CS 475 – Parallel Programming

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Project #4 - Vectorized Array Multiplication and Multiplication/Reduction using SSE

Array Size	NonSimdMul	SimdMul	Speedup
1000	395.78	1938.16	4.9
1024	230.84	1115.12	4.83
2048	396.94	1939.17	4.89
3072	218.98	1054.52	4.82
4096	130.34	1194.8	9.17
5120	216.52	1046.95	4.84
6144	391.82	2131.52	5.44
7168	359.43	1729.57	4.81
8192	195.66	943.99	4.82
9216	390.41	1877.01	4.81
10240	130.77	722.84	5.53
500000	387.39	1866.31	4.82
1000000	378.21	1825.51	4.83
1500000	377.7	1531.69	4.06
2000000	373.61	1262.17	3.38
2500000	376.05	1169.87	3.11
3000000	373.01	930.61	2.49
3500000	365.57	964.68	2.64
4000000	363.53	951.9	2.62
4500000	364.72	926.28	2.54
5000000	360.05	902.1	2.51
5500000	365.73	900.3	2.46
6000000	359.8	900.1	2.5
6500000	359.01	910.02	2.53
7000000	371.07	896.82	2.42
7500000	372	873.33	2.35
8000000	360.79	869.03	2.41

Array Multiplication Comparison of SSE and Non-SSE Speedup

Y-axis: Speedup (Tnon-sse/Tsse)

X-axis: Array Size
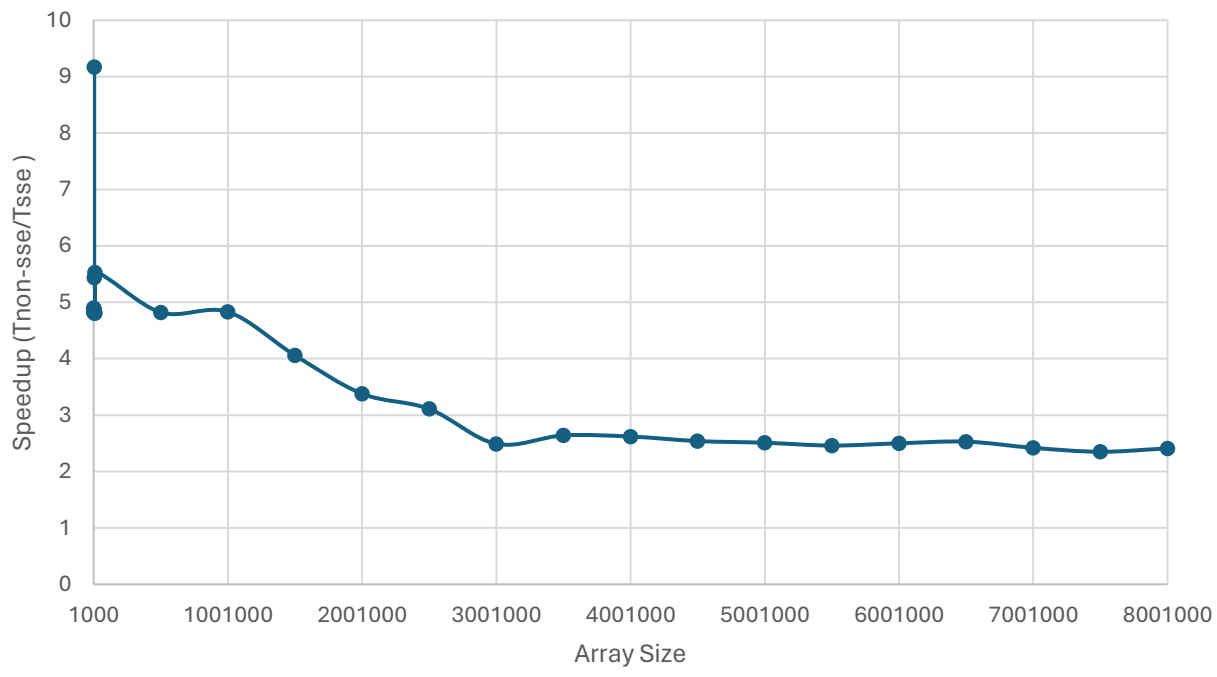
Array Size	NonSimdMulSum	SimdMulSum	Speedup
1000	395.49	1966.56	4.97
1024	131.82	673.72	5.11
2048	308.98	1731.51	5.6
3072	397.85	1971.63	4.96
4096	397.51	1474.86	3.71
5120	342.27	1667.95	4.87
6144	242.99	1173.65	4.83
7168	397.78	1914.57	4.81
8192	364.67	1770.19	4.85
9216	187.88	901.81	4.8
10240	232.15	1126.09	4.85
500000	396.47	1942.59	4.9
1000000	393.39	1925.59	4.89
1500000	390.13	1891.4	4.85
2000000	390.72	1819.04	4.66
2500000	388.03	1634.88	4.21
3000000	386.83	1519.19	3.93
3500000	389.31	1417.92	3.64
4000000	387.2	1273.53	3.29
4500000	388.71	1243.49	3.2
5000000	389.22	1147.8	2.95
5500000	385.53	1165.06	3.02
6000000	387.16	1164.38	3.01
6500000	388.26	1151.49	2.97
7000000	387.9	1154.87	2.98
7500000	387.08	1165.62	3.01
8000000	387.98	1105.16	2.85

