Computer Vision HW1 Report

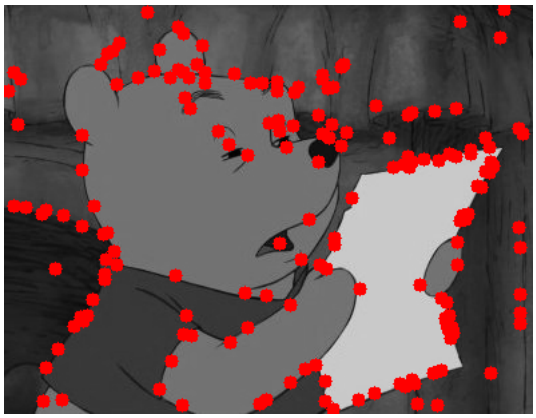
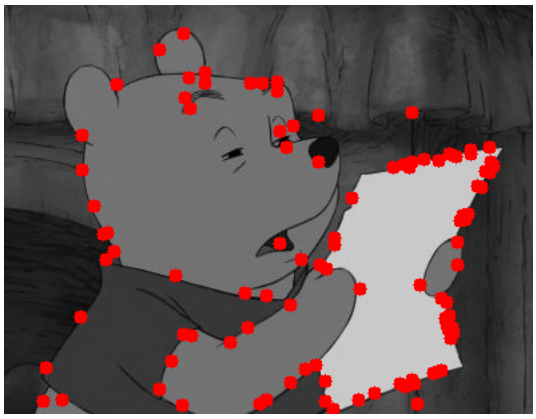
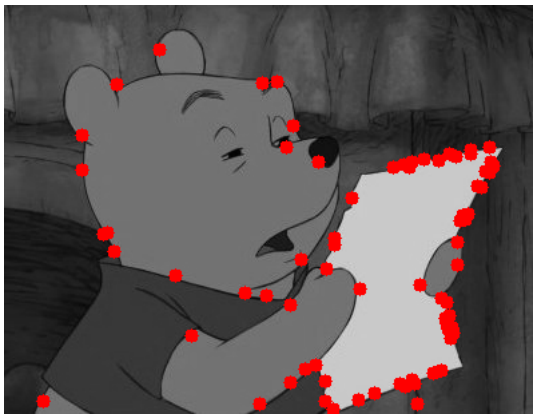
Student ID: R11921038
Name: 江讀晉

Part 1.

- **Visualize the DoG images of 1.png.**

	DoG Image (threshold = 3)		DoG Image (threshold = 3)
DoG1-1.png		DoG2-1.png	
DoG1-2.png		DoG2-2.png	
DoG1-3.png		DoG2-3.png	
DoG1-4.png		DoG2-4.png	

- **Use three thresholds (1,2,3) on 2.png and describe the difference.**

Threshold	Image with detected keypoints on 2.png
1	
2	
3	

(describe the difference)

整體而言，隨著 threshold 的數值增加，keypoint 的數量隨之減少：

- Threshold 為 1 時，除了角色本身的線條邊緣有許多 keypoint 之外，後面傢俱、窗簾的邊緣以及牆上的紋理亦被偵測出來
- Threshold 為 2 時，keypoint 大致只剩下角色本身的線條邊緣，且數量少於 threshold 為 1 時。
- Threshold 為 3 時，keypoint 數量明顯減少，尤以角色的五官、背部和手部處較為明顯，僅有與背景 intensity 相差較大的淺色紙張仍保有較多數量的 keypoint。

Part 2.

- **Report the cost for each filtered image.**

Gray Scale Setting	Cost (1.png)
cv2.COLOR_BGR2GRAY	1207799
R*0.0+G*0.0+B*1.0	**1439568**
R*0.0+G*1.0+B*0.0	1305961
R*0.1+G*0.0+B*0.9	1386209
R*0.1+G*0.4+B*0.5	1277424
R*0.8+G*0.2+B*0.0	**1127895**

Gray Scale Setting	Cost (2.png)
cv2.COLOR_BGR2GRAY	183850
R*0.1+G*0.0+B*0.9	**78454**
R*0.2+G*0.0+B*0.8	86422
R*0.2+G*0.8+B*0.0	**187520**
R*0.4+G*0.0+B*0.6	128825
R*1.0+G*0.0+B*0.0	110862

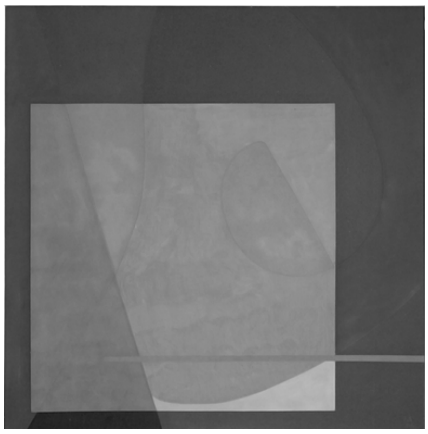
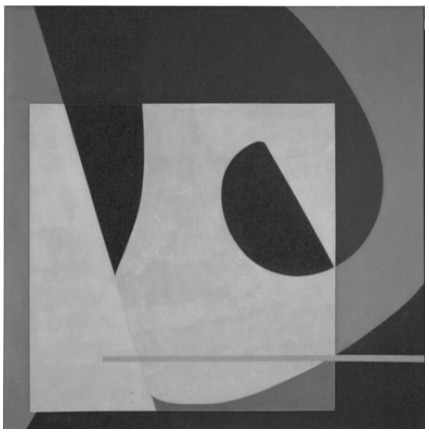
(Cost in red is the highest, and cost in blue is the lowest)

- **Show original RGB image / two filtered RGB images and two grayscale images with highest and lowest cost.**

Original RGB image (1.png)	Filtered RGB image and Grayscale image of Highest cost	Filtered RGB image and Grayscale image of Lowest cost
		
		

(Describe the difference between those two grayscale images)

兩張灰階圖最明顯的差異為葉子和周遭草地的 intensity 對比。Lowest cost 的灰階圖中，葉子的顏色較白，與草地 intensity 值差異較大；Highest cost 的灰階圖則是葉子和草地都偏暗，intensity 較為相近。

Original RGB image (2.png)	Filtered RGB image and Grayscale image of Highest cost	Filtered RGB image and Grayscale image of Lowest cost
		
		

(Describe the difference between those two grayscale images)

和 1.png 的結果相似，各個色塊有較為明顯的 intensity 值差異的灰階圖，有較小的 cost。Cost 較大的灰階圖，其呈現結果受 RGB 圖 brightness 影響大，亮部和暗部顏色各自相近，無法顯示出不同顏色之間的差異。相對地，Cost 較小的灰階圖，則是可以較清楚地呈現出 brightness 和各個顏色之間的差異。

- **Describe how to speed up the implementation of bilateral filter.**

由於 spatial kernel 僅與 window size 大小相關，因此可以在對影像 filtering 之前就先將 spatial kernel 計算完成並存於 class 的變數中，以避免重複計算。