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CS475

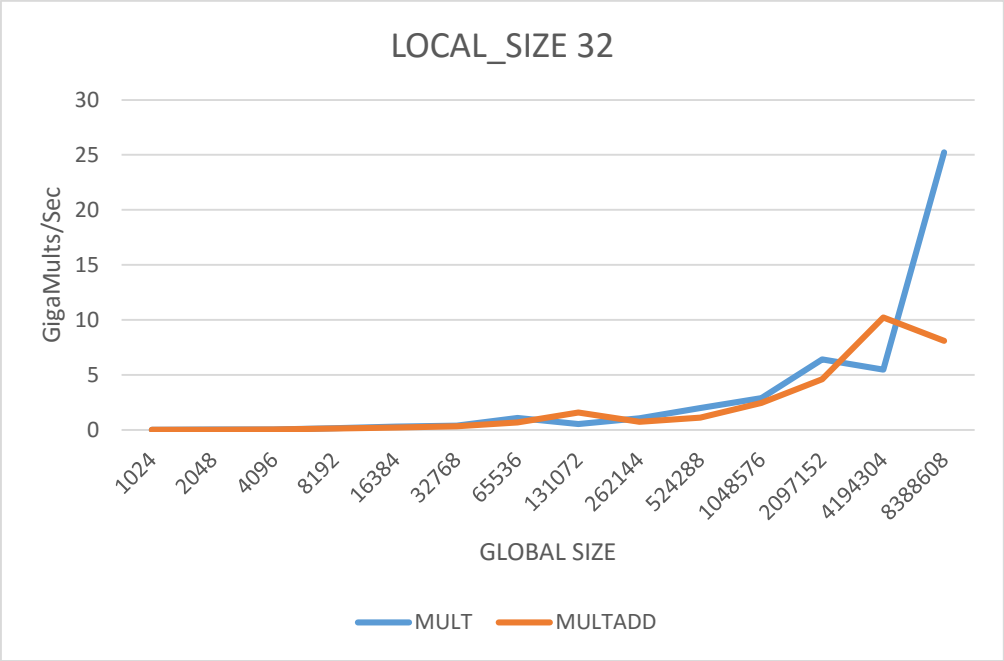
PROJECT 6

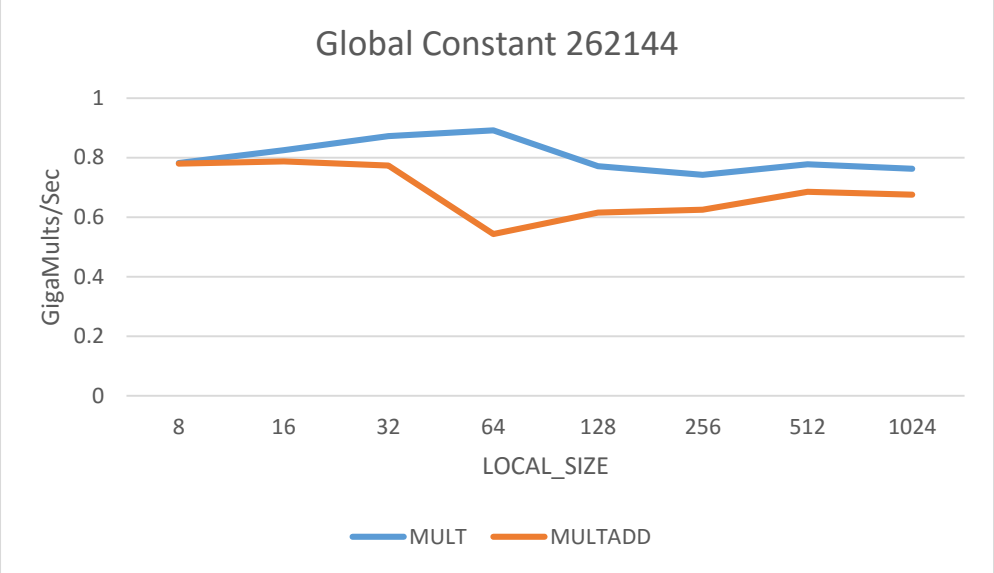
To start, I used my own computer for this project and decided to run it through Visual Studio. I had a hard time getting it to run on my Linux machine, and then I found it was easy to start with the zipped first file you supplied.