Array Multiplication/Reduction Comparison of SSE and Non-SSE Speedup
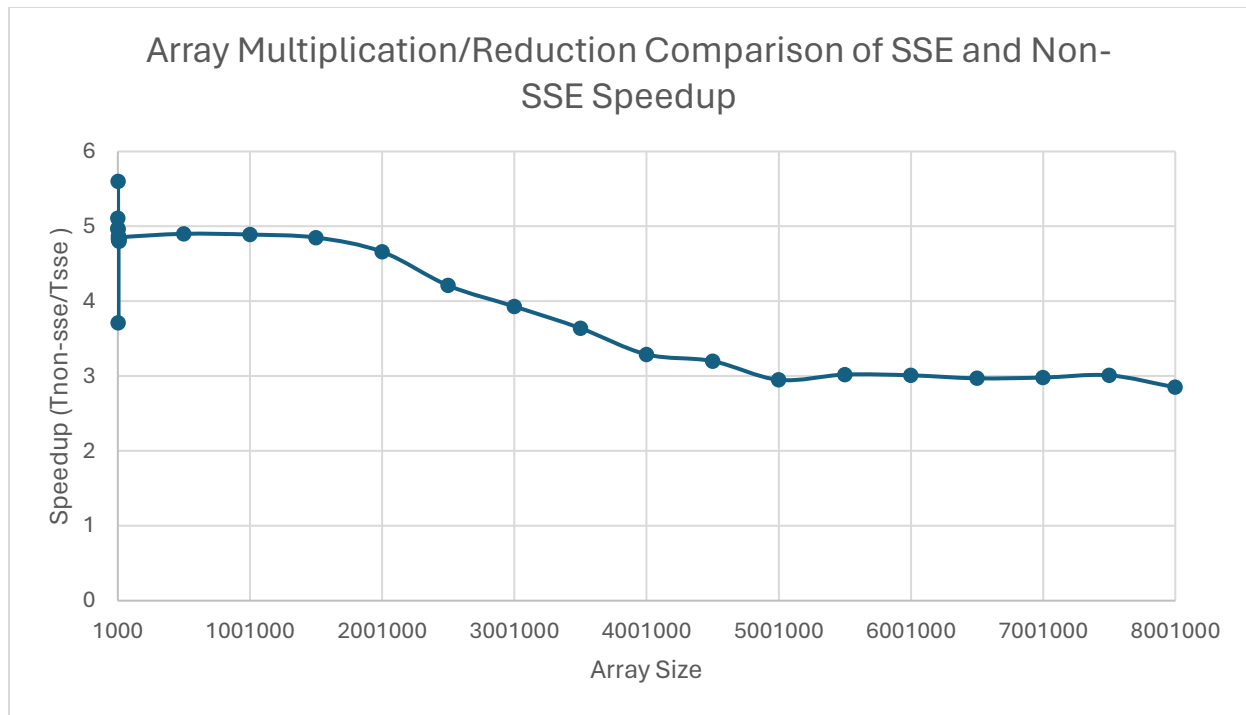
- Ran on OSU flip server. flip has 24 processors with 6 cores/processor, total of 144 cores. Size of the caches are: L1: 32K, L2: 256K, L3: 12288K
- Table 1 shows the Array **Multiplication** Comparison of SSE and Non-SSE Speedup along with max performance numbers for Non-SSE and SSE in column 2-3.
- Table 2 shows Array **Multiplication/Reduction** Comparison of SSE and Non-SSE Speedup along with max performance numbers for Non-SSE and SSE in column 2-3.
- Based on the data shown in the table and graph, for smaller data sets there is no setup time in SIMD, in comparison to multicore. As the array size gets larger, there is less difference in performance between Non-SSE and SSE, hence a dip in the graph as dataset gets larger. Thread process setup time in multicore keeps small dataset sizes from being efficient which explains higher speedup for the start of the graph. Speedup for array multiplication levels out to less than 3 as the dataset gets larger. Speedup for array multiplication/reduction decreases as dataset gets larger.