**CS575 Project 6**

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**Array Multiply and the Array Multiply-Add portions**

1. **What machine you ran this on**

Text

Description automatically generated

1. **Show the tables and graphs**

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**Chart, line chart

Description automatically generated**

**Figure 1.** Multiply and multiply-add performance versus global dataset size, with a series of colored constant local work size curves

**Chart, line chart

Description automatically generated**

**Figure 2.** Multiply and multiply-add performance versus local work size, with a series of colored constant global dataset size curves

1. **What patterns are you seeing in the performance curves?**

In figure 1, we can tell that larger global data set size contributes to better performance. When the local work size is 128, it has the best performance whereas size 256 and 512 have similar performance at the second place.

We may also conclude from Figure 2 that a greater global dataset size contributes to improved performance. Larger local work sizes, on the other hand, may not automatically imply superior performance. When the local task size is less than 128, the performance of curves with global dataset sizes more than 1M improves, but once they approach 128, they hit a bottleneck and can no longer grow.

1. **Why do you think the patterns look this way?**

With additional processing units and task groups, each processing unit will have less data to process, which may potentially improve performance.

1. **What is the performance difference between doing a Multiply and doing a Multiply-Add?**

In general, they both perform similarly.

1. **What does that mean for the proper use of GPU parallel computing?**

It is vital to evaluate the sizes of work items before beginning our tasks since different task sizes have varying effects on the performance. Our calculation may be done by a large number of threads on the GPU, because GPU processors are designed to handle streaming data. The performance of both array calculations could indicate how effective GPU computing is.

**Array Multiply-Reduction portions**

1. **Show this table and graph**

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**Chart, line chart

Description automatically generated**

**Figure 3.** Multiply-reduction performance versus input array size

1. **What pattern are you seeing in this performance curve?**

In figure 2, we can say that larger global data set size contributes to better performance. Same as figure 1, when the local work size is 128, it has the best performance.

1. **Why do you think the pattern looks this way?**

Because of the GPU's design, it's possible that utilizing a local work size between 100 to 200 is more appropriate.

1. **What does that mean for the proper use of GPU parallel computing?**

Same as the aforementioned question, before starting a new task, we must assess the sizes of the work pieces because different job sizes may have distinct effects on performance.