



Lab 3 Report

ECE254



November 20, 2018
UWaterloo
Zahin Mohammad, Minghao Lee

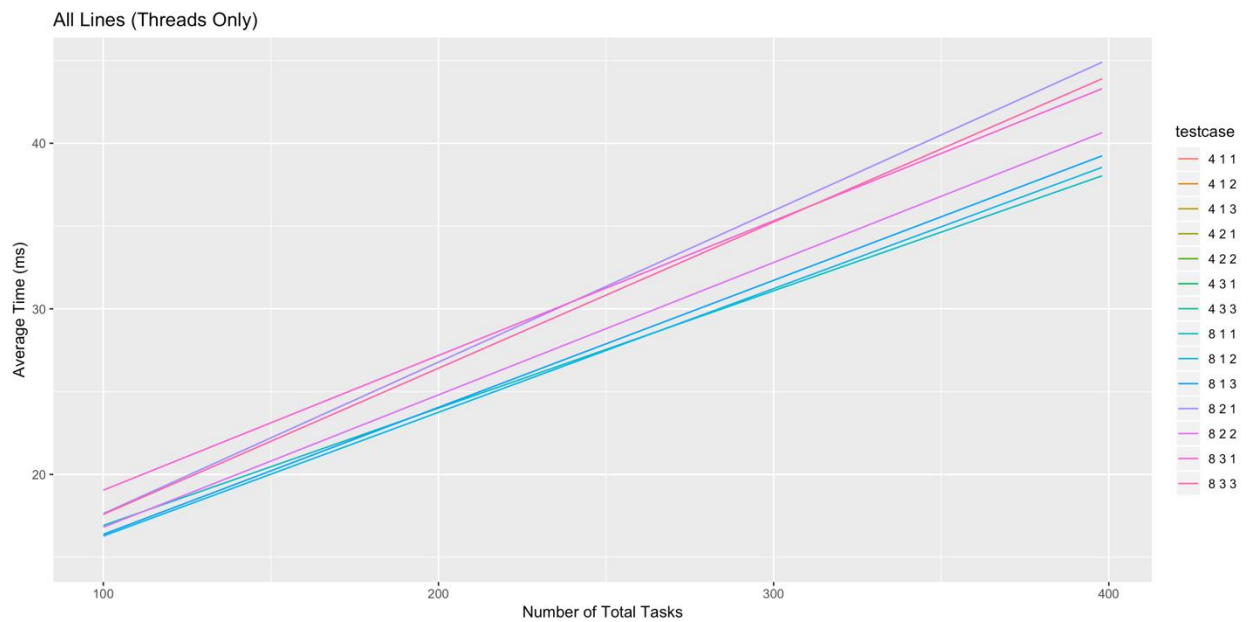
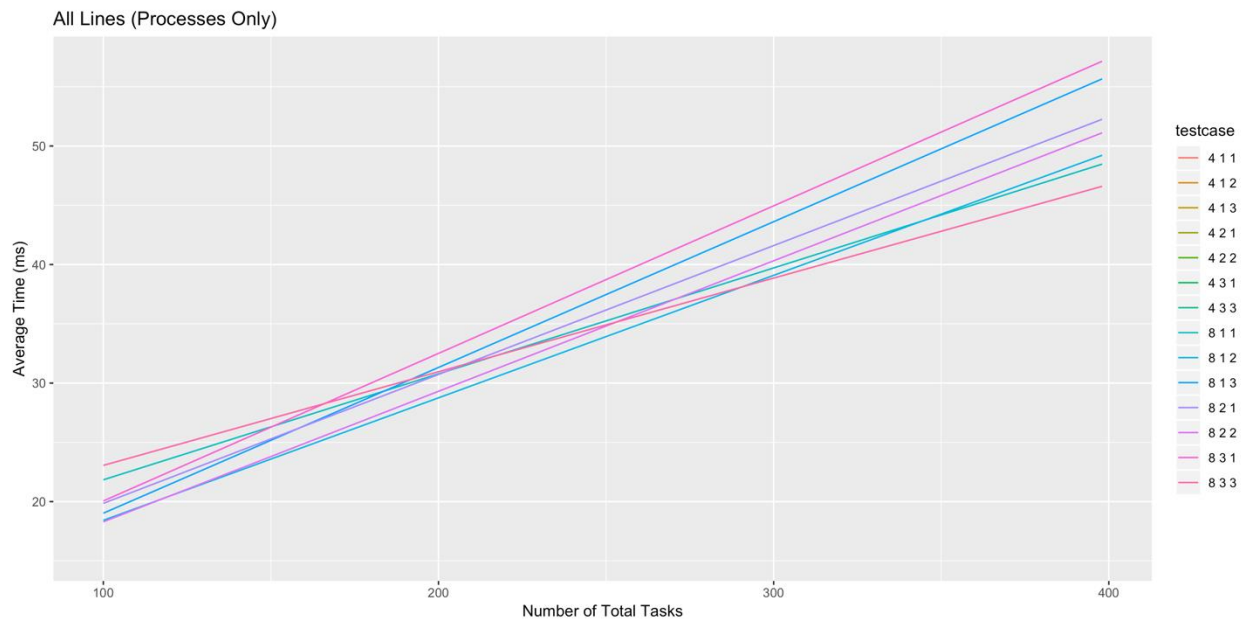
Lab 3 Stats:

Table of average timing and standard deviation measurement:

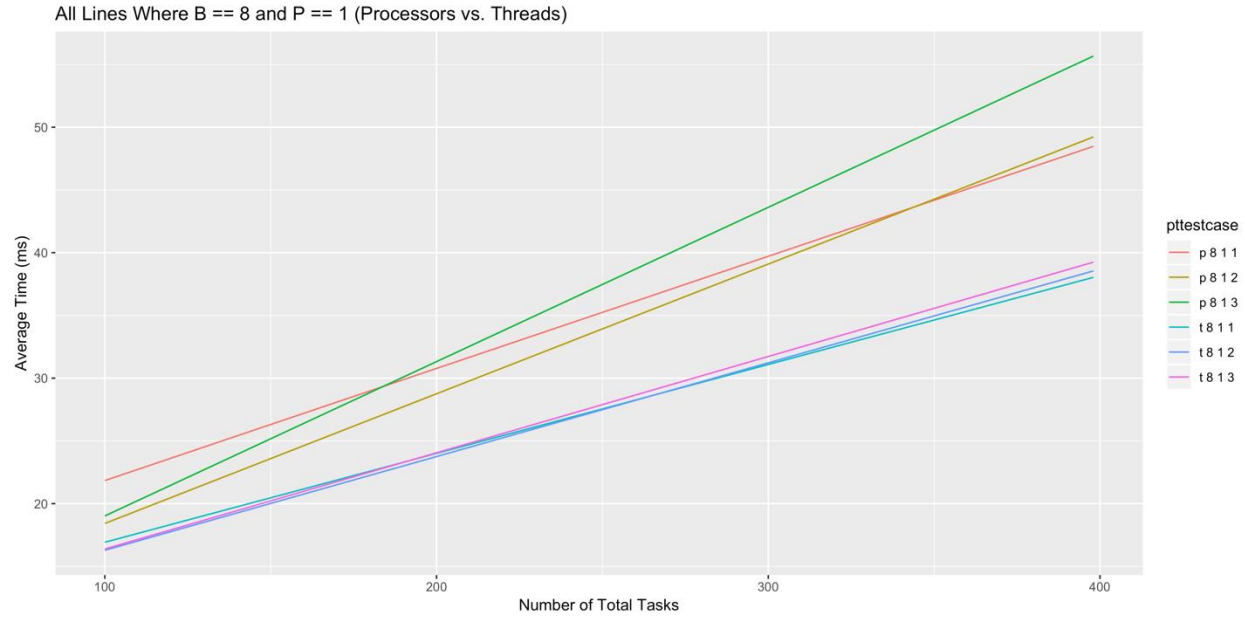
N	B	P	C	AVG Time Processes	AVG Time Threads	STD Time Processes	STD Time Threads
100	4	1	1	15.394694	18.271276	3.16425013	2.78711728
100	4	1	2	15.491816	16.40133	4.01192172	4.08294235
100	4	1	3	19.819686	15.003216	4.29685812	2.72242077
100	4	2	1	19.961146	17.951596	4.89742728	2.82672831
100	4	3	1	19.579208	18.848402	5.50861545	2.32825814
100	4	2	2	20.037968	17.926262	3.98607911	3.13730815
100	4	3	3	23.990856	17.47346	3.21538919	2.04846435
100	8	1	1	21.838822	16.921692	4.33415459	2.83961686
100	8	1	2	18.420256	16.280728	4.20879143	2.91078368
100	8	1	3	19.02039	16.383124	4.26845067	3.25995789
100	8	2	1	19.85311	17.634148	5.63183324	3.49488044
100	8	3	1	20.05484	19.050412	5.38729711	2.33154648
100	8	2	2	18.29362	16.81041	3.9830807	2.89034548
100	8	3	3	23.056076	17.588156	3.67544434	2.32839468
398	8	1	1	48.47887	38.035058	13.7589338	10.4998442
398	8	1	2	49.222884	38.544808	11.5672543	9.82696234
398	8	1	3	55.66906	39.248046	13.3072927	8.48848417
398	8	2	1	52.25754	44.897082	17.0586843	11.5030619
398	8	3	1	57.157522	43.300432	18.4468181	11.3451655
398	8	2	2	51.119446	40.635418	13.9866045	9.56382552
398	8	3	3	46.604294	43.899142	10.791907	8.64969359

