

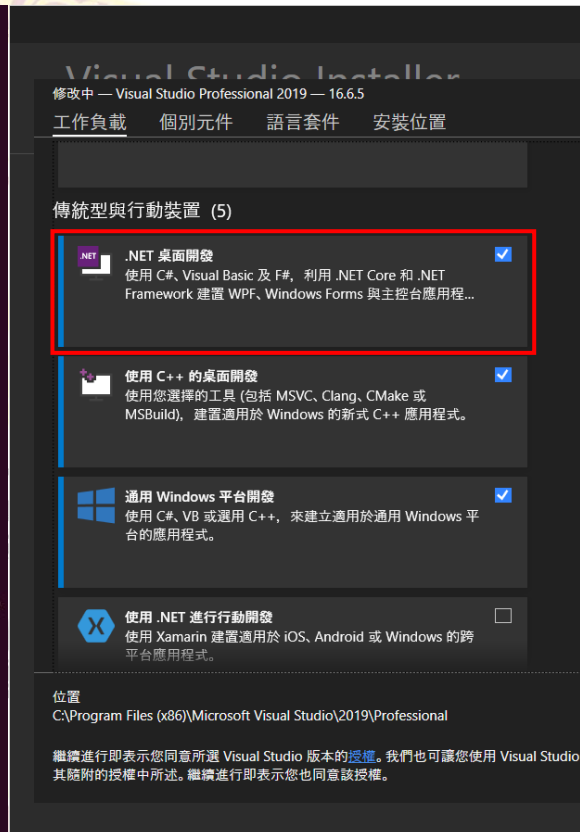
# Principles and Applications of Digital Image Processing

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## ● Overview

Because I use C#, I think I have better explain the structure of my project/solution.

```
rmml@rmml:~/Desktop/b07611001_HW_1$ tree
.
├── b07611001hw1sol
│   ├── b07611001hw1
│   │   ├── App.config
│   │   ├── b07611001hw1.csproj
│   │   ├── bin
│   │   │   ├── Debug
│   │   │   │   ├── b07611001hw1.exe
│   │   │   │   ├── b07611001hw1.exe.config
│   │   │   │   └── b07611001hw1.pdb
│   │   │   └── Release
│   │   ├── Image64.cs
│   │   ├── Mainwindow.cs
│   │   ├── Mainwindow.Designer.cs
│   │   └── Mainwindow.resx
│   │   └── obj
│   │       ├── Debug
│   │       │   ├── b07611001hw1.csproj.AssemblyReference.cache
│   │       │   ├── b07611001hw1.csproj.CoreCompileInputs.cache
│   │       │   ├── b07611001hw1.csproj.FileListAbsolute.txt
│   │       │   ├── b07611001hw1.csproj.GenerateResource.cache
│   │       │   ├── b07611001hw1.exe
│   │       │   ├── b07611001hw1.Mainwindow.resources
│   │       │   ├── b07611001hw1.pdb
│   │       │   ├── b07611001hw1.Properties.Resources.resources
│   │       │   ├── DesignTimeResolveAssemblyReferences.cache
│   │       │   ├── DesignTimeResolveAssemblyReferencesInput.cache
│   │       │   └── TempPE
│   │       └── Release
│   ├── Program.cs
│   ├── Properties
│   │   ├── AssemblyInfo.cs
│   │   ├── Resources.Designer.cs
│   │   ├── Resources.resx
│   │   ├── Settings.Designer.cs
│   │   └── Settings.settings
│   └── b07611001hw1sol.sln
└── HW1_楊禮蔚_b07611001.pdf
```



### ➤ Prerequisites:

Microsoft .NET Framework, Windows environment.

### ➤ Description:

HW1\_楊禮蔚\_b07611001.pdf: this report.

b07611001hw1sol.sln: solution file, can be open with Visual Studio, could link several project files.

b07611001hw1.csproj: project file.

Image64.cs: a self-designed class.

