**Lab 07**

|  |  |
| --- | --- |
| Name: | 謝方智 |
| Student ID: | B08611010 |
| Total Score: |  |

**Note:**

Most of the explanations in this lab is mandatory, However, giving reasonable explanations to your answer or programs will earn you partial credits when your answer is incorrect.

1. **Filters and Convolution (25 points, 5 points each question)**

|  |  |  |
| --- | --- | --- |
| # | Description | Score |
| a | This filter extracts horizontal edges in an image. |  |
| b | This filter extracts slanted edges in an image. |  |
| c | This is the Laplacian filter times negative one. It extracts the edges in an image and can be used for edge enhancement. |  |
| d | This is the Sobel x filter. It extracts vertical edges in an image. |  |
| e | This filter extract both horizontal and vertical edges in an image, but not slanted ones. |  |

1. **Denoising a Picture (15 points)**

|  |  |  |
| --- | --- | --- |
| # | Description | Score |
| - | Be sure to show all your experiment result (e.g., image processing steps and output images) here.  First, I checked the result for each filter and applying them several times:  Applying total variation filter twice seems to me to do best in denoising while still maintaining enough detail in the image.  Next, I tried finding the best edge extraction combination (using Laplace filter) for image sharpening:    Laplacian filter seemed to work better on grayscale images, so I tried converting the denoised images to grayscale first, applied Laplacian filter, and converted them back to rgb. Although the results looked pretty similar to each other, the last one (bottom right) worked best for sharpening after trying.  Here’s the final result: |  |

1. **Properties of Convolution (20 points)**

|  |  |  |
| --- | --- | --- |
| # | Description | Score |
| 1 | 1. Commutativity   Commutativity of Convolution   1. Associative   PPT - Objectives: Convolution Definition Graphical Convolution Examples  Properties PowerPoint Presentation - ID:3194048   1. Distributive |  |
| 2 | The median filter is non-linear. Just call cv2.medianBlur(img, size). |  |

1. **Image Segmentation and Color Space (20 points)**

|  |  |  |
| --- | --- | --- |
| # | Description | Score |
| - | Paste your result here and briefly describe your image processing procedure and approach. How do you think your results are?    先將rgb影像轉為hsv，再用color bar顯示出黃色對應的hsv範圍，再將此範圍轉換為一個mask，便是輸出結果。 |  |

1. **Document Scanner (20 points)**

|  |  |  |
| --- | --- | --- |
| # | Description | Score |
| - | Paste your result here and briefly describe your image processing procedure and approach. How do you think your results are?    I first manually locate the four corners of the invoice in the image, and transform the image so that it only contains the invoice. Next, I converted the rgb image to grayscale, and used the Sauvola threshold to binarize the image and get the final result. |  |