- 基本思路：生成一系列随机数 0-1，没有负坐标，相当于 1/4 个原图，比例没有影响

rand() with srand()

- rand(): generate random numbers in the range [0, RAND_MAX]

`https://www.runoob.com/cprogramming/c-function-srand.html#:~:text=srand%20%E5%87%BD%E6%95%B0%E6%98%AF%E9%9A%8F%E6%9C%BA%E6%95%B0,%E4%BD%BF%E7%94%A81%20%E6%9D%A5%E5%88%9D%E5%A7%8B%E5%8C%96%E7%A7%8D%E5%AD%90%E3%80%82`

- 计算机并不能产生真正的随机数，而是已经编写好的一些无规则排列的数字存储在电脑里，把这些数字划分为若干相等的 N 份，并为每份加上一个编号用 srand()函数获取这个编号，然后 rand()就按顺序获取这些数字，当 srand()的参数值固定的时候，rand()获得的数也是固定的，所以一般 srand 的参数用 time(NULL)，因为系统的时间一直在变，所以 rand()获得的数，也就一直在变，相当于是随机数了。只要用户或第三方不设置随机种子，那么在默认情况下随机种子来自系统时钟。如果想在一个程序中生成随机数序列，需要至多在生成随机数之前设置一次随机种子。

#

- 总核数 = 物理 CPU 个数 X 每颗物理 CPU 的核数
- 总逻辑 CPU 数 = 物理 CPU 个数 X 每颗物理 CPU 的核数 X 超线程数
- 查看物理 CPU 个数
  cat /proc/cpuinfo| grep "physical id"| sort| uniq| wc -l
- 查看每个物理 CPU 中 core 的个数(即核数)
  cat /proc/cpuinfo| grep "cpu cores"| uniq
- 查看逻辑 CPU 的个数
  cat /proc/cpuinfo| grep "processor"| wc -l
- mycomputer:

run

- gcc pthread.c -lpthread
- ./a.out
- 本机：

```
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 1
ll, 10000000
The approximate value of pi for the desired amount of points (10000000) is: 3.142281
use time: 0.289402(s)%
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 2
ll, 5000000
ll, 5000000
The approximate value of pi for the desired amount of points (10000000) is: 3.141351
use time: 5.061890(s)%
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 4
ll, 2500000
ll, 2500000
ll, 2500000
ll, 2500000
The approximate value of pi for the desired amount of points (10000000) is: 3.141750
use time: 1.753281(s)%
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 6
ll, 1666666
ll, 1666666
ll, 1666666
ll, 1666666
ll, 1666666
ll, 1666666
The approximate value of pi for the desired amount of points (10000000) is: 3.142022
use time: 2.206262(s)%
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 8
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
The approximate value of pi for the desired amount of points (10000000) is: 3.141856
use time: 2.142041(s)%
```

```
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 1
ll, 100000000
The approximate value of pi for the desired amount of points (100000000) is: 3.141729
use time: 2.609934(s)%
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 4
ll, 25000000
ll, 25000000
ll, 25000000
ll, 25000000
The approximate value of pi for the desired amount of points (100000000) is: 3.141671
use time: 18.808316(s)%
❯ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 8
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
The approximate value of pi for the desired amount of points (100000000) is: 3.141227
use time: 20.218396(s)%
```

- 在学校的服务器上（八个 cpu）：

```
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 1
ll, 10000000
The approximate value of pi for the desired amount of points (10000000) is: 3.142646
use time: 1.910266(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 2
ll, 5000000
ll, 5000000
The approximate value of pi for the desired amount of points (10000000) is: 1.586388
use time: 0.633009(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 4
ll, 2500000
ll, 2500000
ll, 2500000
ll, 2500000
The approximate value of pi for the desired amount of points (10000000) is: 0.818192
use time: 0.409130(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 10000000
Please enter the threads you want: 8
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
ll, 1250000
The approximate value of pi for the desired amount of points (10000000) is: 0.401525
use time: 0.343498(s)
-bash-4.2$
```

```
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 1
ll, 100000000
The approximate value of pi for the desired amount of points (100000000) is: 3.141380
use time: 18.018564(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 2
ll, 50000000
ll, 50000000
The approximate value of pi for the desired amount of points (100000000) is: 1.573738
use time: 6.848329(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 4
ll, 25000000
ll, 25000000
ll, 25000000
ll, 25000000
The approximate value of pi for the desired amount of points (100000000) is: 0.790241
use time: 3.863149(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 8
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
ll, 12500000
The approximate value of pi for the desired amount of points (100000000) is: 0.398222
use time: 3.324414(s)
-bash-4.2$ ./a.out
Please enter a positive number for the amount of points you would like to generate: 100000000
Please enter the threads you want: 12
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
ll, 8333333
The approximate value of pi for the desired amount of points (100000000) is: 0.268473
use time: 3.208809(s)
-bash-4.2$
```

问题

- 可能我只有一个 cpu，达不到多线程并行的效果，
- 我用 top 看，cpu 也已占到了 700% 左右
- 学校的 cpu(八个核) 可以达到并行的效果，但是 pi 不准确，估计是 rand, srand 时间的问题?

影响效率的因素

- 线程间的同步，对全局的访问
- I/O 的操作，总线的占用，计组原理的东西。。。
- cpu 调度问题，优先级，耗时之类的
- ...