Project #7B – Autocorrelation using MPI

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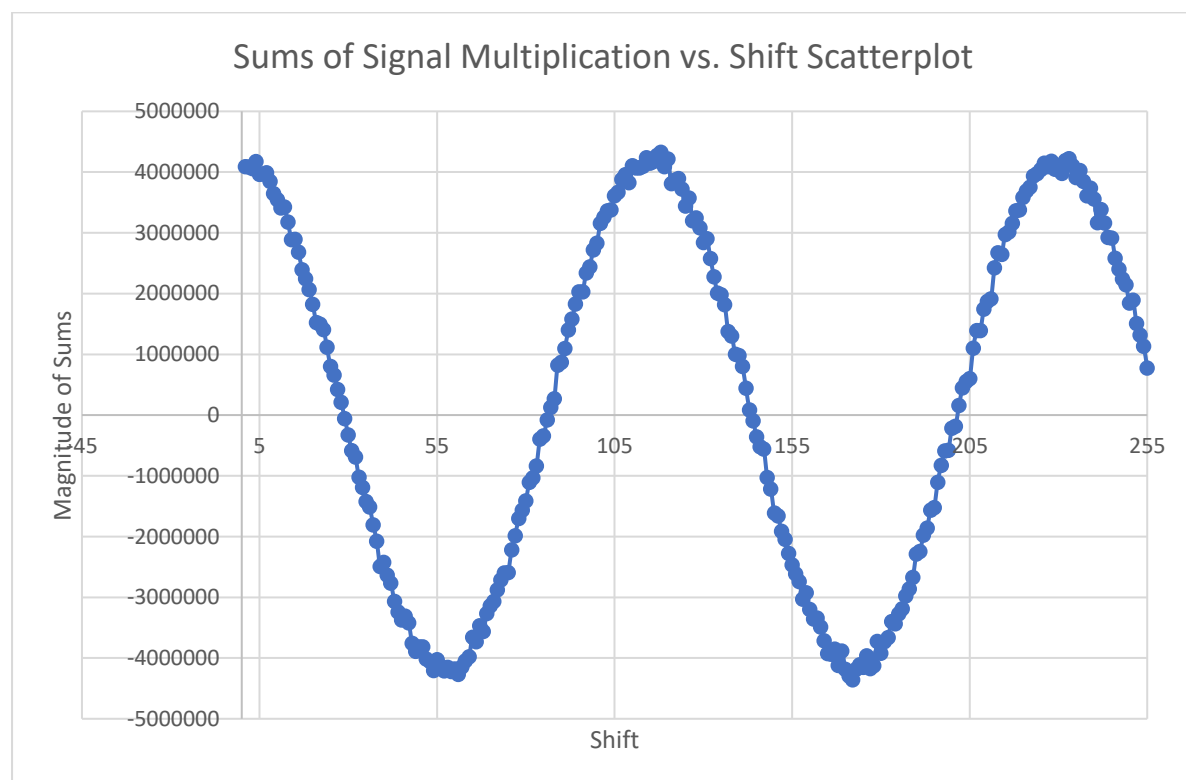
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Introduction

This project takes 8,388,608 signal and uses MPI to compute the summations of the array times 1024 shifts of the array, i.e. A[0] * A[1] + A[1] * A[2] + … + A[1023] * A[0], A[0] * A[2] + A[1] *A[3] + … + A[1022] * A[0], etc. A scatterplot of secret sine wave is shown and performance of using different number of processors is evaluated.
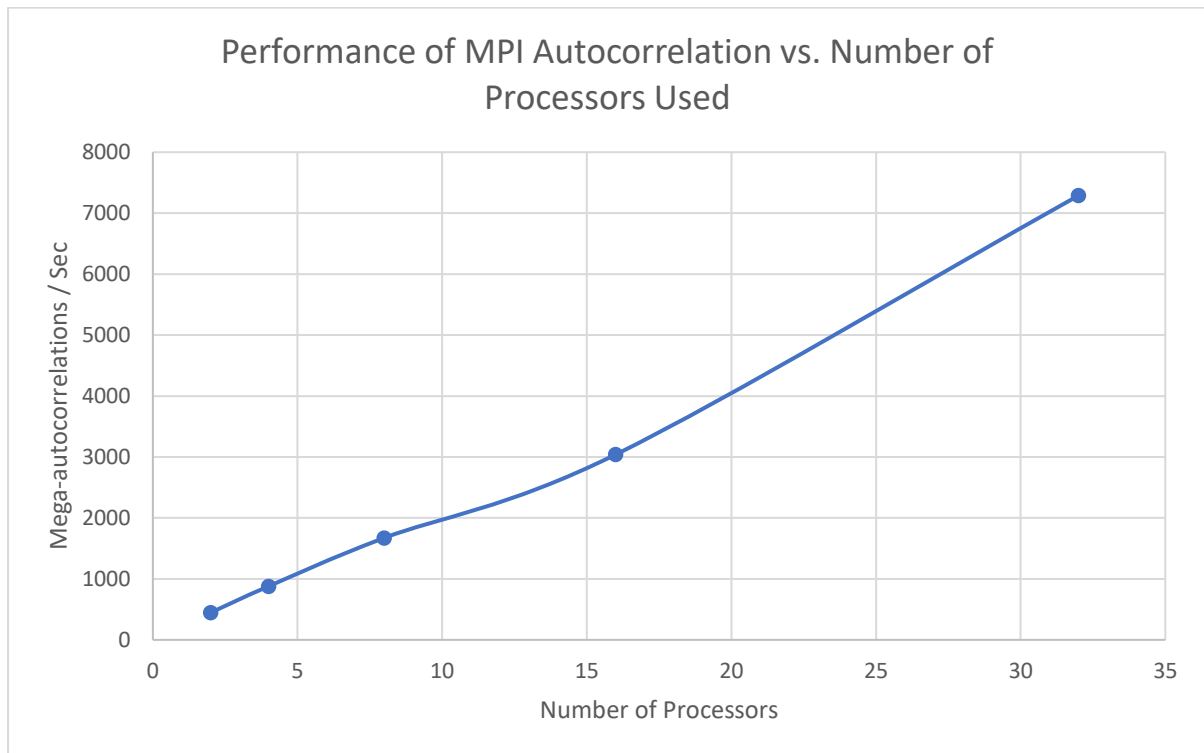
The project is run on OSU DGX system.

Result

Period = 115 shifts

Performance

The curve is close to linear. It shows that a double of processors used gives approximately a double of the performance.

The program is designed as Scatter and Gather. There is a machine distributing the data to (N – 1) other processors in the network and gather results back from them (N is the number of processors). Given that the number of elements is very large, huge amount of computation is carried out for every communication. Besides, the number of elements can always be evenly distributed for the choice of processors numbers in this project, which gives a comparatively consistent trend as all processors used are fully utilized. This explains the pattern of the performance curve is close to linear.