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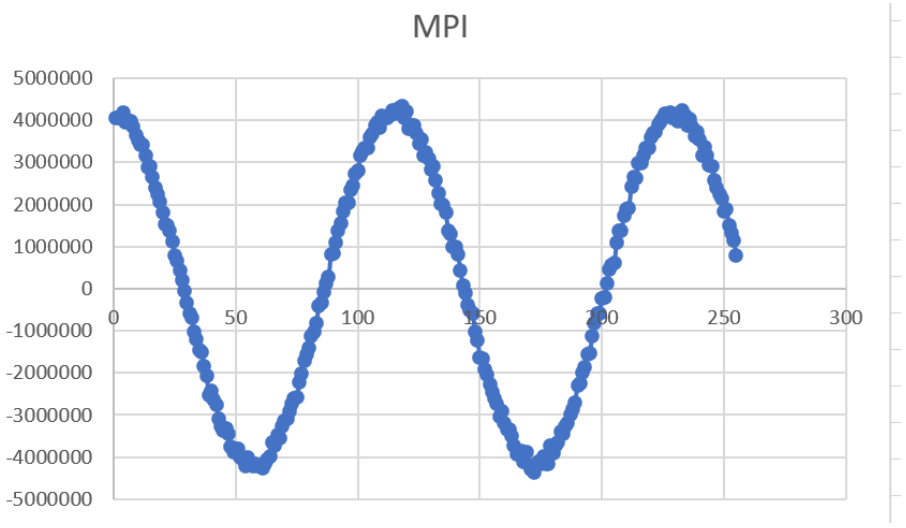
CS 575
Project #7B
Autocorrelation using MPI

1.Show the Sums{1] ... Sums[255] vs. shift scatterplot.



1	1	4090730
2	2	4088133
3	3	4059845
4	4	4175616
5	5	3965383
6	6	3970828
7	7	3991717
8	8	3848795
9	9	3646289
10	10	3546194
11	11	3411650
12	12	3425584
13	13	3177111
14	14	2888809
15	15	2895396
16	16	2682447
17	17	2395724
18	18	2246475
19	19	2065806
20	20	1822596
21	21	1527322
22	22	1497241
23	23	1409667
24	24	1120067

25	25	801631.6
26	26	660697.8
27	27	423644.6
28	28	215225
29	29	-57969.1
30	30	-325429
31	31	-585678
32	32	-689290
33	33	-1023990
34	34	-1188756
35	35	-1421420
36	36	-1513757
37	37	-1807853
38	38	-2074804
39	39	-2490376
40	40	-2423749
41	41	-2634853
42	42	-2767275
43	43	-3068066
44	44	-3242240
45	45	-3369861
46	46	-3310333
47	47	-3416027
48	48	-3757029
49	49	-3888289
50	50	-3813518

51	51	-3814012
52	52	-4014756
53	53	-4057679
54	54	-4205620
55	55	-4020750
56	56	-4130661
57	57	-4209625
58	58	-4150691
59	59	-4221229
60	60	-4177423
61	61	-4263545
62	62	-4146238
63	63	-4048036
64	64	-3978539
65	65	-3653061
66	66	-3725855
67	67	-3465362
68	68	-3561437
69	69	-3268126
70	70	-3141684
71	71	-3067481
72	72	-2879673
73	73	-2714238
74	74	-2601084
75	75	-2591800

76	76	-2220992
77	77	-1982130
78	78	-1700619
79	79	-1564720
80	80	-1411140
81	81	-1102701
82	82	-1030253
83	83	-829775
84	84	-392223
85	85	-342313
86	86	-76187.5
87	87	127355.6
88	88	270323.3
89	89	822048.5
90	90	872388.8
91	91	1095458
92	92	1401685
93	93	1583622
94	94	1828243
95	95	2032875
96	96	2028380
97	97	2343447
98	98	2442767
99	99	2721917
100	100	2827745

