

CSC458 Assignment 3

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Exercise 1

The way I implement **histo_private.cpp** is by assigning each thread with a portion of elements in **input**. I created a two dimension array of p_hist_r, p_hist_g, and p_hist_b in the main process by allocating it with pointer to pointer. The first dimension of each two dimension array of is the thread index, and the second dimension is the array of storing the rgb information. By this way, I could pass the pointer to thread the same way we did in the serial version. After the thread is joined by the main process, the main process merge those private histogram array as out result. The program has passed the tests on *cycle*, *node2x18a*, and *node-ibm-822*, and the benchmark was run on cycle machine with millisecond as unit and rounding to the fourth decimal place. The benchmark is run on cycle machine.

Table 1: First part

	300px		earth		flood		moon-small	
	avg	stddev	avg	stddev	avg	stddev	avg	stddev
thread = 1	0.4752	0.04198	15.5530	0.7488	1.0551	0.0433	1.2895	0.0758
thread = 2	0.3386	0.02163	9.6614	0.1899	0.5983	0.0234	0.7301	0.0246
thread = 4	0.3250	0.02311	4.9968	0.0732	0.4557	0.0259	0.4754	0.0145
thread = 8	0.5740	0.03784	2.7895	0.1464	0.4792	0.0203	0.4616	0.0245

Table 2: Second part

	moon-large		polar		noise		phobos		university	
	avg	stddev	avg	stddev	avg	stddev	avg	stddev	avg	stddev
thread = 1	57.5394	8.0210	4.3464	0.1517	3.7555	0.1674	3.5785	0.0798	0.7345	0.0542
thread = 2	31.8513	3.0031	2.2948	0.0291	4.0202	0.7334	2.3084	0.1588	0.4619	0.0291
thread = 4	19.0670	0.9186	1.2783	0.0195	1.8389	0.1879	1.1316	0.0238	0.3944	0.0266
thread = 8	12.6258	0.1081	0.8784	0.0204	1.4263	0.1762	0.8270	0.0673	0.5443	0.0865

Exercise 2

I use C++11 atomics in this exercise and the benchmark was run on cycle machine with millisecond as unit and rounding to the fourth decimal place. The benchmark is run on cycle machine.

Table 3: First part

	300px		earth		flood		moon-small	
	avg	stddev	avg	stddev	avg	stddev	avg	stddev
thread = 1	3.4139	0.1594	125.1039	24.9828	9.8868	1.5664	12.9836	0.8562
thread = 2	6.4220	1.5368	444.3868	166.9722	13.6713	2.3225	23.8788	7.0693
thread = 4	4.7436	0.4355	329.0156	57.2621	11.9534	0.8926	25.2616	4.7356
thread = 8	4.3772	0.2086	344.1646	39.7422	13.6136	1.0988	26.5941	4.6187

Table 4: Second part

	moon-large		polar		noise		phobos		university	
t	avg	stddev	avg	stddev	avg	stddev	avg	stddev	avg	stddev
1	606.4016	156.8377	28.5763	1.7181	26.3128	1.9515	25.5694	2.2176	6.1598	0.6460
2	2282.8958	273.9610	122.8339	36.5971	75.8593	20.2484	66.3201	22.0016	10.7614	2.3954
3	1812.5720	136.4514	82.0153	6.8515	49.8065	5.5285	65.4142	4.7444	15.4262	1.7030
4	1729.9682	280.2855	101.6811	13.6870	34.1223	1.5588	59.1535	7.0312	16.0439	0.5751

Exercise 3

Test_and_test_and_set_lock

This lock is in MCS Figure 4.5. The benchmark is run on cycle machine.

Table 5: First part

	300px		earth		flood		moon-small	
t	avg	stddev	avg	stddev	avg	stddev	avg	stddev
1	9.2689	0.9684	377.8587	80.5265	21.6540	1.6382	26.0621	1.5602
2	25.4030	6.1648	1610.2933	229.4788	67.9486	12.7784	85.6884	17.9814
4	44.9977	10.1139	2805.7076	178.3398	130.0536	12.7741	161.0321	33.9594
8	63.0891	8.3356	3863.0049	133.9088	199.1395	18.9336	233.3086	23.4794

Table 6: Second part

	moon-large		polar		noise		phobos	
t	avg	stddev	avg	stddev	avg	stddev	avg	stddev
1	1851.3428	228.5221	80.3387	21.9791	77.2958	8.1051	67.4052	10.9697
2	7895.7430	741.5912	261.8348	95.3632	303.7603	87.6510	202.4639	42.3571
3	13559.7749	769.2802	640.3909	92.2254	555.4606	126.0588	460.4381	63.0929
4	19988.9011	475.4223	765.8063	35.8661	784.5825	65.2412	716.2571	79.0720

Table 7: Third part

	university	
t	avg	stddev
1	15.1543	1.7375
2	40.4117	9.0448
3	70.6077	15.7719
4	121.8687	16.1765

Ticket Lock

This lock is in MCS Figure 4.6. The benchmark is run on cycle machine.

Table 8: First part

	300px		earth		flood		moon-small	
t	avg	stddev	avg	stddev	avg	stddev	avg	stddev
1	4.8482	0.0635	165.0940	31.4466	12.5567	1.9064	14.9838	1.2782
2	30.3631	5.0925	2410.9683	236.2831	84.6625	33.3777	134.9622	46.7066
4	41.3506	2.5794	2662.8796	173.9180	137.4501	12.8742	156.7908	7.1343
8	48.3109	1.8619	2659.8196	41.0662	143.8012	10.6472	179.9263	5.9783

Table 9: Second part

	moon-large		polar		noise		phobos	
t	avg	stddev	avg	stddev	avg	stddev	avg	stddev
1	851.6880	216.0978	34.4278	3.3729	36.5234	1.7734	33.5256	2.2371
2	11060.0622	184.1015	330.2139	110.6043	449.2077	130.9605	338.5562	157.6437
3	12162.1956	263.9499	529.0560	83.2011	462.8724	10.5224	431.9536	44.0941
4	13410.4912	139.2700	563.5964	43.1326	551.0281	51.3635	463.6545	23.0374

Table 10: Third part

	university	
t	avg	stddev
1	8.7981	0.9441
2	50.8868	22.1204
3	79.7633	5.9983
4	94.9402	6.9555