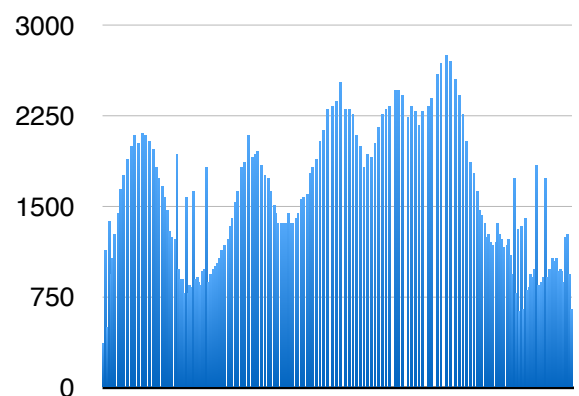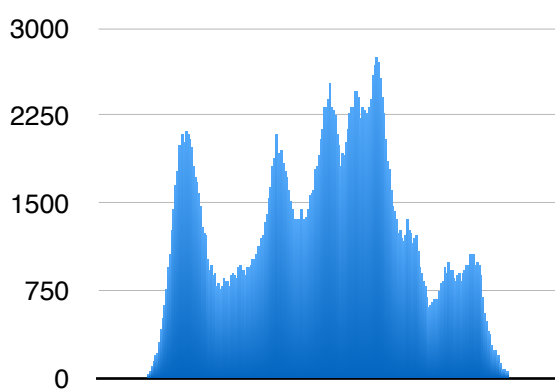# Computer Vision HW3

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解題步驟

1.計算原圖Pixel之Histogram。
2.根據Histogram算出CDF表格。
3.根據CDF表格計算Histogram equalization公式。（公式1）
4.替換掉原圖並輸出。

公式

$$h(v) = \text{round}\left(\frac{cdf(v) - cdf_{min}}{(M \times N) - cdf_{min}} \times (L - 1)\right)$$

參數

```
int headerLength = 172;
int imageWidth = 512;
int imageHeight = 512;
```

程式碼實作
[main funcion]

ArrayList<Integer> bytes = GetByteData(fileName);

HistogramEqualizationHelper helper =
 new HistogramEqualizationHelper(bytes,headerLength,imageWidth,imageHeight);

//calculating new image
for(int i = 0;i < imageWidth*imageHeight ;i++)
{
int origin = bytes.get(headerLength+i);
int after = helper.PixelValueMapping(origin);
bytes.set(headerLength+i, after);
}

WriteOut(bytes,"./assets/result.im");

//origin histogram
Hashtable<Integer,Integer> originHistogram = helper.getOriginHistogram();
WriteOutHistogram(originHistogram,"./assets/hw3-histogram-origin.csv");

Hashtable<Integer,Integer> newHistogram = helper.CalculateHistogram(bytes,
headerLength, imageWidth, imageHeight);
WriteOutHistogram(newHistogram,"./assets/hw3-histogram-after.csv");

[HistogramEqualizationHelper]

```
public int PixelValueMapping(int originValue)
{
        int up = originCDF.get(originValue) - originCDF.get(MinOfCDF);
        int bottom = (imageWidth*imageHeight) -originCDF.get(MinOfCDF);
        float ratio = (float)up / (float)bottom;
        int result = Math.round(ratio*255);
        return result;
}

public HistogramEqualizationHelper(ArrayList<Integer> bytes, int header,
                                     int width, int height)
{
        originData = (ArrayList<Integer>)bytes.clone();
        originHistogram = this.CalculateHistogram(bytes,header,width,height);
        headerLength = header;
        imageWidth = width;
        imageHeight = height;
        originCDF = this.CalculateCDF(originHistogram);
        MinOfCDF = this.GetMinCDF(originHistogram);
        MaxOfCDF = this.GetMaxCDF(originHistogram);
}
```

結果

Image

Histogram