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Project Name: Vectorized Array Multiplication and Multiplication/Reduction using SSE

CS 575 - Project #4

1. Tell what machine you ran this on

I ran this on the flip server which uses “CentOS Linux”.

2. Show the 2 tables of performances for each array size and the corresponding speedups

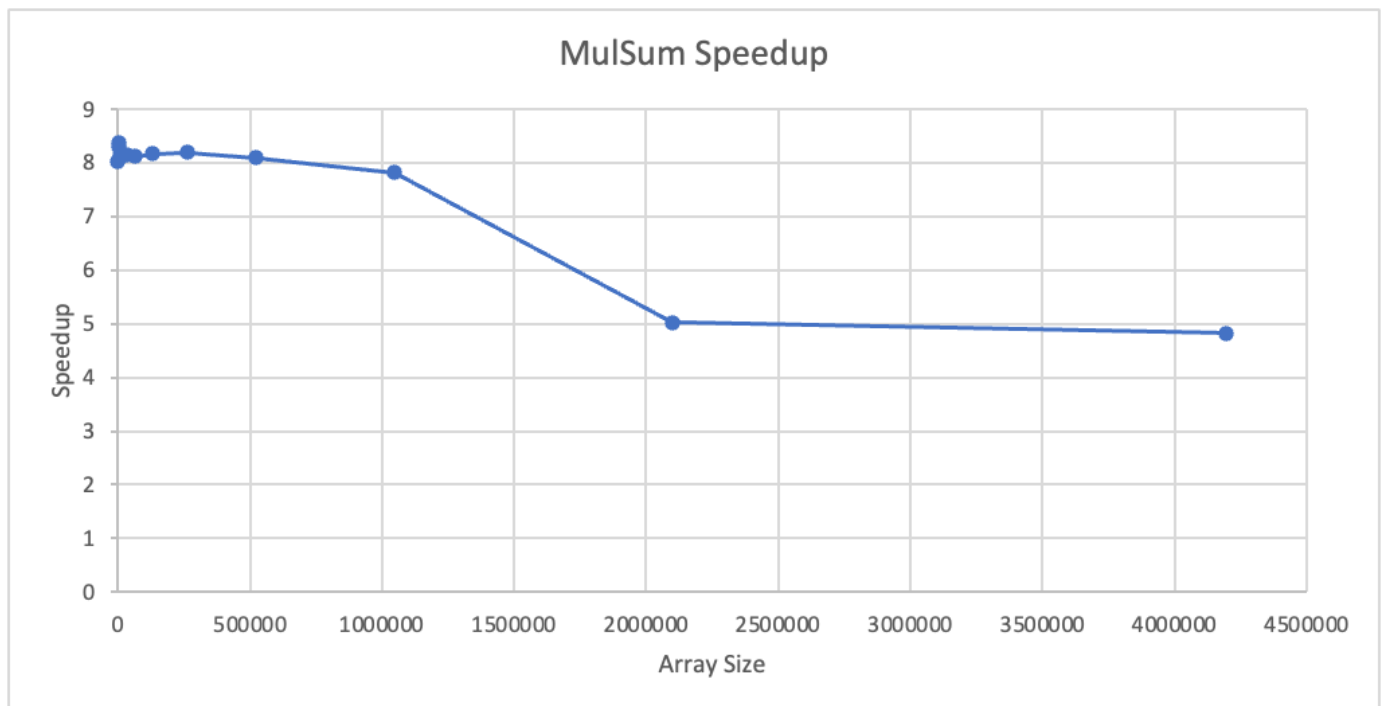
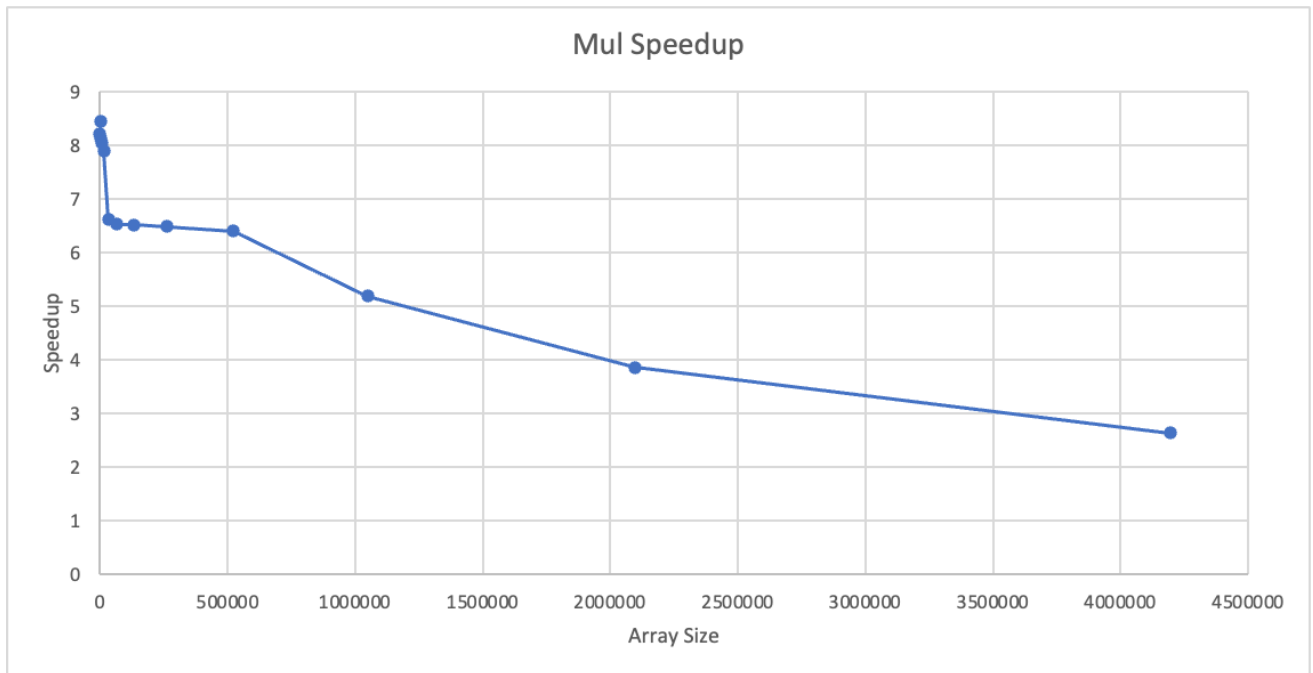
For MulSpeedup,

