Programming Assignment 2

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# The idea of your program

1. The concept of the algorithm (2-opt)
2. How you divide the algorithm/data into different threads

# Performance analysis with 1, 2, 4, 8, 16 thread(s)

How may 2-opt comparison do you perform within 30 seconds?

Observe the results and discuss if the performance improves as the number of threads increases. Try to justify your answer.

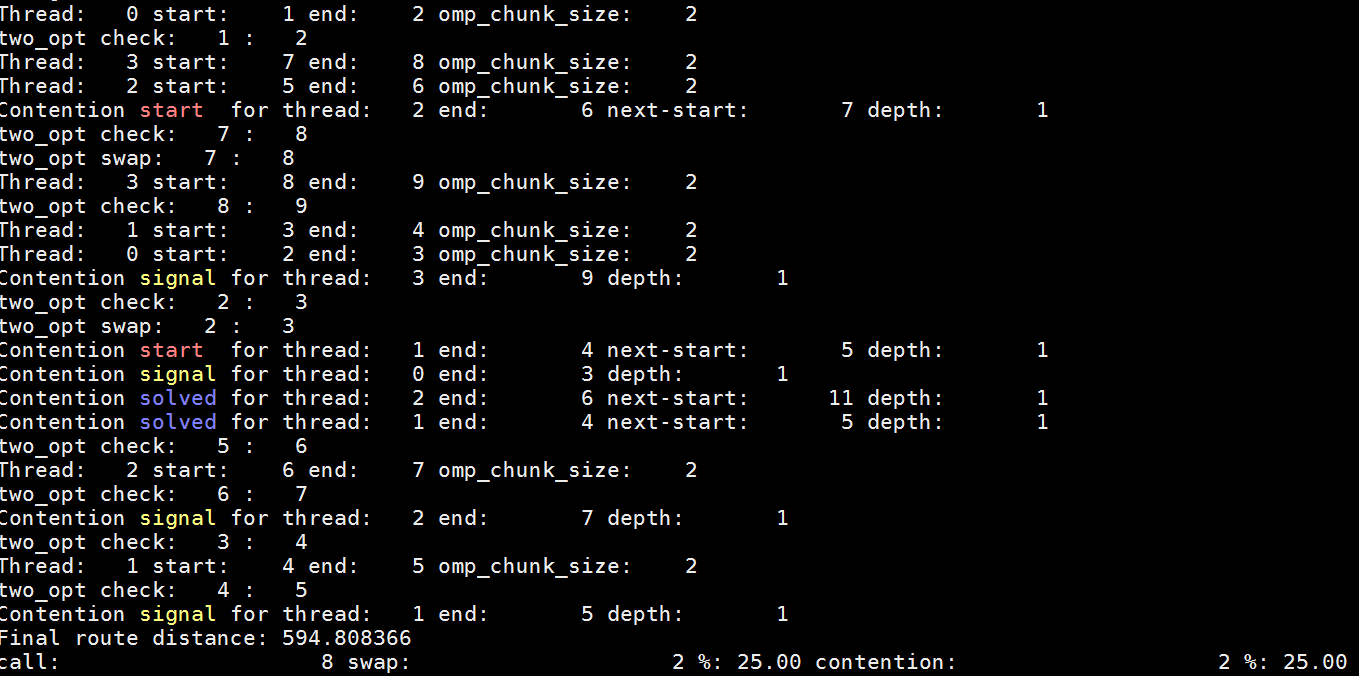
# Compare your results with the un-parallel version of your code (with test8)