Lab 3 Analysis:

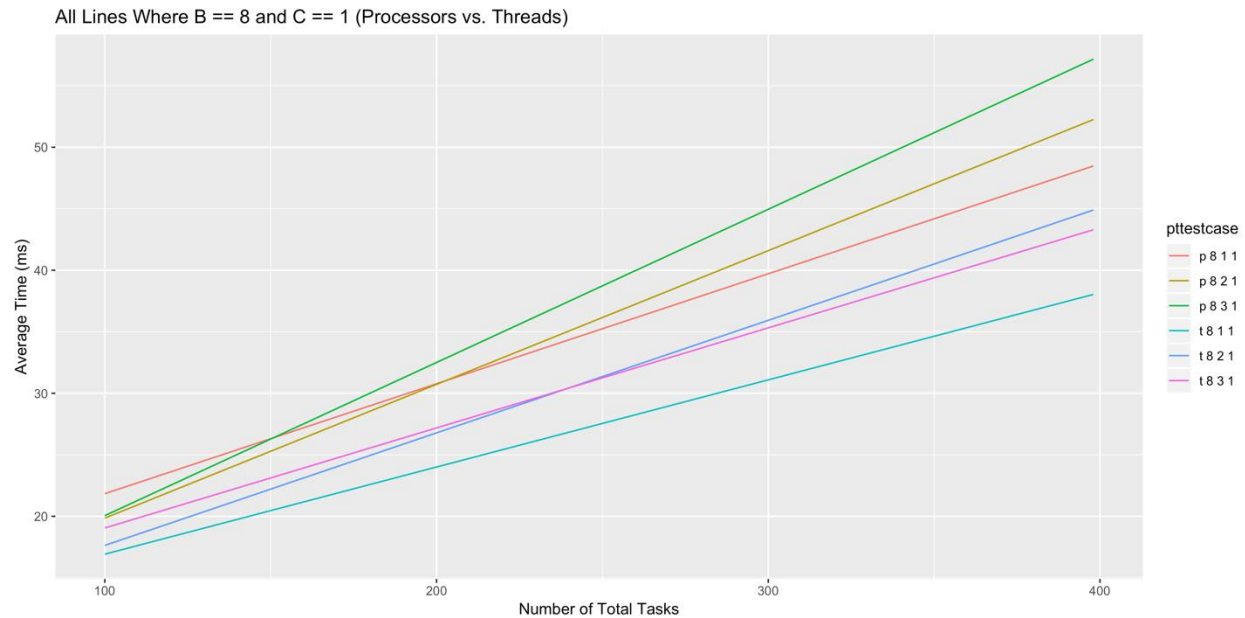
- Compare the timing results of multi-thread with shared memory and multi-process with message queue. Discuss the advantages and disadvantages of these two approaches to solve the same problem.