ArraySize	NonSimdMul	SimdMul	Speedup
1024	120.46	990.33	8.22
2048	121.04	1021.49	8.44
4096	120.73	982.25	8.14
8192	120.78	971.89	8.05
16384	120.97	954.23	7.89
32768	120.95	802.27	6.63
65536	120.77	788.25	6.53
131072	120.44	785.12	6.52
262144	119.83	778.06	6.49
524288	119.64	766.05	6.40
1048576	226.87	1177.32	5.19
2097152	223.74	863.48	3.86
4194304	223.72	589.55	2.64

For MulSumSpeedup,

ArraySize	NonSimdMulSum	SimdMulSum	Speedup
1024	121.80	978.21	8.03
2048	122.32	1016.42	8.31
4096	122.89	1028.36	8.37
8192	123.18	1003.20	8.14
16384	123.23	1001.96	8.13
32768	123.22	1003.40	8.14
65536	123.21	1000.76	8.12
131072	122.75	1003.09	8.17
262144	122.64	1004.05	8.19
524288	122.33	989.97	8.09
1048576	234.29	1833.16	7.82
2097152	230.88	1158.98	5.02
4194304	230.11	1110.62	4.83

3. Show the graphs (or graph) of SIMD/non-SIMD speedup versus array size (either one graph with two curves, or two graphs each with one curve)



4. What patterns are you seeing in the speedups?

The speedups for both graphs hover around 8 with the maximum speedup for Mul being 8.44 and for MulSum being 8.37. For both the cases, with an increase in the array size the speedup starts to decrease. For the MulSpeedupSum however, it is consistent for array sizes 1024 to 524288 after which it starts decreasing. For MulSpeedup it starts to decrease right after array size 2048.

5. Are they consistent across a variety of array sizes?

No, the speedups are not consistent across a variety of array sizes. This is because when the array size increased the speedup decreased for both Mul as well as MulSum.

6. Why or why not, do you think?

There is some overhead involved in setting up and managing the SIMD operations, such as loading and storing data into SIMD registers. This can be the reason the speedups decrease when array size increases and the speedups are not consistent. Also, when the array size increases it takes more time to fetch data from memory and hence that can lead to a decrease in speedup too.