Do you use any random functions in your code? **No**

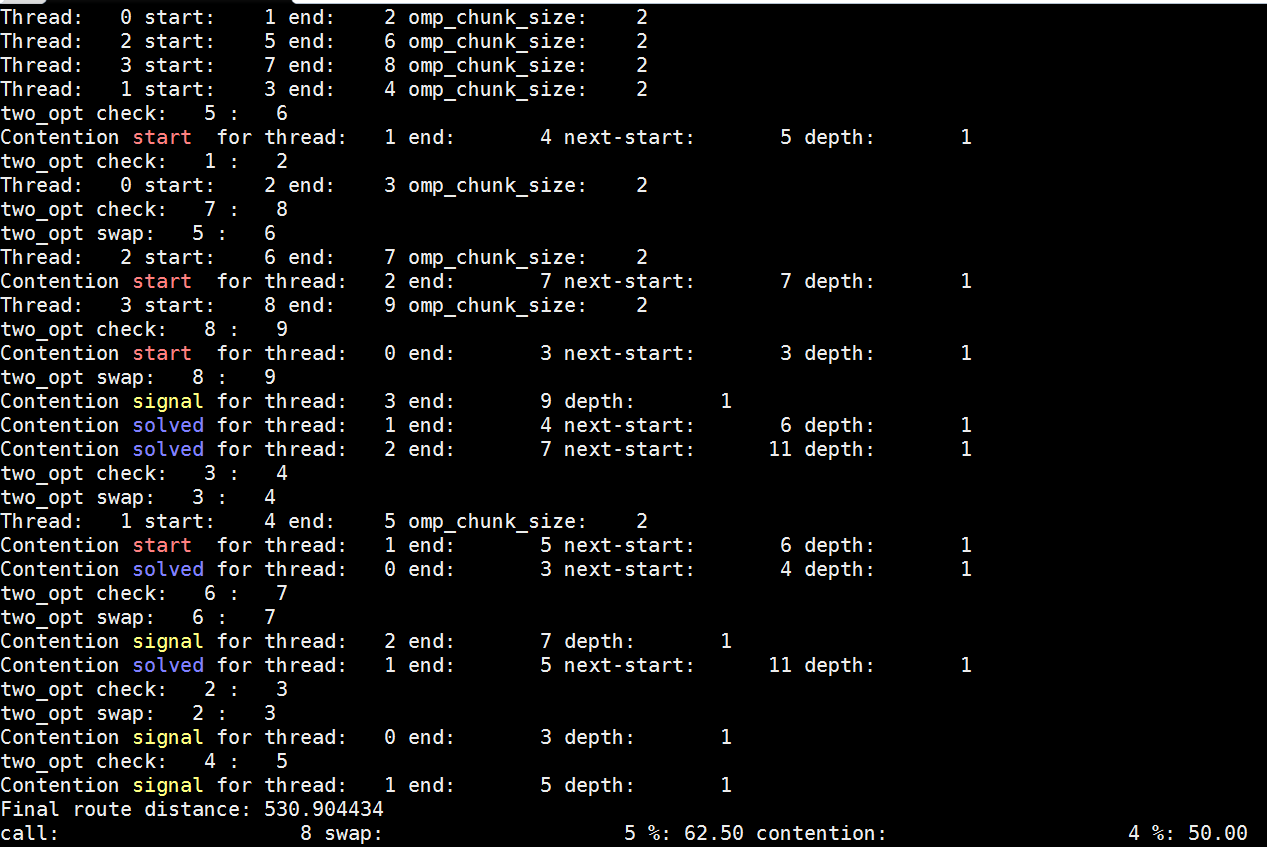
If not, then your answer should be equal. Otherwise, there are **race condition** unhandled in your code.

The distance is not equal because in my program, a thread can process the part of route that other thread is working on, even though there’s no race condition.

Log 1: 4- thread / Test 0 / 2opt\_swap(): 8 / Final distance: 594



Log 2: 4- thread / Test 0 / 2opt\_swap(): 8 / Final distance: 530



Both example the execute 2opt\_swap(i, i+1) once, so 2opt\_swap() is called 8 times each (10 node with the first node untouched). Yet the route changes and final distance are different due to the randomness in thread job scheduling by OS.

# Record your distance every 30 seconds with **test11**

Please observe if the distance improves within 10 minute.

|  |  |
| --- | --- |
| Time | Distance |
| 0m 30s |  |
| 1m 00s |  |
| 1m 30s |  |
| 2m 00s |  |
| 2m 30s |  |
| 3m 00s |  |
| 3m 30s |  |
| 4m 00s |  |
| 4m 30s |  |
| 5m 00s |  |
| 5m 30s |  |
| 6m 00s |  |
| 6m 30s |  |
| 7m 00s |  |
| 7m 30s |  |
| 8m 00s |  |
| 8m 30s |  |
| 9m 00s |  |
| 9m 30s |  |
| 10m 00s |  |

# Discussion

If there’s any race condition in your code, please describe how you handle them?

What is the most difficult part of this assignment?

What is the bottle neck of your program? Do you think that it can be improved?

Can the number of thread be more than the number of core, please justify your answer?

Which do you prefer, pthread or OpenMP, why? What are their pros and cons?

Please describe your findings in this assignment and discuss them.

# Feedback

Feel free to fill in this section.

Additional reference

If you want to see threads: <http://ask.xmodulo.com/view-threads-process-linux.html>

Processes v.s. Threads in linux: <http://www.thegeekstuff.com/2013/11/linux-process-and-threads>

Clone(): <http://man7.org/linux/man-pages/man2/clone.2.html>