

Exercise 2

- Compile the three given source codes slow.c, medium.c, and fast.c with the compiler flag -fopenmp to enable OpenMP parallelism.
 - The programs were compiled with the Makefile that I uploaded.
- Vary the number of cores by setting the environment variable OMP_NUM_THREADS before running the program, e.g. OMP_NUM_THREADS=1 ./slow. Measure the execution times of all three programs for all numbers of cores your personal computing system (e.g. PC or laptop) offers.

- Unoptimized:

Num Threads	Slow	Medium	Fast
1	1.221	0.476	0.193
2	1.959	0.711	0.101
3	3.3	1.803	0.073
4	5.156	2.477	0.069
5	6.706	1.714	0.056
6	7.795	2.421	0.054
7	9.897	5.036	0.27
8	27.063	4.805	0.102

- See if you can reduce the execution times even further by trying out different compiler flags (optimization flags).

- Optimized with -O1:

Num Threads	Slow	Medium	Fast
1	2.6528	1.8079	0.1883
2	3.1385	4.415	0.0926
3	11.682	9.0049	0.0623
4	17.4864	7.2228	0.0793
5	21.6017	8.4591	0.0386
6	28.5567	7.821	0.0239
7	29.9601	6.6523	0.0301
8	33.5731	8.1061	0.0764

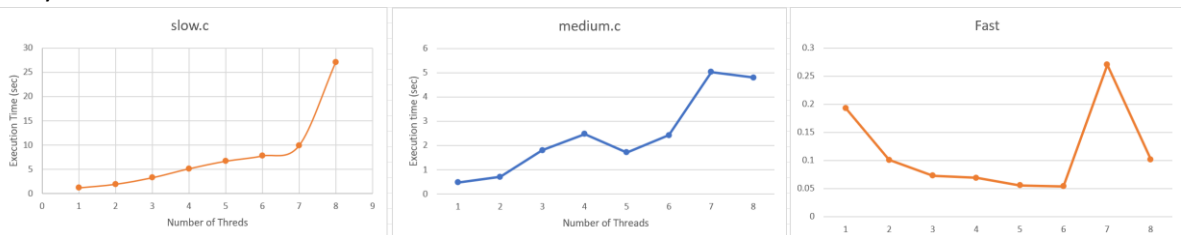
- Optimized with -O2:

Num Thread	Slow	Medium	Fast
1	1.7375	0.5215	0
2	2.2871	1.1867	0.0001
3	2.9974	2.7866	0.0002
4	5.1096	1.6615	0.0003
5	5.7992	2.6737	0.0004
6	6.6856	3.015	0.0004
7	7.2591	3.1087	0.0006
8	8.5631	3.0135	0.0023

- Optimized with -O3:

Num Threads	Slow	Medium	Fast
1	1.1325	1.2453	0
2	2.1005	3.2743	0.0002
3	4.7486	7.8055	0.0003
4	13.2871	8.6556	0.0004
5	17.6128	7.5288	0.0004
6	28.2122	7.1915	0.0005
7	32.5634	9.3617	0.0007
8	33.2616	6.4854	0.0006

- Create a table and figures that illustrate the measured data and study them. What effects can you observe?



- You can observe that if the program is compiled with optimizations, the execution time is a lot faster (fastest in general with -O2) than without.
- The number of Threads used for example with the program slow.c also can increase the execution time of the program, but with the program fast.c it decreases it. This could be due to the overhead of creating and executing all the threads.
- How stable are the measurements when running the experiments multiple times?

- single execution:

Num Threads	Slow	Medium	Fast
1	1.221	0.476	0.193
2	1.959	0.711	0.101
3	3.3	1.803	0.073
4	5.156	2.477	0.069
5	6.706	1.714	0.056
6	7.795	2.421	0.054
7	9.897	5.036	0.27
8	27.063	4.805	0.102

- compared to the average of 10 executions (not optimized):

Num Threads	Slow	Medium	Fast
1	1.0178	1.0531	0.267
2	2.1202	2.1202	0.1079
3	6.4857	6.3739	0.1238
4	13.7818	7.5222	0.1519
5	17.6234	7.8007	0.1426
6	20.7019	8.7268	0.1308
7	21.7748	7.0119	0.1415
8	37.6534	8.3426	0.1277

- the measurements can vary a lot between multiple executions