

# Interesting results

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## Optimize for acceleration

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### GPU info

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```
+-----+
| NVIDIA-SMI 361.42      Driver Version: 361.42      |
+-----+-----+
| GPU  Name            Persistence-M| Bus-Id        Disp.A |
| Fan  Temp   Perf    Pwr:Usage/Cap|      Memory-Usage |
+=====+=====+
|   0  GeForce GTX 950      Off   | 0000:01:00.0     On  |
| 33%   40C    P8          8W /  90W |  482MiB / 2044MiB |
+-----+-----+
```

### Executed time via basic method

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These are the GPU run time 10 times.

```
1st time: 1113771us
2nd time: 1113888us
3rd time: 1113197us
4th time: 1113896us
5th time: 1113891us
6th time: 1113780us
7th time: 1113824us
8th time: 1113931us
9th time: 1115095us
10th time: 1115653us
```

Average time: *1.1140926 seconds*

## Using lower resolution

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- Code in `lab3_accelerate_a.cu` file.

I used the method from TA in problem 1. I upsample the `{diffx, diffy}` = `{0, 1}`, `{1, 0}`, `{0, -1}` and `{-1, 0}`. There are the nearest point from center. Then, I replace the points like a triangle, there are `{0, 2}`, `{1, -1}` and `{-1, -1}`. Because centroid point of three points is center point **G(0, 0, 0)**, is the same with basic method (4 points).

Finally, I got a better result below. From 20,000 iterations to becomes **6,000 iterations** to converge, and the images are very similar via watching by eyes.

```
1st time: 292607us
2nd time: 288680us
3rd time: 288771us
4th time: 289976us
5th time: 289635us
6th time: 288571us
7th time: 289866us
8th time: 289869us
9th time: 288590us
10th time: 290020us
```

Average time: *0.2896585 seconds*

## Using SOR method

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- Code in `lab3_accelerate_b.cu` file.

Finally, I got a better result below. From 20,000 iterations to becomes **10,000 iterations** to converge, and the images are very similar via watching by eyes.

When  $w = 1.35$  :

```
1st time: 628234us
2nd time: 628267us
3rd time: 628037us
4th time: 628185us
5th time: 628117us
6th time: 627981us
7th time: 628320us
8th time: 628162us
9th time: 627972us
10th time: 628328us
```

Average time: *0.6281603 seconds*