Project 1 of CSE 473/573

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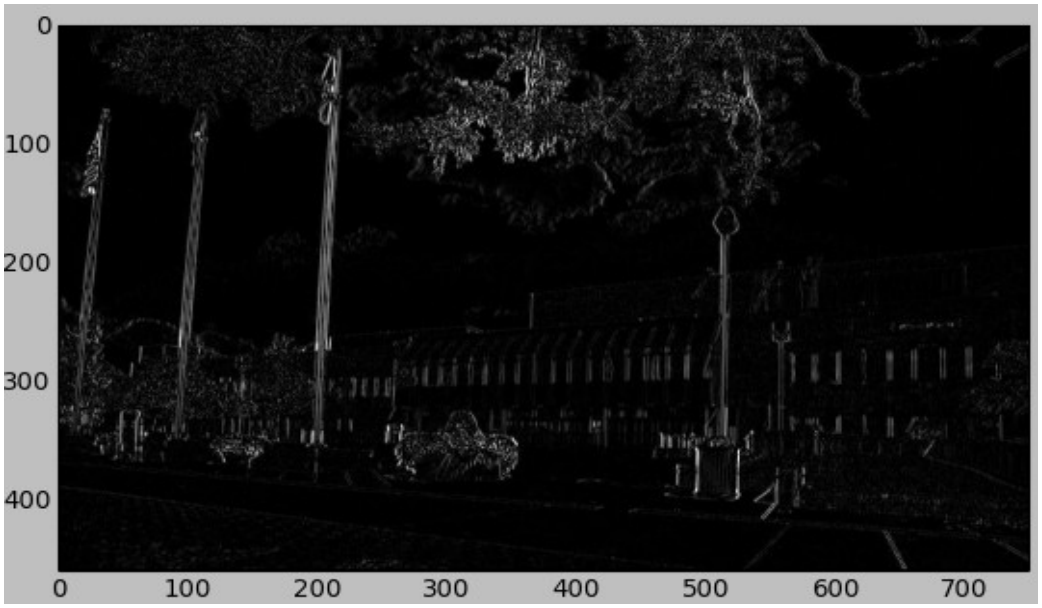
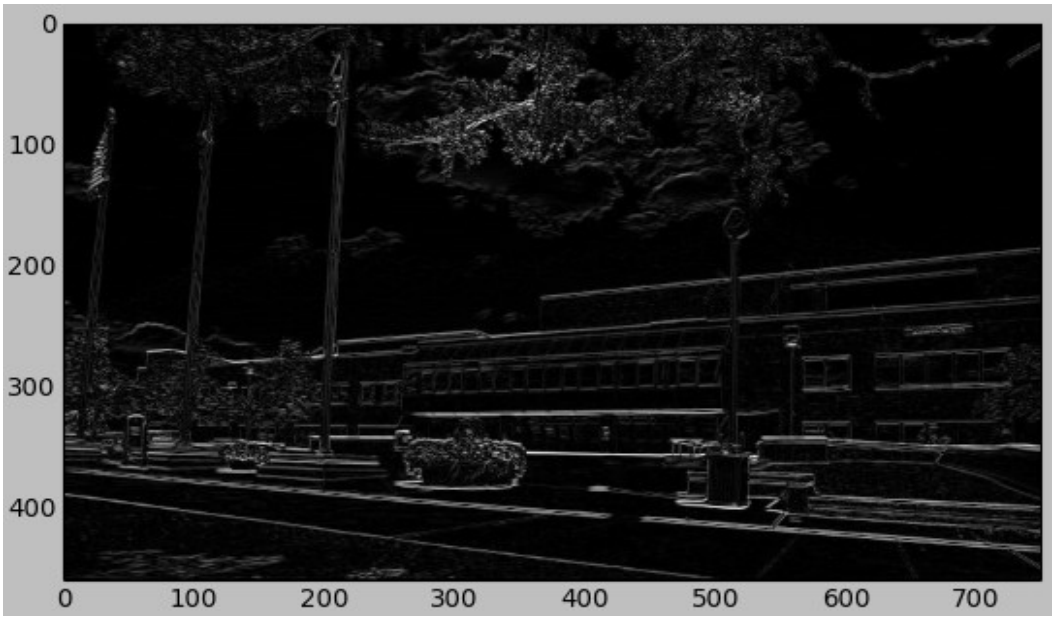
1. Edge Detection

In this part, we should use two sobel operators to detect the edge of the image.
The horizontal changes of the result is shown below:



The vertical change of the result is shown below:

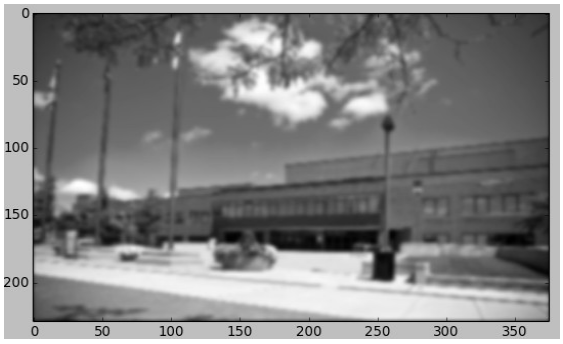
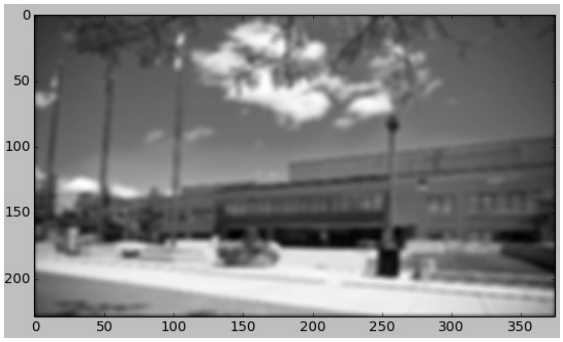
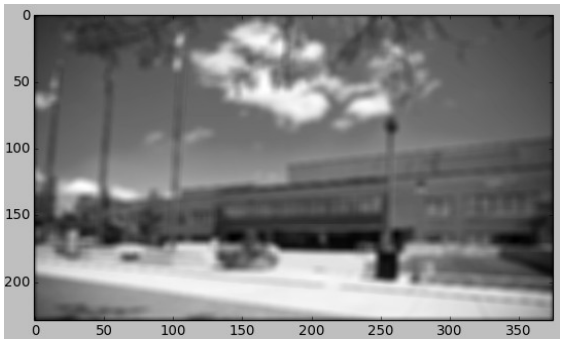
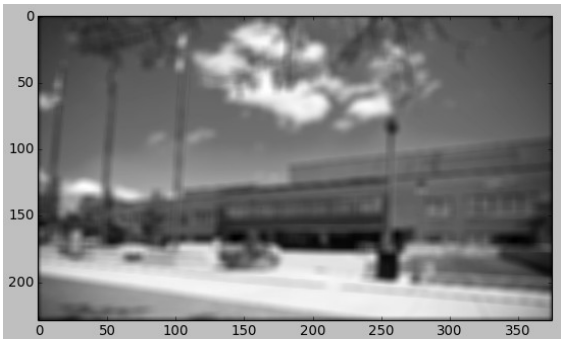
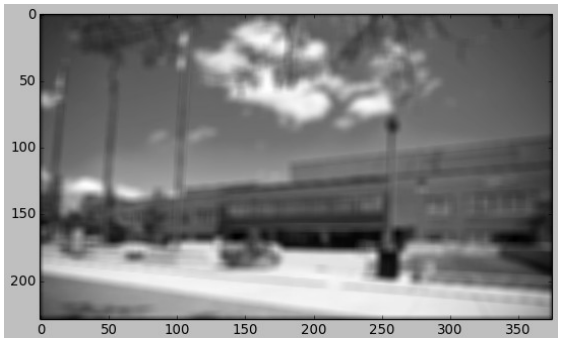


2. KeyPoint Detection

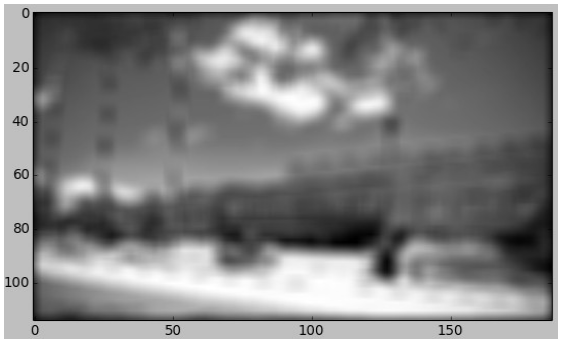
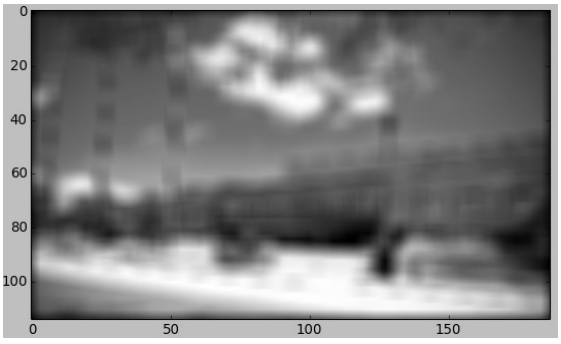
In this part, I implemented SIFT algorithm to extract keypoint of the image.

