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Parallel Programming Assignment 1 Report

The speedup values are directly proportional to the value of f. The relationship is by no means linear, but the speedup values are “sensitive”, so to speak. For instance, when f = 0.5, N=1, and r = 1, both speedup values grow from 1 to roughly 2. When f = 0.99999999 (f_index = 0), N=1, and r=1, however, the speedup values grow from 1 to almost 1024. Furthermore, the maximum speedup value (either asymmetric or dynamic) achieved when f = 0.99999999 is 1048575.6749. When f = 0.5, the maximum value achieved is only 63550.0606.
Another interesting characteristic of the data is that the stability of the speedup values oscillates indirectly with f. For instance, when f = 0.99999999 and N = 1024, the speedup values are as follows.

0.99999999	1024	1024	1	1	1024.0000	1024.0000
0.99999999	4096	1024	1	4	4095.9999	4095.9999
0.99999999	16384	1024	1	16	16383.9975	16383.9975
0.99999999	65536	1024	1	64	65535.9587	65535.9587
0.99999999	262144	1024	1	256	262143.3315	262143.3315
0.99999999	1048576	1024	1	1024	1048565.2732	1048565.2732
0.99999999	4096	1024	4	4	2048.0000	4096.0000
0.99999999	16384	1024	4	16	14335.9991	16383.9989
0.99999999	65536	1024	4	64	63487.9810	65535.9797
0.99999999	262144	1024	4	256	260095.6723	262143.6671
0.99999999	1048576	1024	4	1024	1046522.6627	1048570.6418
0.99999999	16384	1024	16	16	4096.0000	16383.9995
0.99999999	65536	1024	16	64	53247.9936	65535.9902
0.99999999	262144	1024	16	256	249855.8501	262143.8348
0.99999999	1048576	1024	16	1024	1036285.3886	1048573.3261
0.99999999	65536	1024	64	64	8192.0000	65535.9954
0.99999999	262144	1024	64	256	204799.9508	262143.9187
0.99999999	1048576	1024	64	1024	991230.8105	1048574.6683
0.99999999	262144	1024	256	256	16384.0000	262143.9607
0.99999999	1048576	1024	256	1024	802815.6146	1048575.3394
0.99999999	1048576	1024	1024	1024	32768.0000	1048575.6749

You can see here that once r increases and c “restarts”, the speedup values drop significantly. They grow until c reaches its max value, at which points it drops again.
This isn't the case when f is smaller. For instance, here are the parallel set of values when f = 0.5 and N = 1024.

0.50000000	1024	1024	1	1	1024.0000	1024.0000
0.50000000	4096	1024	1	4	1638.4000	1638.4000
0.50000000	16384	1024	1	16	1927.5294	1927.5294
0.50000000	65536	1024	1	64	2016.4923	2016.4923
0.50000000	262144	1024	1	256	2040.0311	2040.0311
0.50000000	1048576	1024	1	1024	2046.0020	2046.0020
0.50000000	4096	1024	4	4	2048.0000	2730.6667
0.50000000	16384	1024	4	16	3584.0000	3640.8889
0.50000000	65536	1024	4	64	3968.0000	3971.8788
0.50000000	262144	1024	4	256	4064.0000	4064.2481
0.50000000	1048576	1024	4	1024	4088.0000	4088.0156
0.50000000	16384	1024	16	16	4096.0000	6553.6000
0.50000000	65536	1024	16	64	7606.8571	7710.1176
0.50000000	262144	1024	16	256	8059.8710	8065.9692
0.50000000	1048576	1024	16	1024	8159.7480	8160.1245
0.50000000	65536	1024	64	64	8192.0000	14563.5556
0.50000000	262144	1024	64	256	15753.8462	15887.5152
0.50000000	1048576	1024	64	1024	16249.7049	16256.9922
0.50000000	262144	1024	256	256	16384.0000	30840.4706
0.50000000	1048576	1024	256	1024	32112.6400	32263.8769
0.50000000	1048576	1024	1024	1024	32768.0000	63550.0606

In this case, even when r increases and c restarts, the number continues to increase instead of vacillating. In this sense, a lower value of f is more “stable”.

Finally, dynamic speedup values are always greater than or equal to asymmetric speedup values, though there are a good number of instances where they are comparable in magnitude. In the second above image where f = 0.5, N = 1024, r = 1, and c = 1024, the asymmetric speedup value and dynamic speedup value are exactly the same (at least to the given decimal places). On the other hand, when r = 1024 and c = 1024, the dynamic speedup value is almost double the asymmetric speedup value.
Furthermore, when f = 0.99999999, N = 1024, r = 1024, and c = 1024, the asymmetric speedup value and dynamic speedup value are significantly different, separated by a factor of almost 32. Of course, when f is greater, we can say that the “spread” between dynamic values and asymmetric values is also greater, but other than that, I’m not seeing any other pattern.