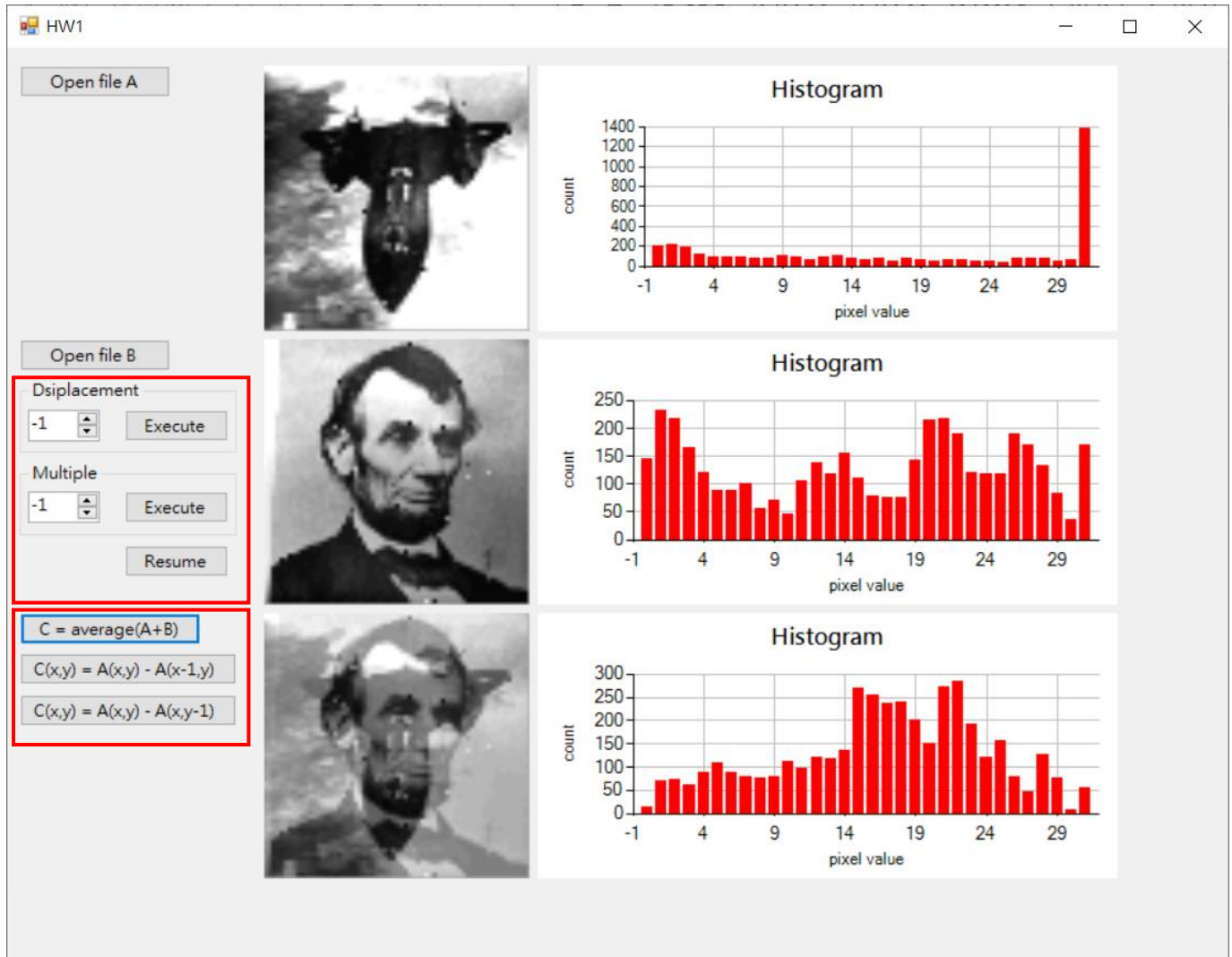
Mainwindow.cs: main code.

Mainwindow.Designer.cs: declaration of objects.

Program.cs: entrance for the code (static void Main()).

b07611001hw1.exe: executable file.