LOCAL 32	MULTIPLY		Local 32	MULTIPLYADD	
NUM_ELEMENTS	GigaMults/Sec	# of Workgroups	Global Size	GigaMults/Sec	# of Workgroups
1024	0.018	32	1024	0.018	32
2048	0.036	64	2048	0.026	64
4096	0.046	128	4096	0.047	128
8192	0.148	256	8192	0.14	256
16384	0.311	512	16384	0.227	512
32768	0.403	1024	32768	0.338	1024
65536	1.08	2048	65536	0.684	2048
131072	0.547	4096	131072	1.579	4096
262144	1.061	8192	262144	0.736	8192
524288	1.998	16384	524288	1.108	16384
1048576	2.883	32768	1048576	2.463	32768
2097152	6.403	65536	2097152	4.621	65536
4194304	5.471	131072	4194304	10.222	131072
8388608	25.233	262144	8388608	8.113	262144

Global 262144	MULTIPLY		Global 262144	MULTIPLYADD	
LOCAL_SIZE	GigaMults/Sec	# of Workgroups	LOCAL_SIZE	GigaMults/Sec	# of Workgroups
8	0.782	32768	8	0.78	32768
16	0.825	16384	16	0.787	16384
32	0.872	8192	32	0.773	8192
64	0.891	4096	64	0.543	4096
128	0.771	2048	128	0.615	2048
256	0.742	1024	256	0.625	1024
512	0.778	512	512	0.685	512
1024	0.763	256	1024	0.675	256

Graphs from the given Tables





When changing the Array sizes while using OpenCL, I see with small arrays the performance isn't very drastic. But once I got into the millions there was an exponential growth of performance. It seems the MultAdd function was a little tougher for the computer to tackle, but not by a lot. I believe this exponential growth happens because with smaller arrays the computer is mostly just taking the time to set up and the goes through the calculations lightning fast. Although, with much larger arrays the computer sets up the arrays in OpenCL and the gets lots of computations while going through the array as if it were like the smaller ones.

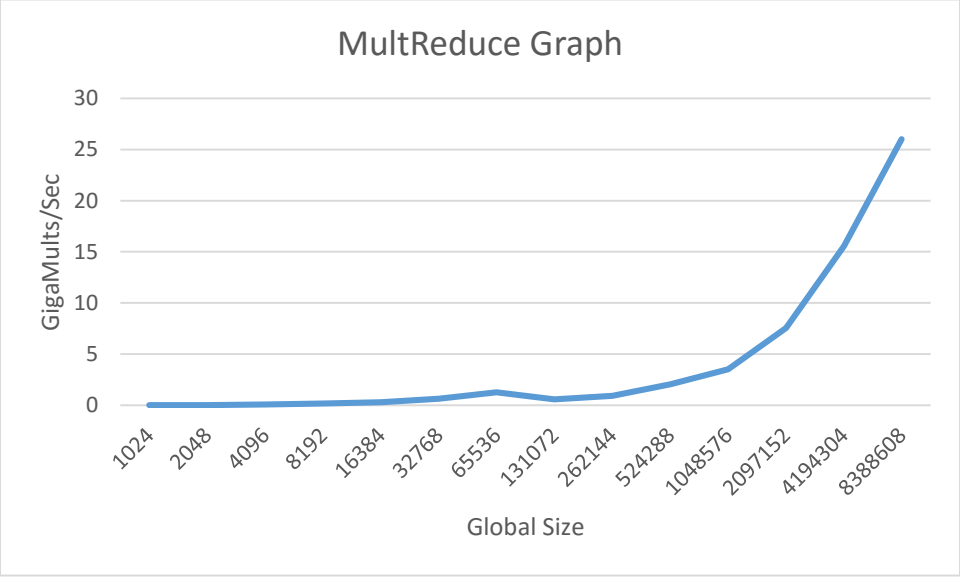
When fixing the array size and changing the Local_Size, there seems to be no change in performance from using more or less local size. I think this is because the OpenCL mostly would focus on getting the array ready which the LOCAL_SIZE doesn't affect even if you raise it to a large amount.

It seems that just multiplying is better computing than multiplying and adding. So I would assume that the proper use for the GPU is to have multiple single math expressions and then you can keep combining them. Kind of like using the PEDMAS with mathematics.

TABLE FOR REDUCE ARRAY

LOCAL_SIZE 32	MULTREDUCE	
Global	GigaMults/Sec	WorkGroups
1024	0.018	32
2048	0.038	64
4096	0.079	128
8192	0.168	256
16384	0.319	512
32768	0.65	1024
65536	1.277	2048
131072	0.583	4096
262144	0.934	8192
524288	2.061	16384
1048576	3.519	32768
2097152	7.565	65536
4194304	15.565	131072
8388608	26.013	262144

Graph of the MultReduce Data



The pattern in the reduce graph is the same as the Mult graph where it's growing exponentially. Although, I do see that it's growing faster exponentially than the Mult graph. Sadly, I'm not sure if this is how it's supposed to look. From the slides I saw in class, I believe this needs to be a logarithmic style graph.

If I go off the data I have here I believe that proper use of the GPU should take advantage of the reduction, so it gives off more computations faster than if you wouldn't reduce. Although, if I side with my gut feeling about a logarithmic graph, I could say the GPU should absolutely use reduction. Because even at lower array sizes you would have so much processing power, and at the plateau that happens is just the GPU's physical working limit. So if you used reduction you can get max performance with almost anything.