Project 7B

Autocorrelation using CPU OpenMP, CPU SIMD, and GPU OpenCL

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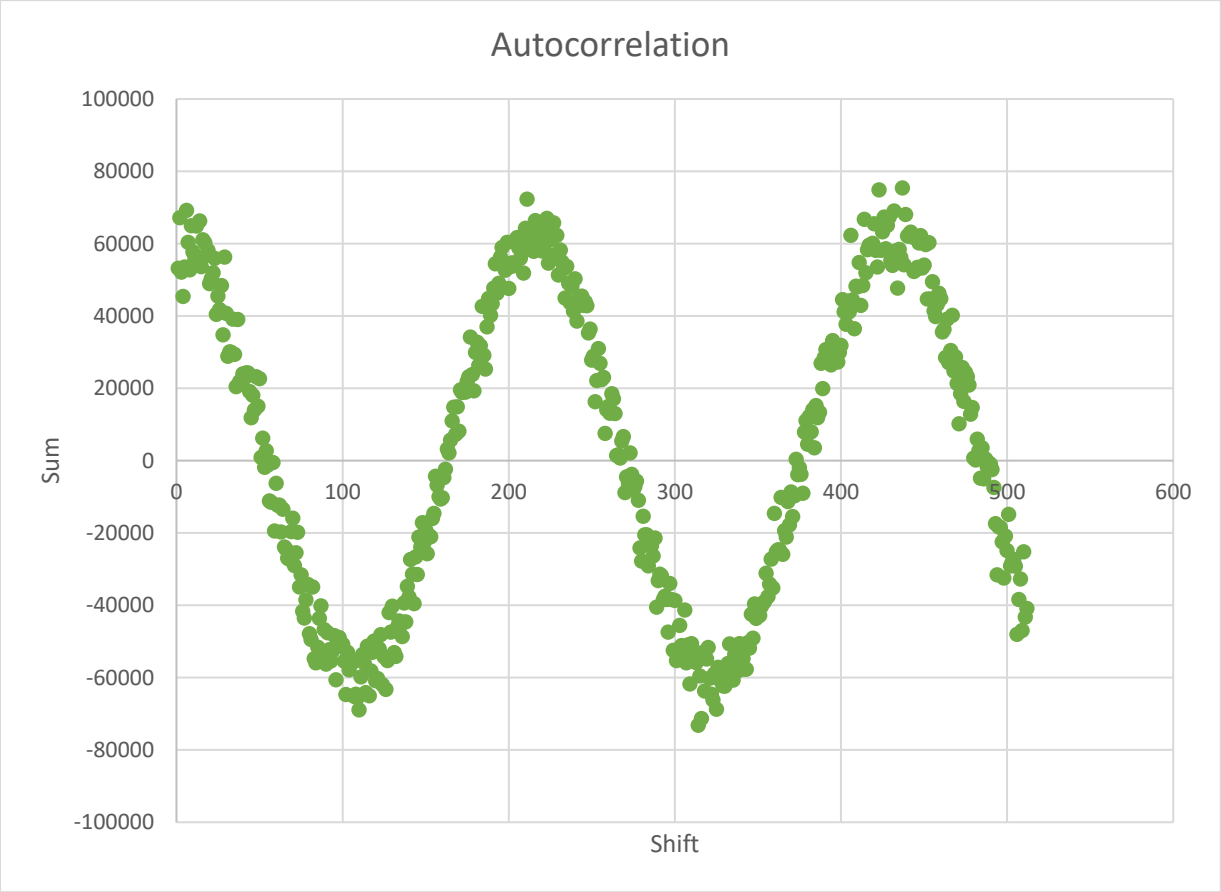
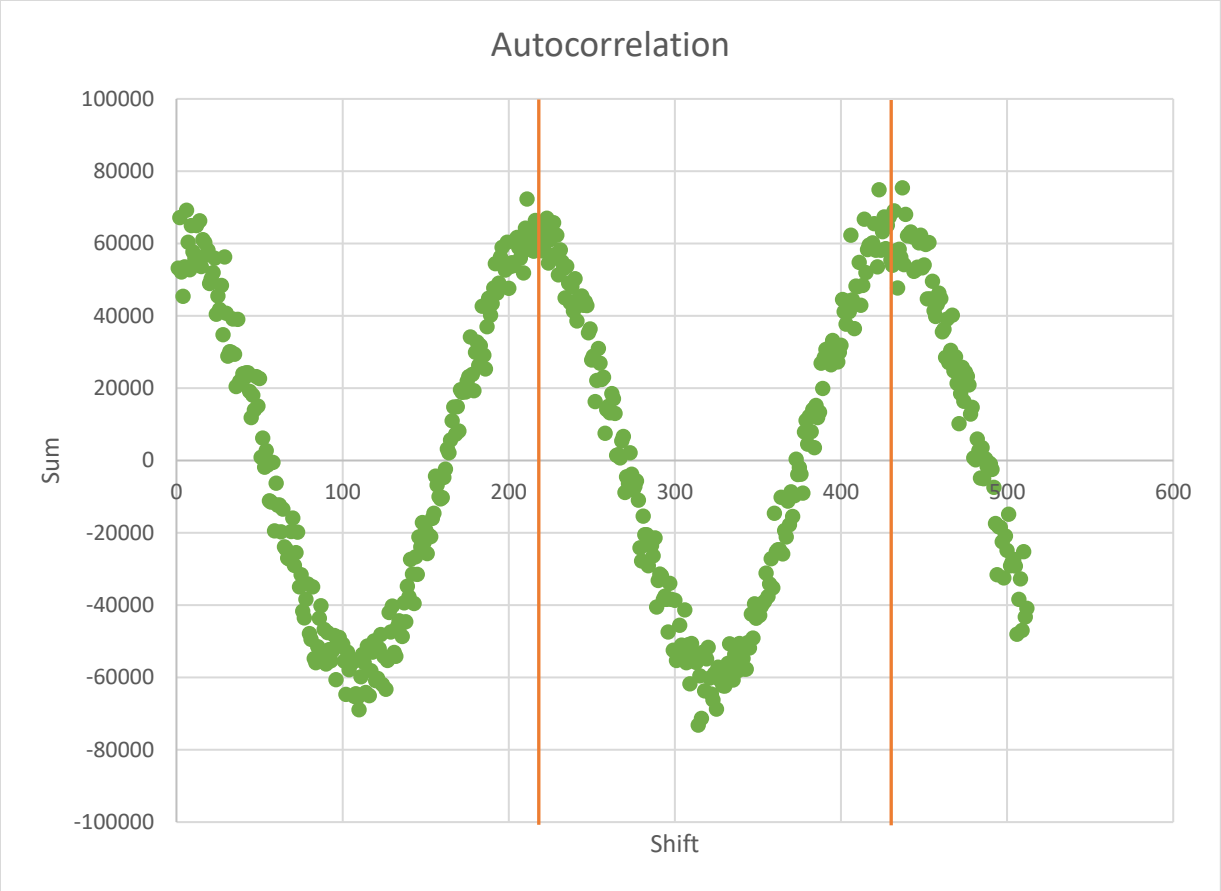
1. **What machines you ran this on**