➤ UI:



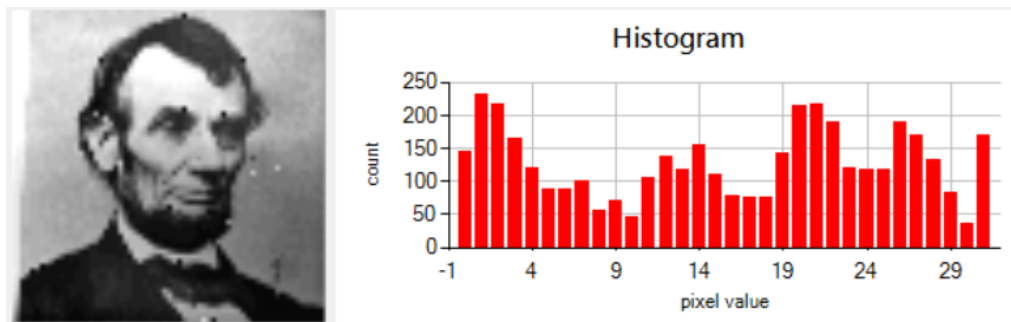
A. Manipulation section:

An execute button to manipulate the image and a resume button to undo the change. I use a NumericUpDown box to get the number of manipulation, with upper limit of 100 and lower limit of -100.

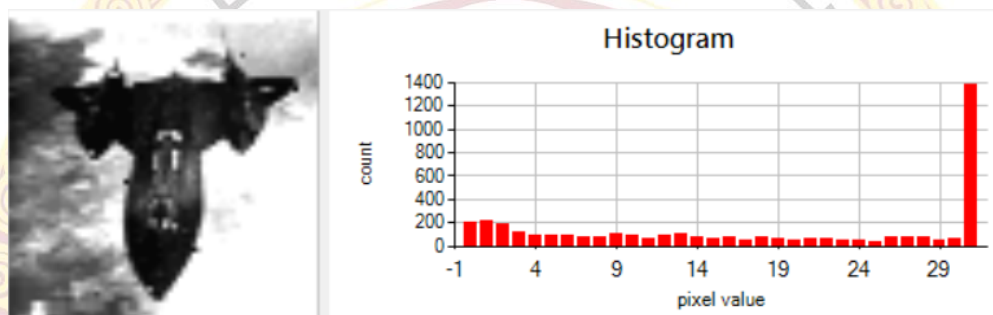
B. Operation section:

I add a third button to try the operation 2 in different direction.

