Image Processing Project2 Answer Sheet

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| Explain how you implement FFT by DFT  在FFT演算法中，針對輸入做不同方式的分組會造成輸出順序上的不同。如果我們使用時域抽取（Decimation-in-time），那麼輸入的順序將會是位元反轉排列（bit-reversed order），輸出將會依序排列。但若我們採取的是頻域抽取（Decimation-in-frequency），那麼輸出與輸出順序的情況將會完全相反，變為依序排列的輸入與位元反轉排列的輸出。 |
| Explain how you implement inverse FFT from FFT  先將輸入的序列做排序 排序的方式為 先將索引轉成2進制然後反轉 再轉回十進制 產生新的索引序列 接著再依照公式做利用規則與對稱性做運算 |
| Show the result of problem1.txt after FFT |

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| image with noise |
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| image with noise after FFT |
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| Explain what kind of the noise is (are) in the image |
| 同時有兩種雜訊在圖內   1. 胡椒鹽雜訊 2. 週期性(脈衝)雜訊 |
| The filter(s) you use to process the image |
| (Hint: you need to show the filter parameter)  **D = 30;**  **v\_k = 300; u\_k = 300;**  **v\_k = 500; u\_k = 100;**  **v\_k = -200; u\_k = 200;**  **v\_k = 100; u\_k = 500;** |
| The result of image with noise after \_\_\_Butterworth Notch\_\_filter |
| Without noise after median filter |
| Summary and discussion:   1. 使用FFT轉換後, 再取log(1+abs(fft\_img)), 發現有週期性的脈衝 2. 使用Butterworth Notch filter將各個亮點給遮住, 衰減週期性脈衝 3. 與原圖相比, 經過butterworth notch filter後, 背景格狀圖樣被移除 4. 使用中值濾波, 將亮、暗點的胡椒雜訊給移除 |

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| problem3\_4a.bmp | |
|  | 1.Noise type: 白鹽式雜訊  2.Noise mean: 0.3  3.Noise deviation: 0.3 |
| Histogram of noise:  C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4a_hist.jpg |
| How do you get the noise type?  產生pdf distribution後, 畫出分佈圖 | |
| Result of problem3\_4a.bmp after filtering | |
| C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4a.jpg | |
| What filter is more suitable to problem3\_1.bmp? why?   1. 算術平均濾波器 2. 因為可以使影像變平滑, 使雜訊變模糊 | |

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| problem3\_4b.bmp | |
|  | 1.Noise type: 胡椒鹽及白鹽  2.Noise mean: <0.2  3.Noise deviation: <0.2 |
| Histogram of noise:  C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4b_hist.jpg |
| How do you get the noise type?  產生pdf distribution後, 畫出分佈圖 | |
| Result of problem3\_4b.bmp after filtering | |
| C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4b.jpg | |
| What filter is more suitable to problem3\_2.bmp? why?   1. 自適中值濾波器 2. 可以將P< 0.2的胡椒鹽及白鹽式雜訊過濾 | |

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| problem3\_4c.bmp | |
|  | 1.Noise type: 胡椒鹽及白鹽  2.Noise mean: <0.2  3.Noise deviation: <0.2 |
| Histogram of noise:  C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4c_hist.jpg |
| How do you get the noise type?  產生pdf distribution後, 畫出分佈圖 | |
| Result of problem3\_4c.bmp after filtering | |
| C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4c.jpg | |
| What filter is more suitable to problem3\_3.bmp? why?   1. 自適中值濾波器+幾何平均濾波器 2. 可以將P< 0.2的胡椒鹽及白鹽式雜訊過濾, 再用算術平均將影像做平滑處理 | |

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| problem3\_4d.bmp | |
|  | 1.Noise type: 胡椒鹽  2.Noise mean: 0.3  3.Noise deviation: 0.3 |
| Histogram of noise:  C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4_hist.jpg |
| How do you get the noise type?  產生pdf distribution後, 畫出分佈圖 | |
| Result of problem3\_4d.bmp after filtering | |
| C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4d.jpg | |
| What filter is more suitable to problem3\_4.bmp? why?   1. 自適中值濾波器 \* 2 (第一次filter\_size=5, 第二次filter\_size=3) 2. 可以將P> 0.2的胡椒鹽及白鹽式雜訊過濾後, 還有部分雜訊沒被過濾, 再用filter\_size=3的自適中值濾波器過濾 (因為第二次filter\_size=5時, 會造成影像比較模糊, filter\_size=3可以保留比較多細節 | |

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| problem3\_4e.bmp | |
|  | 1.Noise type: 高斯雜訊  2.Noise mean: 0.2  3.Noise deviation: 0.2 |
| Histogram of noise:  C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4e_hist.jpg |
| How do you get the noise type?  產生pdf distribution後, 畫出分佈圖 | |
| Result of problem3\_4e.bmp after filtering | |
| C:\Users\Admin\Documents\NCTU\Digital_Image_Processing\Project2(在職)\Project2\題目原檔\第三題\p3_4e.jpg | |
| What filter is more suitable to problem3\_5.bmp? why?   1. 算術平均濾波器 2. 因為可以使影像變平滑, 使雜訊變模糊 | |