Project 7

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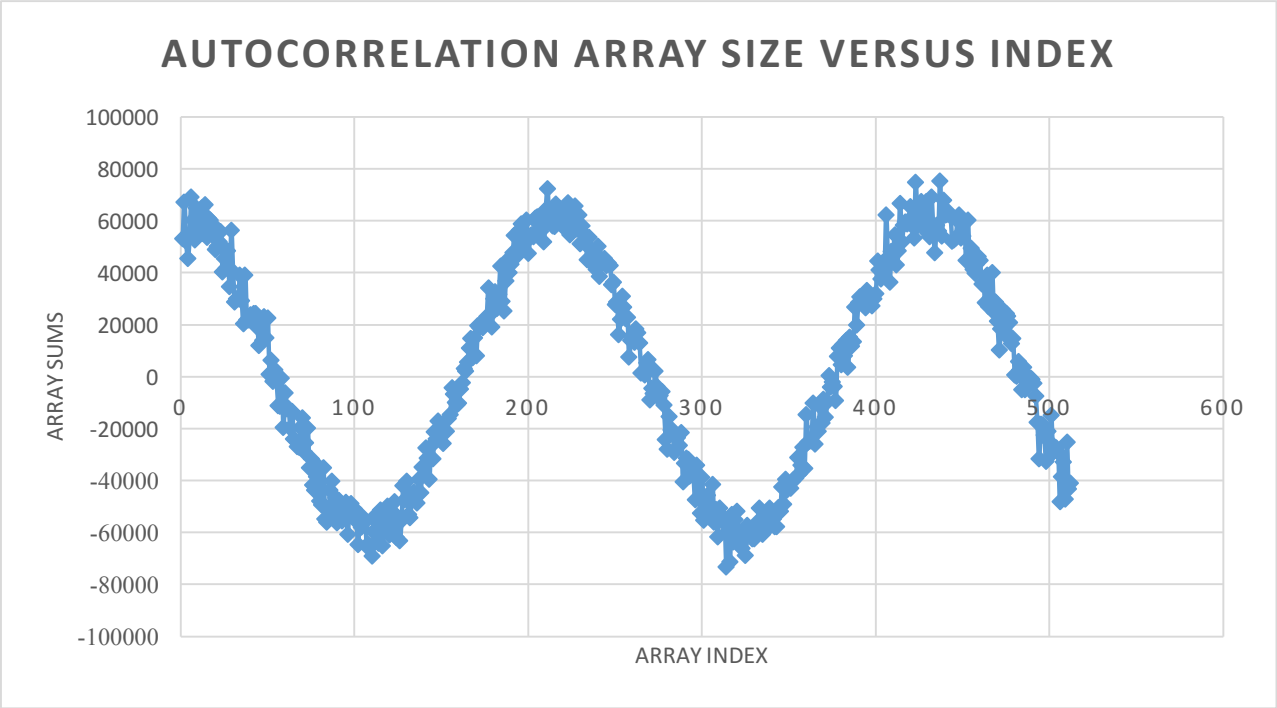
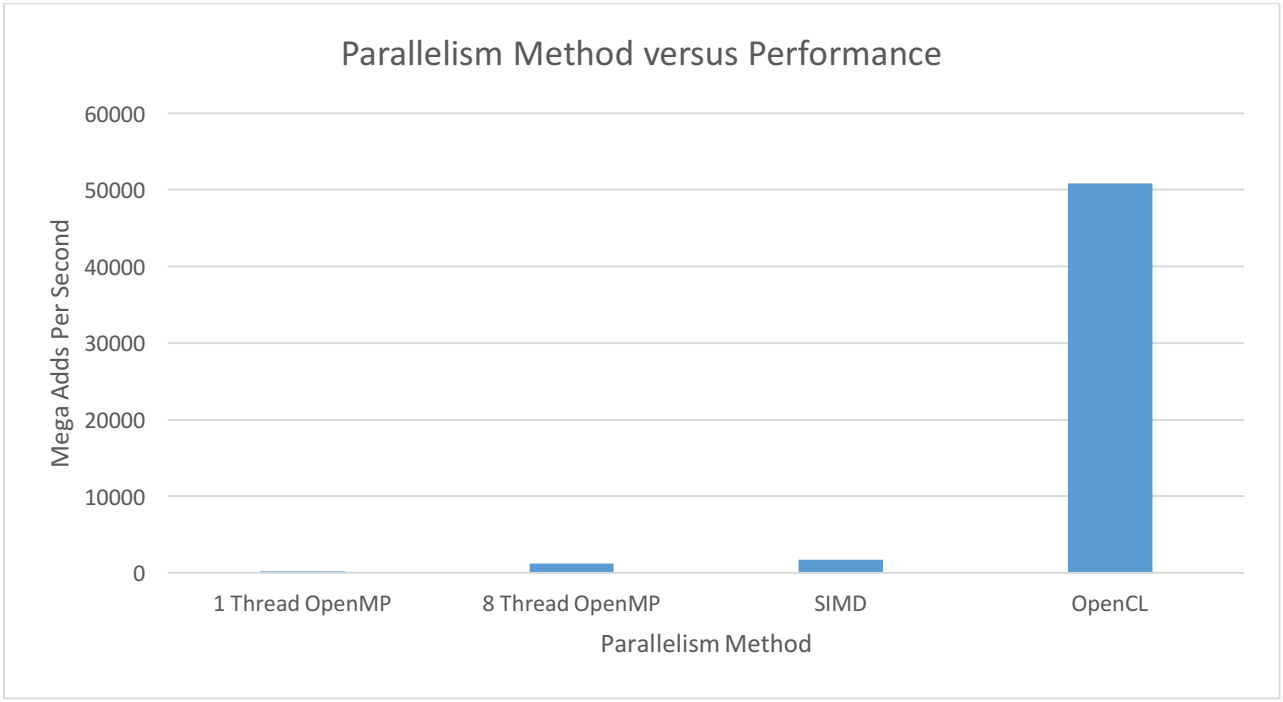
Machine Specifications

I ran this project on flip and rabbit through my 2015 MacBook Pro. Please note the SIMD program only works on flip and OpenCL only works on rabbit.

Scatterplot





1. State what the hidden sine-wave period is, i.e., at what multiples of *shift* are you seeing maxima in the graph?

The sine wave period seems to be approximately around 210~. We observe this as some maxima is observed around array index 0 and returns to these maxima after one cycle at around array index 210-220.

2. What patterns are you seeing in the performance bar chart? Which of the four tests runs fastest, next fastest, etc.? By a little, or by a lot?

I'm observing that utilizing the GPU with OpenCL crushes the competition from all the methods from the CPU. We observe that after OpenCL the margin of performance is not as dramatic. We observe that SIMD comes in at 2nd place, followed by 8 threaded OpenMP and 1 thread OpenMP.

3. Why do you think the performances work this way?

I believe that the performances are this way as GPUs have much more horsepower for these kinds of problems in big data processing. Their level of hardware parallelism is unmatched by CPUs currently. Next we see that SIMD has the better performance over OpenMP. This can be explained by how OpenMP is primarily used to exploit multiple threads for multiple cores.

SIMD allows users to explicitly use SIMD instructions on modern CPUs. Additionally depending on the number of threads OpenMP utilizes, the overhead of setting up this parallelism along with the problem set size may get in the way of performance. SIMD does not have as big of an overhead in this regard.