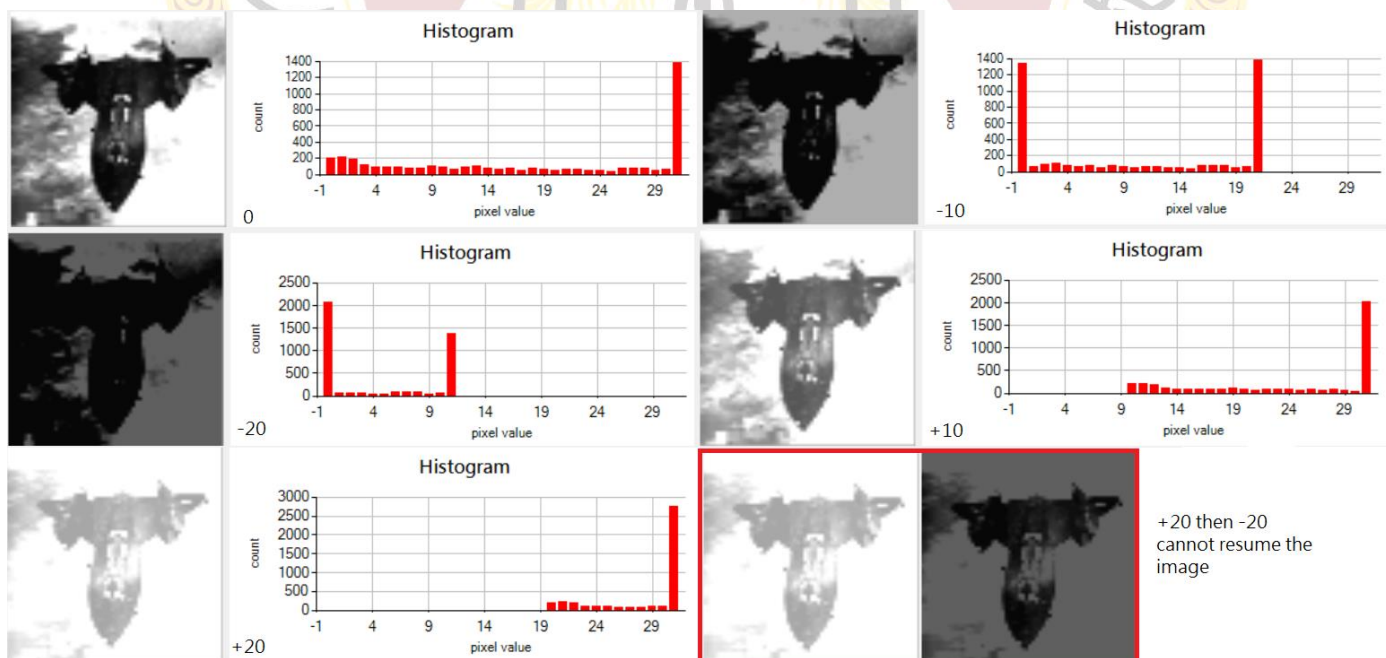
- Part 1: (50%) Histogram of an Image



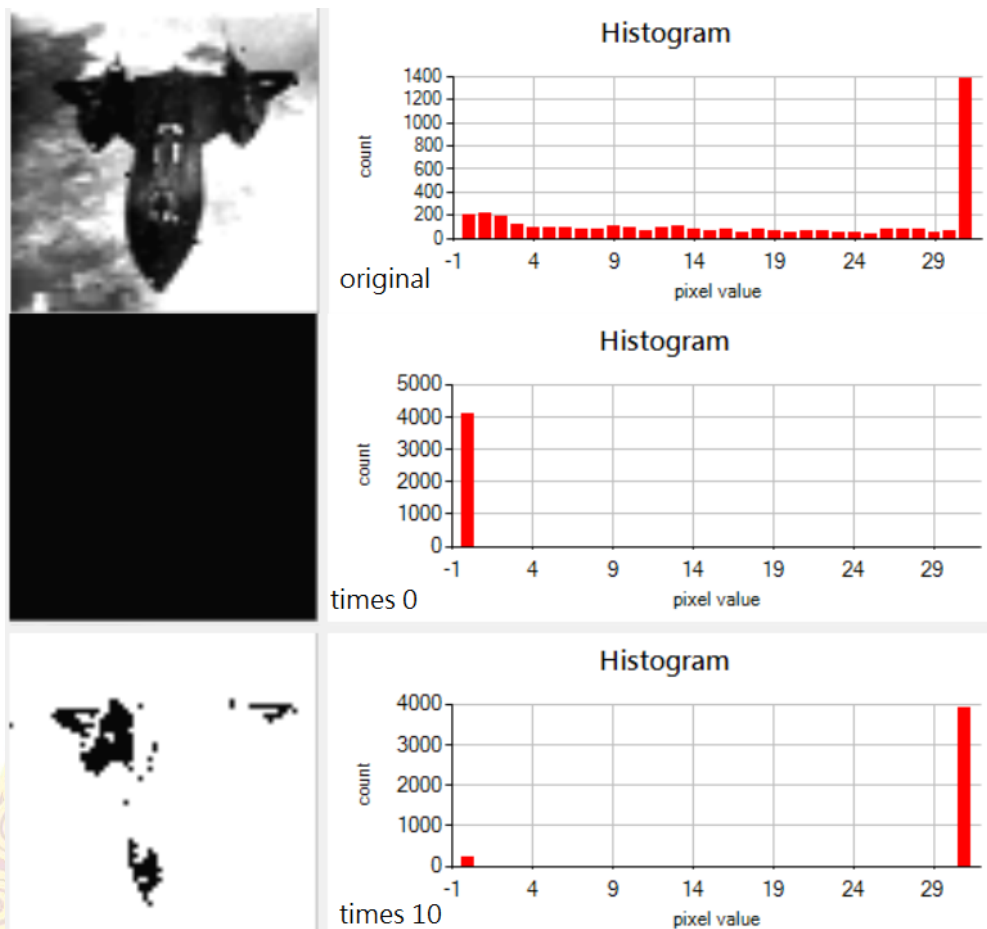
The histogram shows the distribution of grey level (0-31) in the image, as we can see from the LINCOLN.64: the distribution is rather even. Yet a different image, JET.64, shows a concentrated distribution in large grey scale value since the picture has a huge area of brightness.