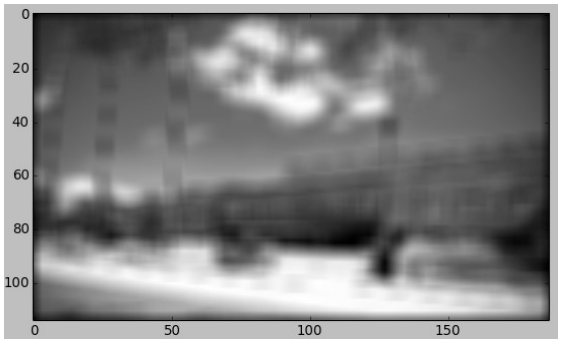
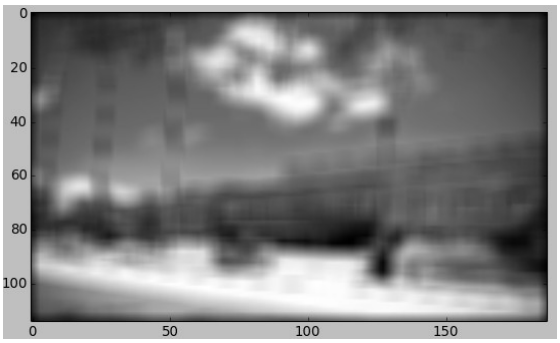
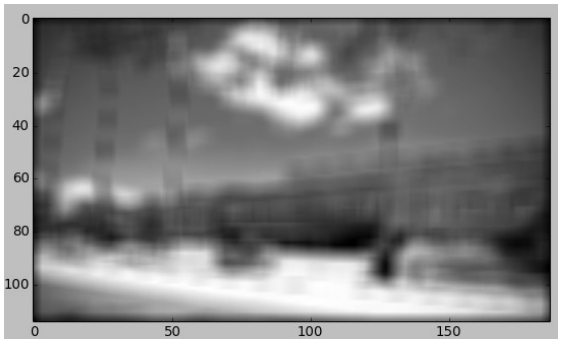
2.1 Octaves

The second octave's resolution is (375*229), all five images are shown below:

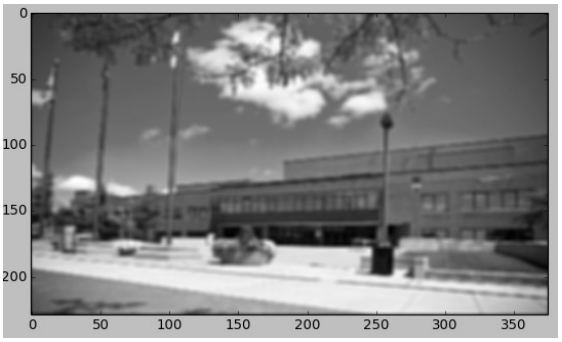
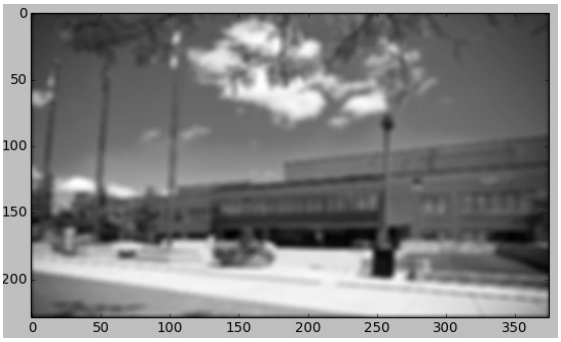
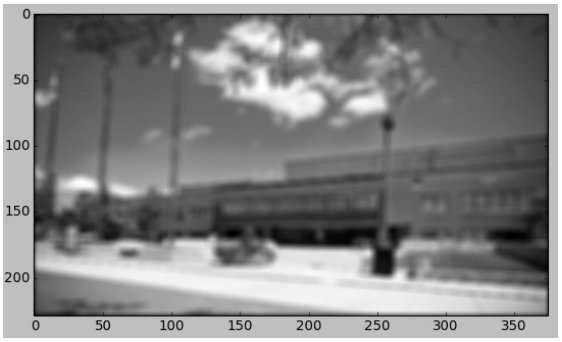
The third octave's resolution is (187*114), all five images are shown below:

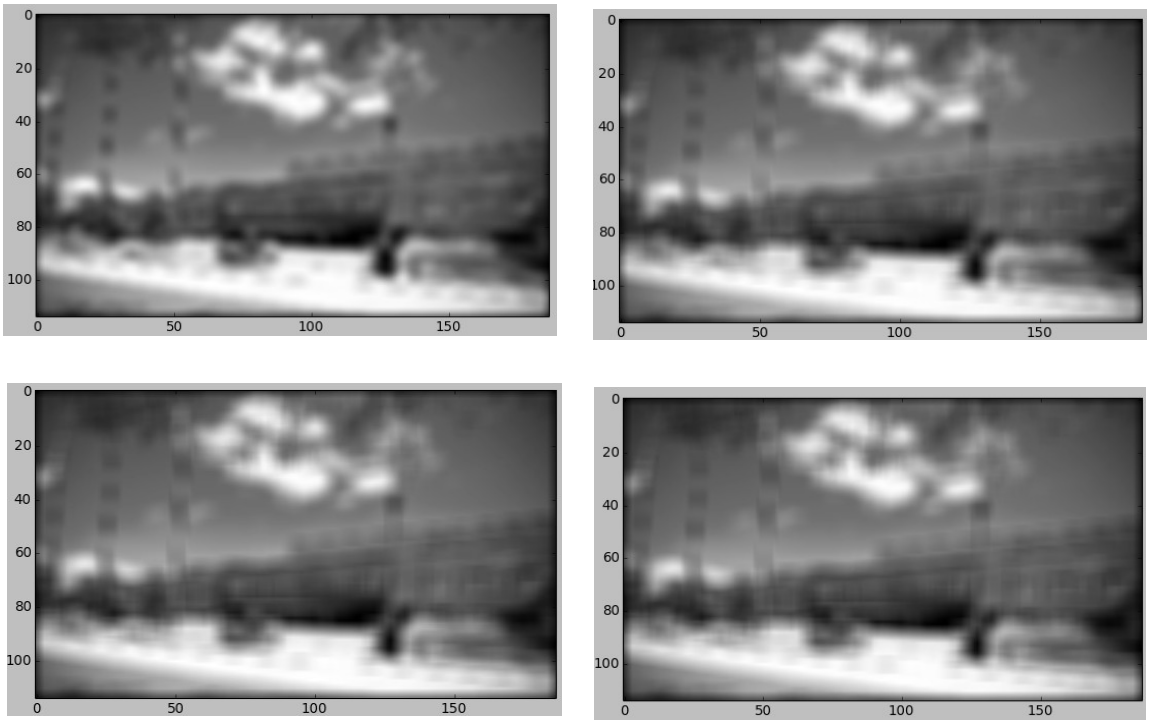




2.2 DoG images

The DoG images obtained using the second octave is shown below:

The DoG images obtained using the third octave is shown below:



2.3 All Keypoint

All the detected keypoints are shown below:

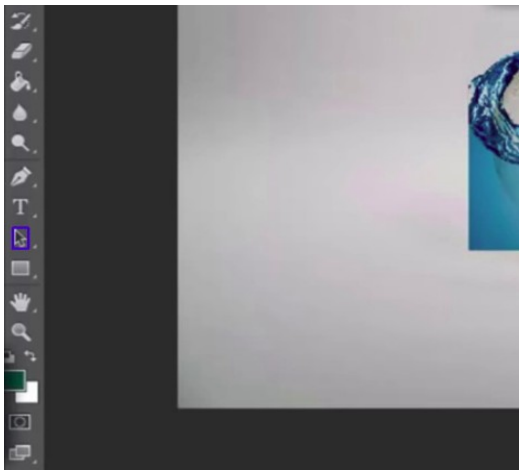
2.4 Left-most Keypoint

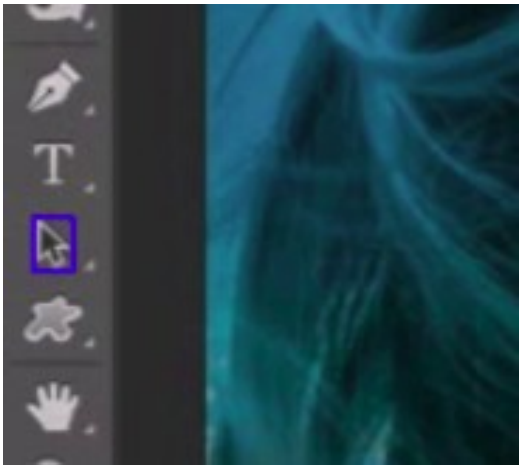
Five left-most keypoints are (130, 4), (242, 4), (260, 4), (284, 4), (316, 4)