   OpenMP and SIMD program are run on *Flip*; OpenCL program is sun on *Rabbit*.

2. **Show the Sums{1] ... Sums[512] vs. shift scatterplot**

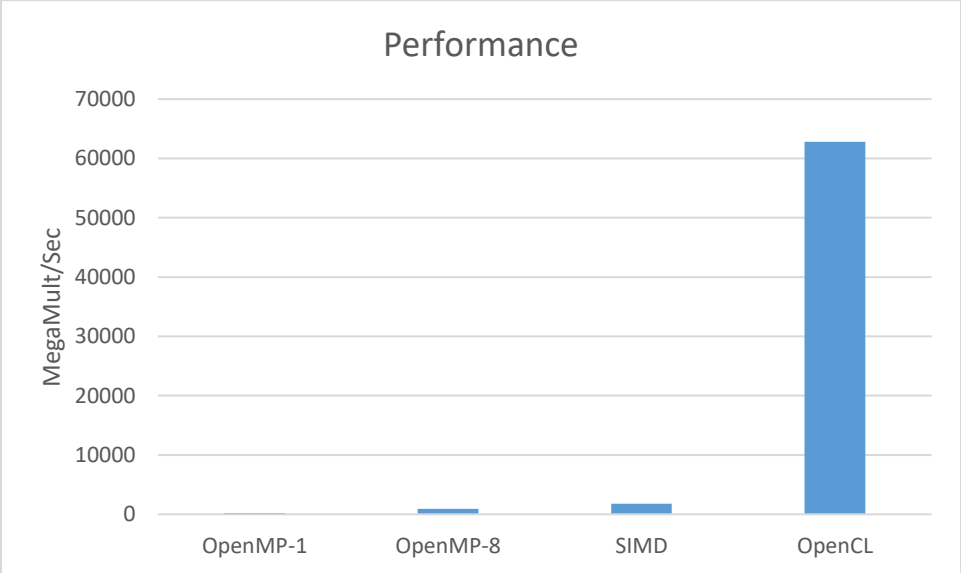


3. **State what the hidden sine-wave period is, i.e., at what multiples of *shift* are you seeing maxima in the graph?**



In the above graph, the orange line marks a period of Sine wave. The multiples of *shift* are **two** in this graph.

4. **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**



OpenCL program is the fastest; the second fastest is SIMD. OpenCL is 30 times faster than SIMD. The third and fourth place are OpenMP with 8 threads and OpenMP with 1 threads.

5. Why do you think the performances work this way?
   In C/C++ plus OpenCL program, the OpenCL code runs on the GPU in where one thread is assigned to each Work-Item. It does not mean that a program with more threads has better performance. Too many threads could lead to overhead working, thus, a proper local work size would have the best performance.
   OpenMP and SIMD both run on CPU. Although SIMD program has better performance than OpenMP, the performance still loses OpenCL a lot which run on GPU.