

Test the serial and parallel programs

In our test laboratory the computer had 8 core processor and ubuntu 16.04 OS. According to these specifications the number of threads can be maximum 8 but we tried serial computation first, then parallel computation increased exponentially starting from 21. We used time utilities to check execution time.

```
guest-5toesy@n10: ~/Desktop
guest-5toesy@n10:~/Desktop$ time ./serial 100000000
3.141592643589325994923910911893472075462341308593750

real    0m6.070s
user    0m6.068s
sys     0m0.004s
guest-5toesy@n10:~/Desktop$ time ./serial 100000000
3.141592643589325994923910911893472075462341308593750

real    0m6.067s
user    0m6.064s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./serial 100000000
3.141592643589325994923910911893472075462341308593750

real    0m6.231s
user    0m6.228s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$
```

```
guest-5toesy@n10: ~/Desktop
guest-5toesy@n10:~/Desktop$ time ./pi 2 100000000
3.141592643590250588658818742260336875915527343750000

real    0m3.107s
user    0m6.192s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./pi 2 100000000
3.141592643590250588658818742260336875915527343750000

real    0m3.101s
user    0m6.176s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./pi 2 100000000
3.141592643590250588658818742260336875915527343750000

real    0m3.445s
user    0m6.848s
sys     0m0.020s
guest-5toesy@n10:~/Desktop$
```

We can see clearly the real time of execution decreased to half. It means that parallel computation with 2 threads x2 faster.

```
guest-5toesy@n10: ~/Desktop
guest-5toesy@n10:~/Desktop$ time ./pi 4 100000000
3.141592643589817157590005081146955490112304687500000

real    0m1.801s
user    0m6.480s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./pi 4 100000000
3.141592643589817157590005081146955490112304687500000

real    0m1.578s
user    0m6.260s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./pi 4 100000000
3.141592643589817157590005081146955490112304687500000

real    0m1.583s
user    0m6.268s
sys     0m0.004s
guest-5toesy@n10:~/Desktop$
```

```
guest-5toesy@n10: ~/Desktop
guest-5toesy@n10:~/Desktop$ time ./pi 8 100000000
3.141592643589879774168593939975835382938385009765625

real    0m0.901s
user    0m7.124s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./pi 8 100000000
3.141592643589879330079384089913219213485717773437500

real    0m0.907s
user    0m7.120s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$ time ./pi 8 100000000
3.141592643589879774168593939975835382938385009765625

real    0m0.909s
user    0m7.124s
sys     0m0.000s
guest-5toesy@n10:~/Desktop$
```

Parallel computation with 4 threads x4 faster and with 8 threads x8 faster.

```
guest-Stoesy@n10: ~/Desktop
guest-Stoesy@n10:~/Desktop$ time ./pi 16 100000000
3.141592643589896205469358392292633652687072753906250

real    0m0.962s
user    0m7.276s
sys     0m0.000s
guest-Stoesy@n10:~/Desktop$ time ./pi 16 100000000
3.141592643589896205469358392292633652687072753906250

real    0m0.972s
user    0m7.376s
sys     0m0.000s
guest-Stoesy@n10:~/Desktop$ time ./pi 16 100000000
3.141592643589896205469358392292633652687072753906250

real    0m0.956s
user    0m7.352s
sys     0m0.000s
guest-Stoesy@n10:~/Desktop$
```

```
guest-Stoesy@n10: ~/Desktop
guest-Stoesy@n10:~/Desktop$ time ./pi 32 100000000
3.141592643589664390901816659606993198394775390625000

real    0m0.979s
user    0m7.520s
sys     0m0.000s
guest-Stoesy@n10:~/Desktop$ time ./pi 32 100000000
3.141592643589663502723396959481760859489440917968750

real    0m0.974s
user    0m7.520s
sys     0m0.000s
guest-Stoesy@n10:~/Desktop$ time ./pi 32 100000000
3.141592643589663502723396959481760859489440917968750

real    0m0.965s
user    0m7.504s
sys     0m0.008s
guest-Stoesy@n10:~/Desktop$
```

As you can see above, more than 8 threads don't effect the real time of execution because our test computer has 8 cores. That means time will decreased until 8 threads. So the computer can execute 8 threads at the same time.