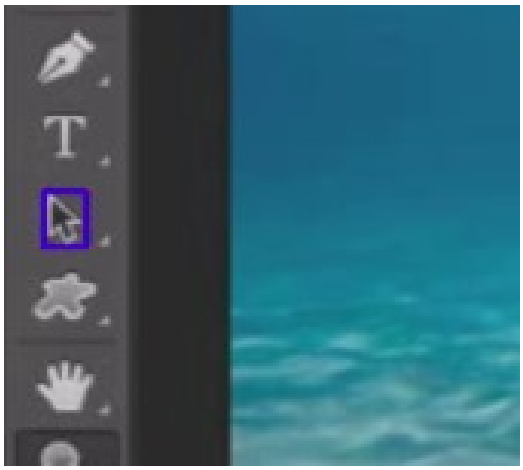
3. Cursor Detection

3.1 Basic

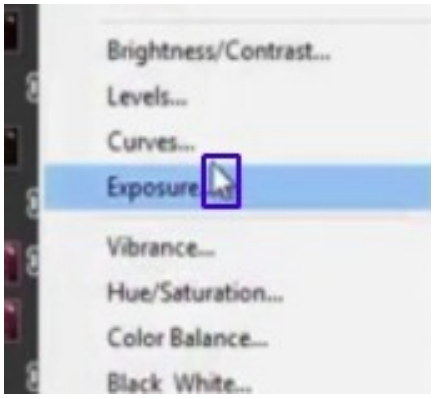
For nine negative images, Only three of them definitely have no cursor or similar object. But one of them I still detect a cursor. Other six of them actually has cursor similar to the real cursor. For these images, there are one images detect completely wrong object, other five detect very similar or correct objects. These negative images' detected results are shown below:

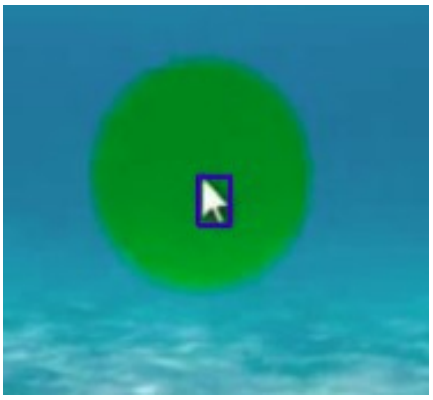


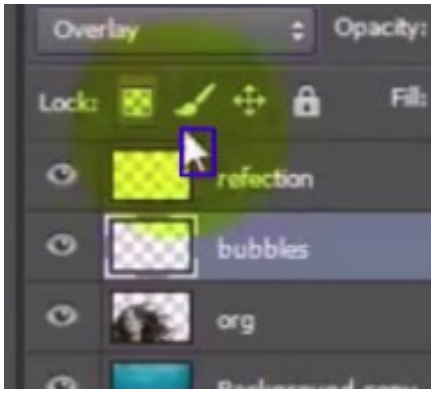


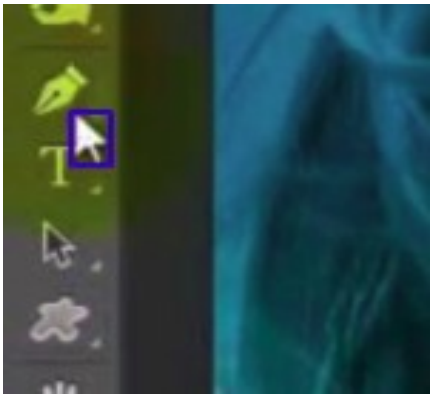


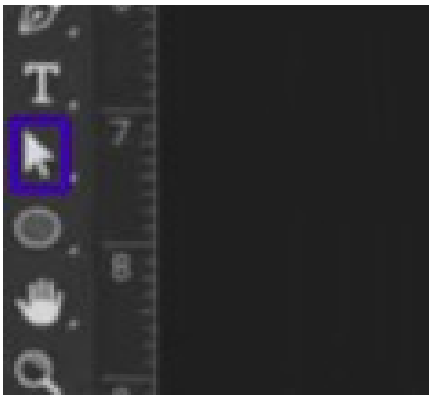
For positive images, all of them detect correct or similar object. These positive images' detected results are shown below:

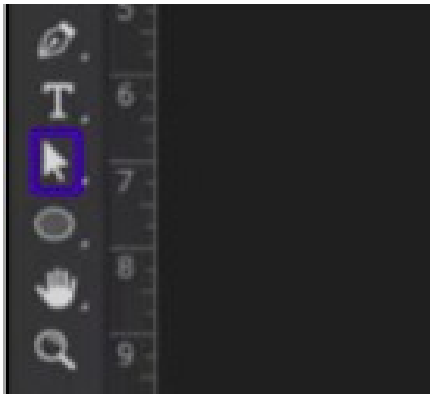


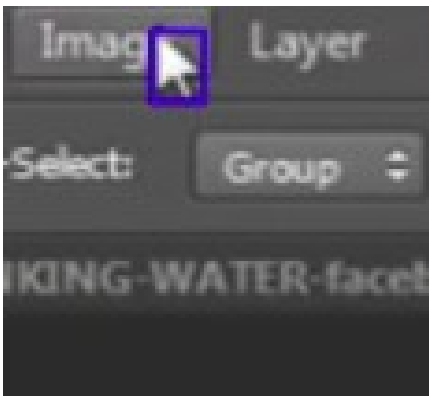


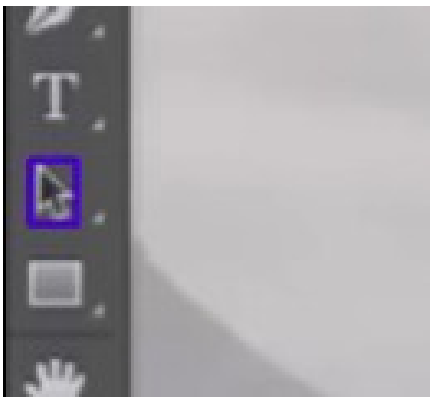


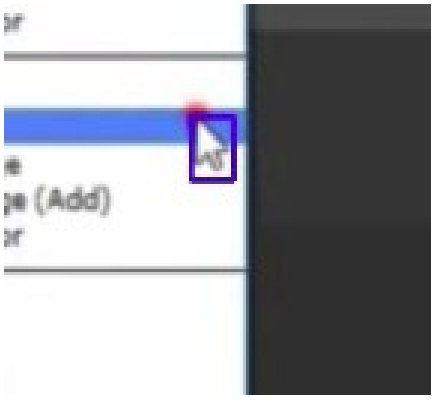


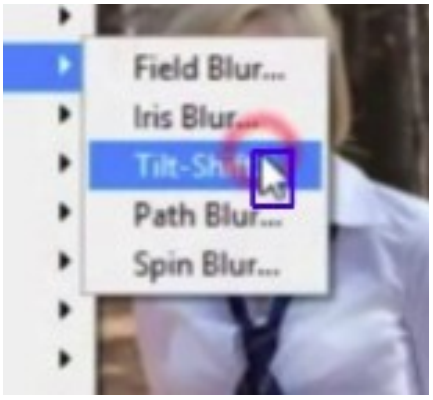


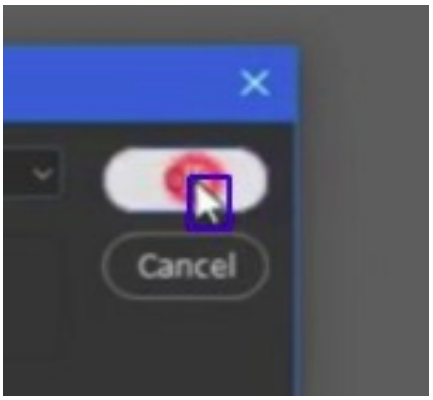


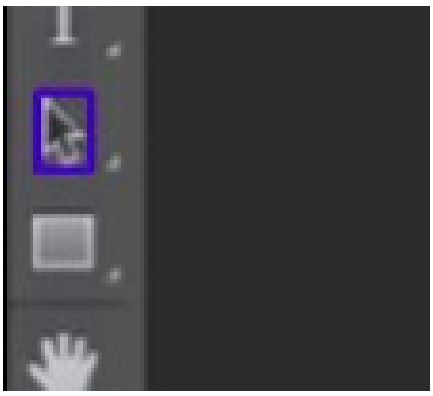


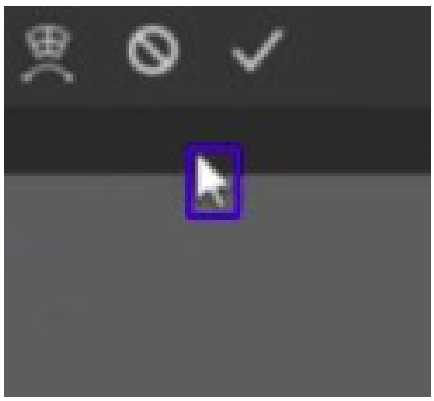


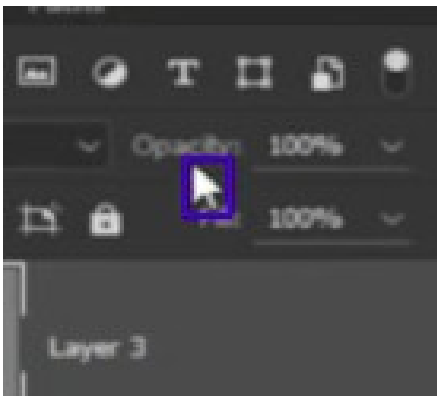

(Add)