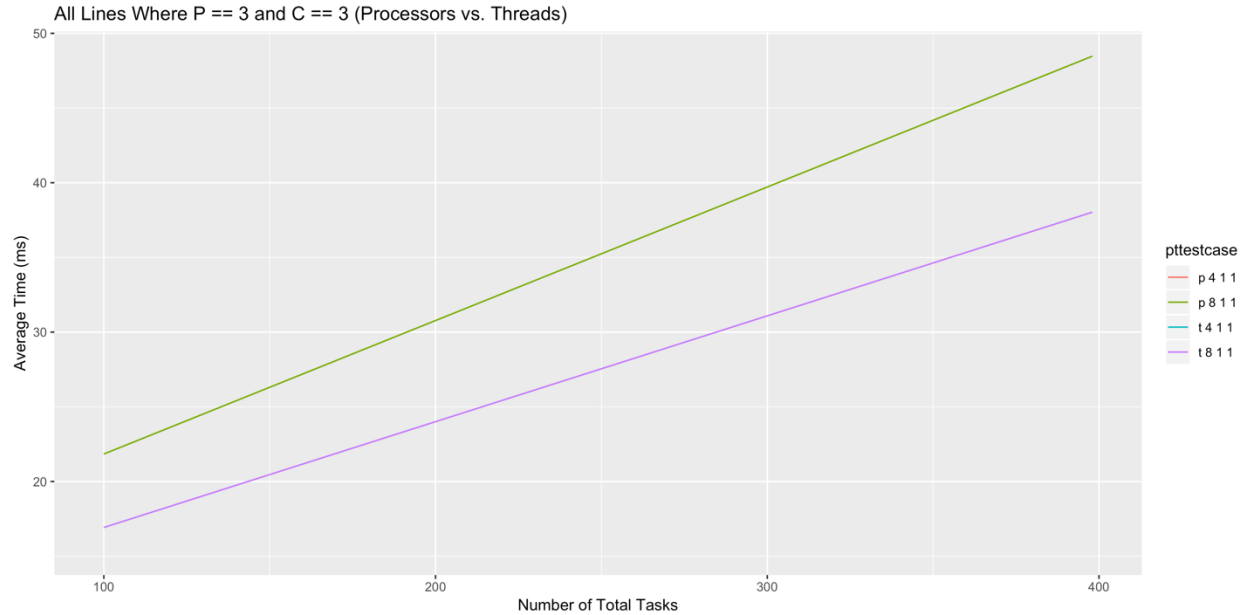
The buffer size wouldn't affect the average time for both multi-thread and multi-process.



When Buffer size is 8 and producer is 1, the average time of the threads with the shared memory is much faster than the average time of the processes with the message queue. More consumers would slow the average time.



When Buffer size is 8 and consumer is 1, the average time of the threads with the shared memory is much faster than the average time of the processes with the message queue. More producers would slow the average time.



When there are three producers and three consumers, the average time of multi-thread with shared memory is much faster than the average time of multi-process with message queue.

Advantages and disadvantages:

Threads with shared memory:

Shared memory is faster than message queue for read or write operation. But each access is treated as one normal memory access and system call is required when creating the shared memory. The data is not safe in shared memory region, which can be modified by any thread that accesses the shared memory and it's not the data owner.

Processes with message queue:

The queue can make sure that every operation wouldn't alter the queue when it processes the message in the queue successfully or fail. No conflicts need be avoided. The message queue is much easier to implement compared to shared memory. And we don't need to worry about the detail protections. However, the access speed would be slower than shared memory by read or write, which is typically a single message.

- Compare how each variable (N/B/P/C) affects the timing of the applications

The larger number of tasks (N) would increase the average time. It would take larger time to finish all tasks.

The buffer size (B) wouldn't affect the average time for both multi-thread and multi-process.

The larger number of producers (P) would increase the average time with the same number of consumers. Producer should wait for free space in buffer and get blocked. This can slow the program to finish all tasks.

The larger number of consumer (C) would increase the average time with the same number of producers. Consumer would wait for the specific task, which is assigned. Otherwise, the consumer is going to be blocked and wait for its assigned task. The waiting time would increase the program time.

The Average time is able to provide more accuracy for the time results. The standard deviation time represents a quantity calculated to indicate the extent of deviation for a group of the time results across 500 times.