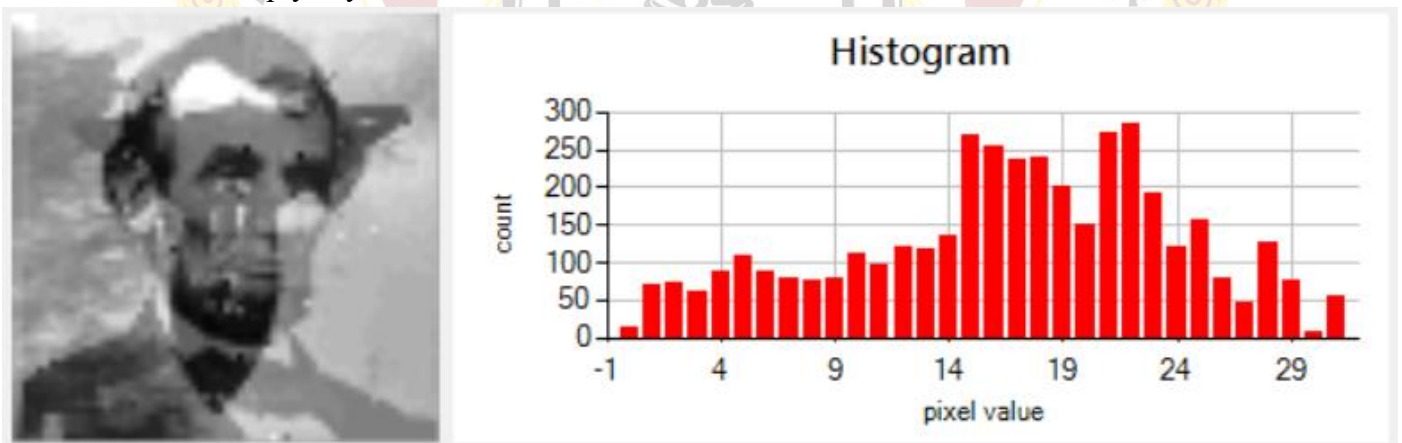
- Part 2: (50%) Arithmetic Operations of an Image Array



As the figure shows, we can apply pixel-wise offset to the image, but if the pixel value after the operation is out of bound (0-31), I regard the value as 0 or 31. As a result, if the operator +20 then -20, the image would be distorted.

