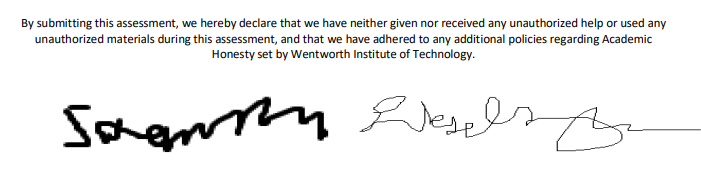
MPI Sample Analysis

Operating Systems Lab Exercise 3

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Part 1:

The goal of this experiment is to determine what optimal number of samples should be used when using the Monte Carlo Integration on a sequence of values. It will be assumed that the function f does not drastically change the answer, and it will be assumed that the Turing system in use is a reasonably accurate model for a generic 40-core host. The number of samples will be increased until a value is clearly being approached, and the lowest value of N that gives a decent representation of the true value will be chosen for future analysis.

Part 2:

The first necessary step is choosing a and b. For purposes of this experiment, it was decided that a will be ??? and b will be ???. The number of samples along with the value calculated from them is shown below:

//include table of n vs calculated result

Given the approximation of ???, a value of ??? was chosen to represent the number of samples. Using that, we can now analyze execution time for different numbers of processes. The relation between number of processes and execution time is found below:

//include table AND graph

Part 3:

Given the asymptote seen around a value of ???, it can be gathered that increasing the number of processes above that will do either nothing or be detrimental to the execution time. Therefore, since the lowest execution time was found to occur at ??? processes, it can be determined that ??? is the optimal number of processes for the given program. Since the execution time for a single process was ???, we can calculate that the calculated speedup with ??? processes would result in execution time of ???. However, the true execution time with ??? processes was ???, due to the fact that the master process must be synchronous, and the overhead associated with multiple processes. This overhead includes moving variables around between threads not on the same core (although this matters little in this program), and extra calculations/assignments that must be performed in order to set up the multiple processes. We are able to go above 40 processes since a processor core can run multiple processes in threads, but this is of little help to us, as it provides no improvement. Using batch processing, the program took ??? to run, while without took ??? to run. //Analyze whether the results are the same or why not

Part 4:

Given the analysis of number of samples in part 2, the optimal number of samples was determined to be ???, as it gives a close enough approximation of the integral without being so large that it would take a long period of time to process. Using the execution times mapped to the number of processes, the optimal processes count was determined to be ???, due to its low execution time.