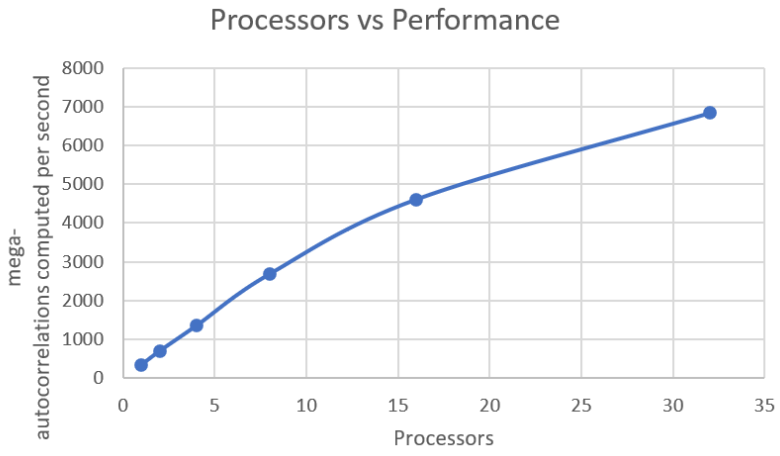
101	101	3161196
102	102	3260972
103	103	3363721
104	104	3375269
105	105	3608587
106	106	3669368
107	107	3882476
108	108	3964053
109	109	3829150
110	110	4112064
111	111	4067050
112	112	4067472
113	113	4099677
114	114	4241656
115	115	4152813
116	116	4174815
117	117	4279238
118	118	4330732
119	119	4093100
120	120	4220473
121	121	3811007
122	122	3875694
123	123	3896317
124	124	3721594
125	125	3442019

126	3576522	151	-1654654	176	-3961126	201	-184444	227	4095651
127	3200593	152	-1914179	177	-4173414	202	162086.3	228	4186497
128	3245267	153	-2045895	178	-4125776	203	449774.9	229	4055941
129	3088147	154	-2281039	179	-3727317	204	553823.4	230	4120536
130	2845928	155	-2463733	180	-3919306	205	601834.5	231	3984938
131	2908606	156	-2612132	181	-3728191	206	1107040	232	4193242
132	2574884	157	-2734450	182	-3658692	207	1397756	233	4224167
133	2281472	158	-3029168	183	-3392542	208	1396877	234	4117558
134	2009500	159	-2922036	184	-3435586	209	1749069	235	3911380
135	1983705	160	-3201366	185	-3272688	210	1876871	236	4035304
136	1821736	161	-3352871	186	-3187428	211	1911577	237	3853621
137	1381652	162	-3345084	187	-2979726	212	2429810	238	3614295
138	1305912	163	-3486548	188	-2859609	213	2675633	239	3742828
139	1002553	164	-3718584	189	-2674376	214	2647378	240	3562957
140	982590.4	165	-3926456	190	-2289859	215	2979663	241	3165565
141	803065.4	166	-3937671	191	-2242837	216	3017146	242	3388298
142	442954.2	167	-3851966	192	-1968587	217	3160623	243	3167304
143	86987.24	168	-4121309	193	-1862740	218	3366231	244	2928012
144	-95749.2	169	-3880682	194	-1560580	219	3380220	245	2919851
145	-351777	170	-4182107	195	-1521535	220	3585360	246	2586114
146	-517532	171	-4294015	196	-1102597	221	3696413	247	2399670
147	-558624	172	-4360003	197	-827708	222	3763008	248	2236367
148	-1024286	173	-4189873	198	-589169	223	3937776	249	2147649
149	-1217983	174	-4113759	199	-578342	224	3971602	250	1842756
150	-1609836	175	-4155990	200	-211496	225	4047464	251	1887429
						226	4154907	252	1515288
								253	1322290
								254	1137678
								255	777751.6

2.State what the secret sine-wave period is, i.e., what change in shift gets you one complete sine wave?

It's a cosin wave and the period is around 120.

3.Show your graph of Performance vs. Number of Processors used.




```
[gaorui@submit-c ~/cs575_sp21/p7$] mpiexec -mca btl self,tcp -np 4 pf
Node   1 entered DoOneLocalAutocorrelation( )
Node   2 entered DoOneLocalAutocorrelation( )
Node   0 entered DoOneLocalAutocorrelation( )
Node   3 entered DoOneLocalAutocorrelation( )
  4 processors,    8388608 elements,   1351.70 mega-autocorrelations computed per second
```

D	E	F	G	H	I	J	K	L
	processors / performance	1	2	4	8	16	32	
		343.11	699.15	1351.7	2684.16	4607.03	6832.7	

4.What patterns are you seeing in the performance graph?

The performance increases with the increasing of the number of processors.

It also become double when the processors grows to double in the beginning and it grows slower when the number of processors is a kind of big.

5.Why do you think the performances work this way?

I guess the reason is even though the MPI is able to fully using CPUs and do the communication job among CPUs, but as the amount of separating jobs increases, it takes more and more time on dividing and transforming.