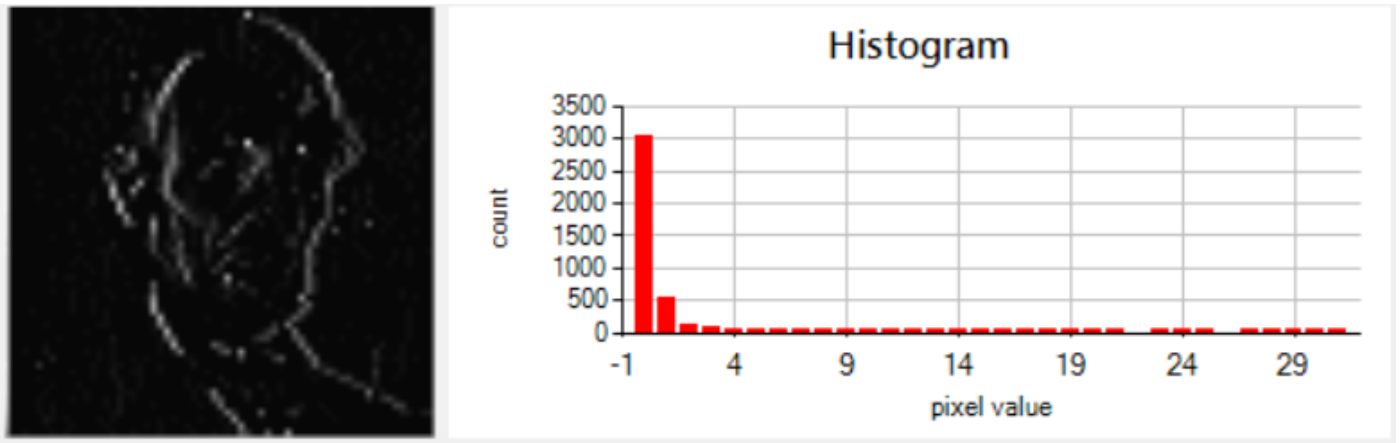


As the figure shows, we can apply pixel-wise multiplication to the image. When multiply 0 or value  $< 0$ , the image would be pitch dark. On the other hand, after multiply a positive number (10), some pixel remains dark, because 0 multiply any number would be itself.

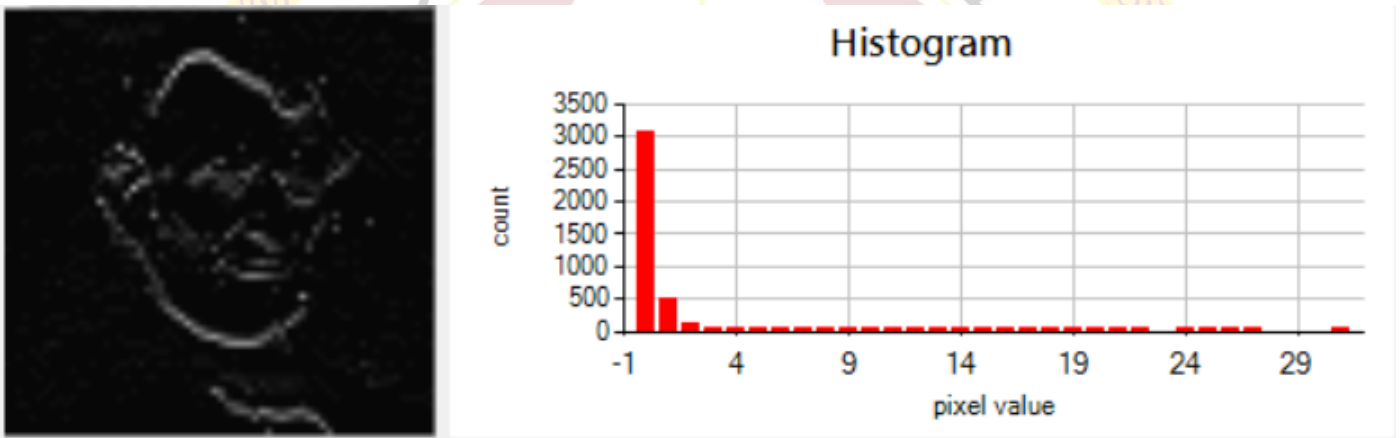


As the figure shows, the average of two image would result a translucent effect. The extreme high value of histogram from JET.64 is diluted by the even distribution of histogram from LINCON.64.





For operation 2, we can see the vertical contour of the image, and the countour is bright at the right side dark in the left side. I assume that it is becaue at the edge, the value difference of neighboring pixel is large, so the subtraction cannot naturalize the difference. On the other hand, when not at the edge, the value of neighboring pixel is similar, so the subtraction can turn the grey scale value close to 0.



For operation 3, we can see the horizontal contour of the image, and the countour is bright at the lower side dark in the upper side. The reason is mentioned above.