Project #4
Vectorized Array Multiplication/Reduction using SSE

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Machine this ran on:

- I ran this on my MacBook Pro running on OS Monterey version 12.0.1 while on the flip OSU server:
  CPU: 2 GHz Dual-Core Intel Core i5
  Memory: 8 GB 1867 MHz LPDDR3

Table of Data:

- These table show the data I collected for mul and sum,

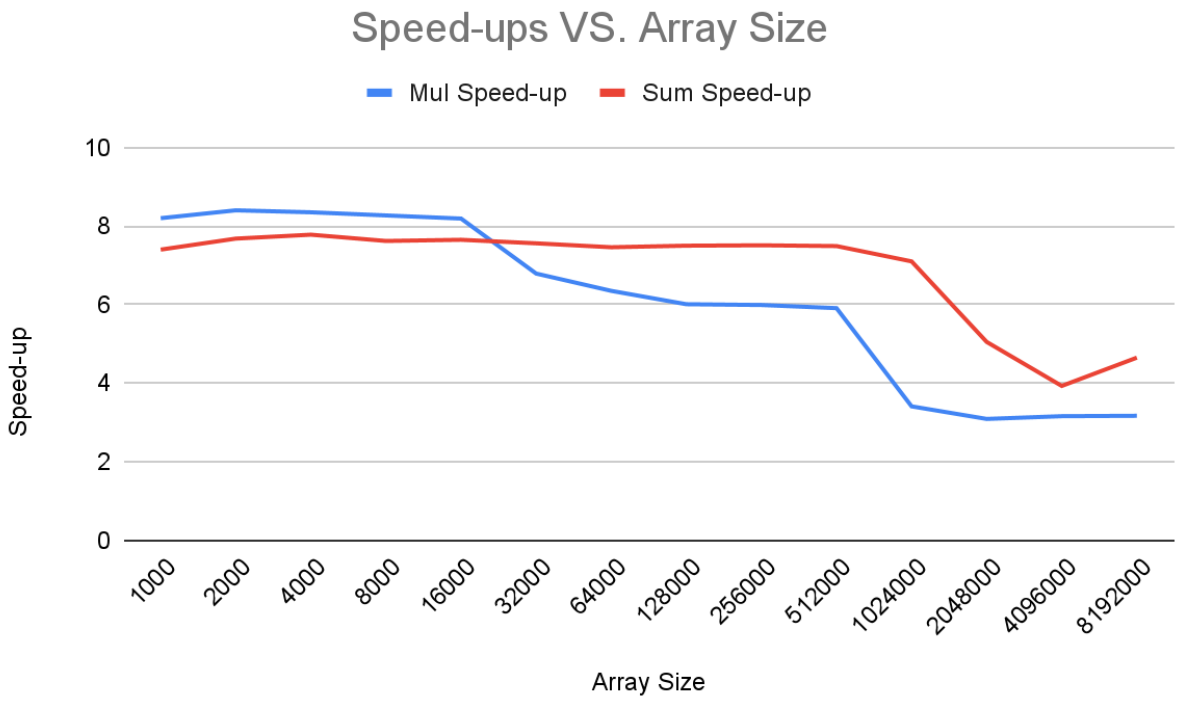
Mul

Array Size	NonSmd Performance	Smd Performance	Speed UP
1000	221.69	1818.36	8.2
2000	223.16	1874.71	8.4
4000	221.6	1849.29	8.35
8000	221.69	1832.32	8.27
16000	221.65	1815.48	8.19
32000	220.88	1499.9	6.79
64000	220.73	1401.52	6.35
128000	220.89	1327.89	6.01
256000	218.4	1307.16	5.99
512000	217.44	1284.22	5.91
1024000	214.01	728.98	3.41
2048000	212.01	654.6	3.09
4096000	210.62	666.01	3.16
8192000	213.96	677.6	3.17

Sum

Array Size	NonSmd Performance	Smd Performance	Speed Up
1000	241.72	1789.57	7.4
2000	242.6	1864.14	7.68
4000	242.63	1887.07	7.78
8000	241.33	1838.99	7.62
16000	241.68	1848.29	7.65
32000	241.52	1826.24	7.56
64000	240.85	1797.55	7.46
128000	241.31	1809.29	7.5
256000	240.25	1803.83	7.51
512000	237.28	1777.17	7.49
1024000	237.88	1689.37	7.1
2048000	236.1	1192.72	5.05
4096000	234.13	920.2	3.93
8192000	235.33	1093.21	4.65

Graph:



Patterns:

- Both speed-ups stay around 8 for the first 5 array sizes but then you can see the mul speed up start to dip even lower. Overall, both the mul and sum speed-ups follow the same pattern over the different array sizes as they each lower from 8 to around 3.

Consistency:

- Like I mentioned earlier, the two lines have relatively the same path with a little bit of inconsistency. You can see the inconsistencies as the array size increases because the two lines start to show more distance from each other.

Why:

- I would assume the two speed ups are similar because there aren't a lot of differences conceptually between the codes. My original assumption was that the SIMD assembly code would out perform the C++ much more than it really did because there it didn’t need to convert to a machine language. This is why I think there is a little bit of inconsistency but they overall follow the same trend.