, H4, 'FaceColor', [0 0 0], 'BarWidth', 1);
```

```
handles.output = hObject;
```

```
guidata(hObject, handles);
```

```
function edit1_Callback(hObject, eventdata, handles)
```

```
% 更改加減的數字
```

```
handles.Add = str2double(get(hObject,'String'));
```

```
handles.output = hObject;
```

```
guidata(hObject, handles);
```

```
% --- Executes during object creation, after setting all properties.
```

```
function edit1_CreateFcn(hObject, eventdata, handles)
```

```
if ispc && isequal(get(hObject,'BackgroundColor'),
```

```
get(0,'defaultUicontrolBackgroundColor'))
```

```
    set(hObject,'BackgroundColor','white');
```

```
end
```

```
function edit2_Callback(hObject, eventdata, handles)
```

```
% 更改乘以的數字
```

```
handles.Multi = str2double(get(hObject,'String'));
```

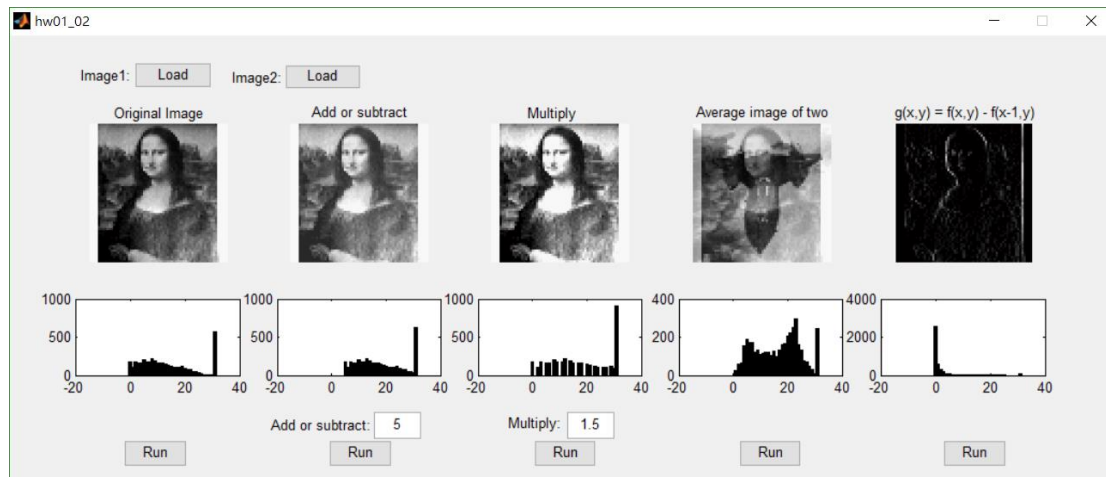
```
handles.output = hObject;
guidata(hObject, handles);
```

% --- Executes during object creation, after setting all properties.

```
function edit2_CreateFcn(hObject, eventdata, handles)
```

```
if ispc && isequal(get(hObject,'BackgroundColor'),
get(0,'defaultUicontrolBackgroundColor'))
    set(hObject,'BackgroundColor','white');
end
```

結果呈現:



結果討論:

- (1) 原圖
- (2) 每個 pixel 數值+5，圖片可看出整體圖片變亮，由直方圖可看出整體往右移動 5 個單位，僅 31 的數目增加，因為此程式設計灰階值大於 31，即等於 31
- (3) 每個 pixel 數值*1.5，圖片可看出黑白的對比提高，由直方圖可看出因乘以分數後去除小數點，造成部分灰階值等於 0 (ex:3*1.5=4.5=4, 4*1.5=6, 因此 5 數目等於 0)
- (4) 將兩個圖片*0.5 相加，圖片可看出兩個隱約的影像，由柱狀圖可看出因兩張圖灰階值分布不同，相加後取平均後，整體的灰階值分布較為平均
- (5) 由本身的 pixel 減去左邊的 pixel，由圖片可看出當一個部分右邊 pixel 較大(較白)，左邊 pixel 較小(黑)，相減後才會產生正值，形成部分輪廓線。由柱狀圖可看出，因為此程式將 pixel 相減，且小於 0 的值等於零，所以整體圖像偏暗。