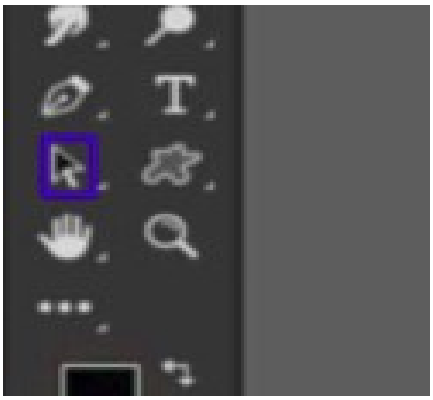

Field Blur...
Iris Blur...
Path Blur...
Spin Blur...


Cancel





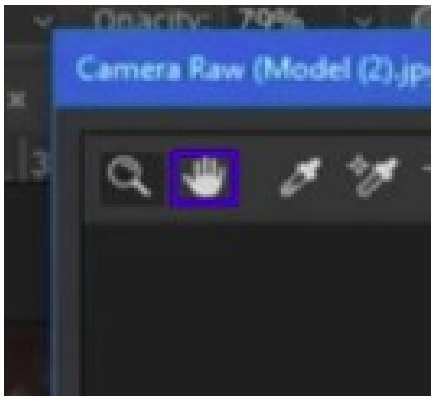

Opacity: 100%
Fill: 100%
Layer 3

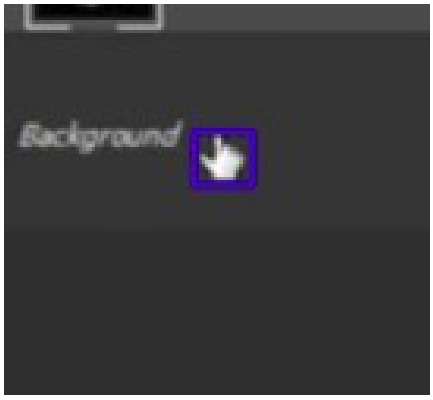


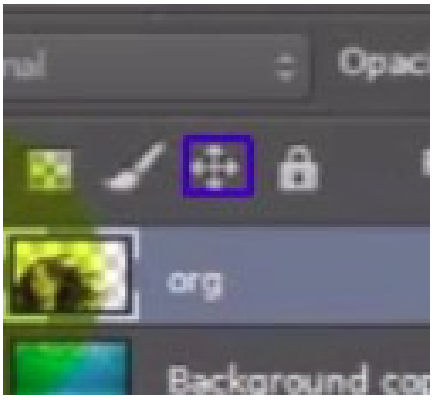
3.2 Bonus

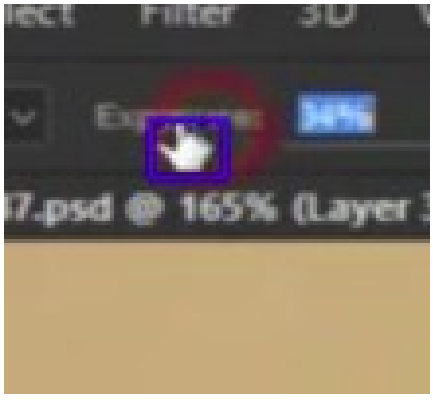
3.2.1 T1 cursor detect

For six positive images of t1, I only detect four of them correctly, other two I detect the same other object, the detected results are shown below:



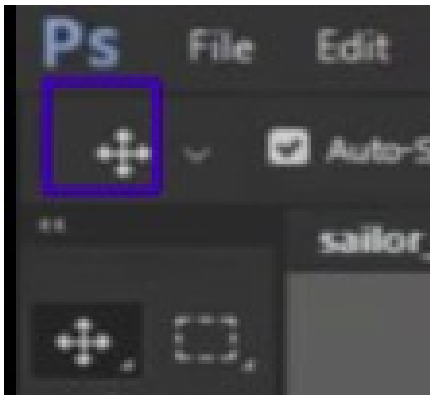


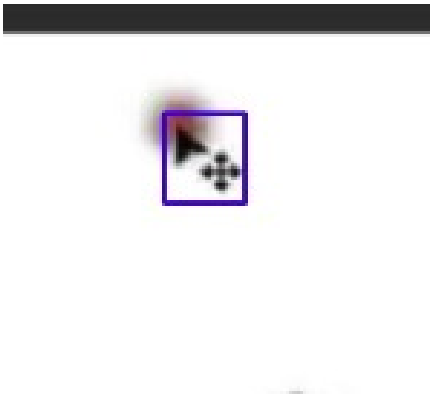




3.2.2 T2 cursor detect

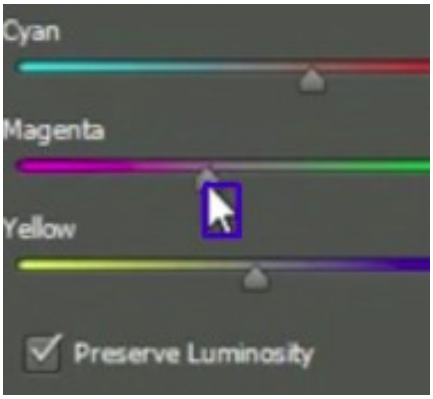
For six positive images of t2, I detect five of them correctly, the detected results are shown below:

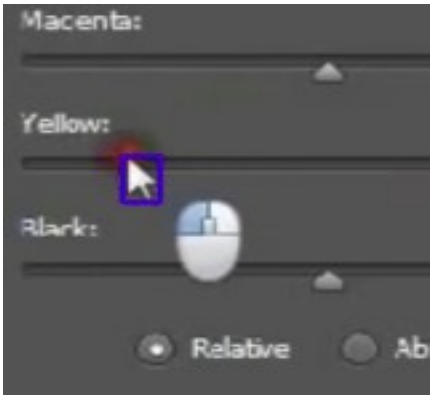


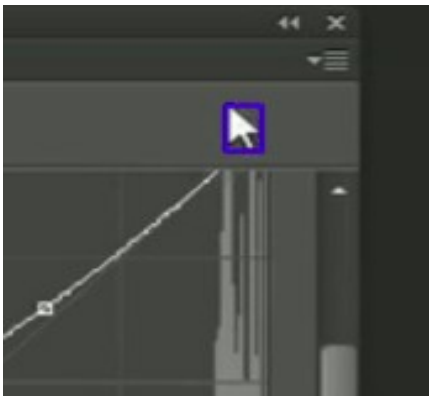


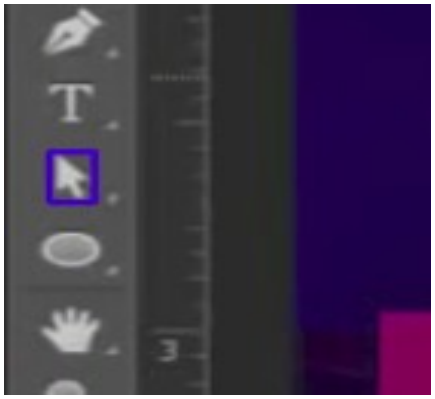
3.2.3 T3 cursor detect

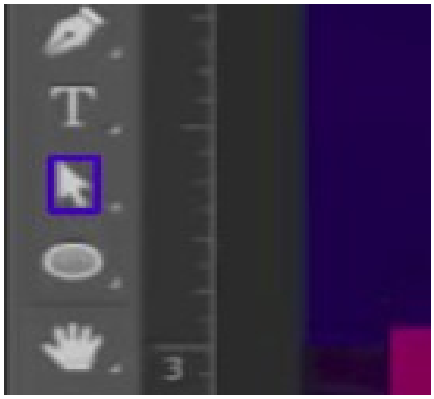
For six positive images of t3, I detect all of them correctly, the detected results are shown below:

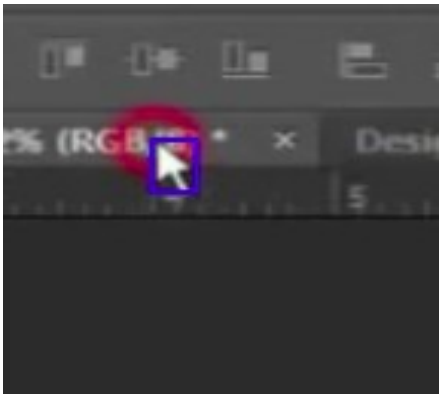












4. Conclusion

In task1, the sobel operator can only detect the edge vertically or horizontally. So in practice, we'd better give the detected result weight in order to get better result.

In task2, some keypoints deviates the edge or corner about ten pixels. I think the reason is after blurring the image, the edges becomes wider than before, so the keypoints deviate the center of the wider edges. That's why I got accurate result in octave1, but got not much accurate result in octave2.

In task3, the detected result depends on many factors, the most important one is the quality of template. If we can get a higher resolution template, the result might be better.