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CSE3320

Fractal – Mandelbrot Assignment Report

The purpose of this experiment was to study and understand how threads of execution can improve the speed of a process by splitting up the work. The Mandelbrot images require heavy computation to be produced, which provides a good setting for the use of threads. With our Mandelbrot setup, certain parameters can be provided to adjust how it looks. Following are the parameters I used for my image and this experiment:

-x 0.19079

-y 0.551489

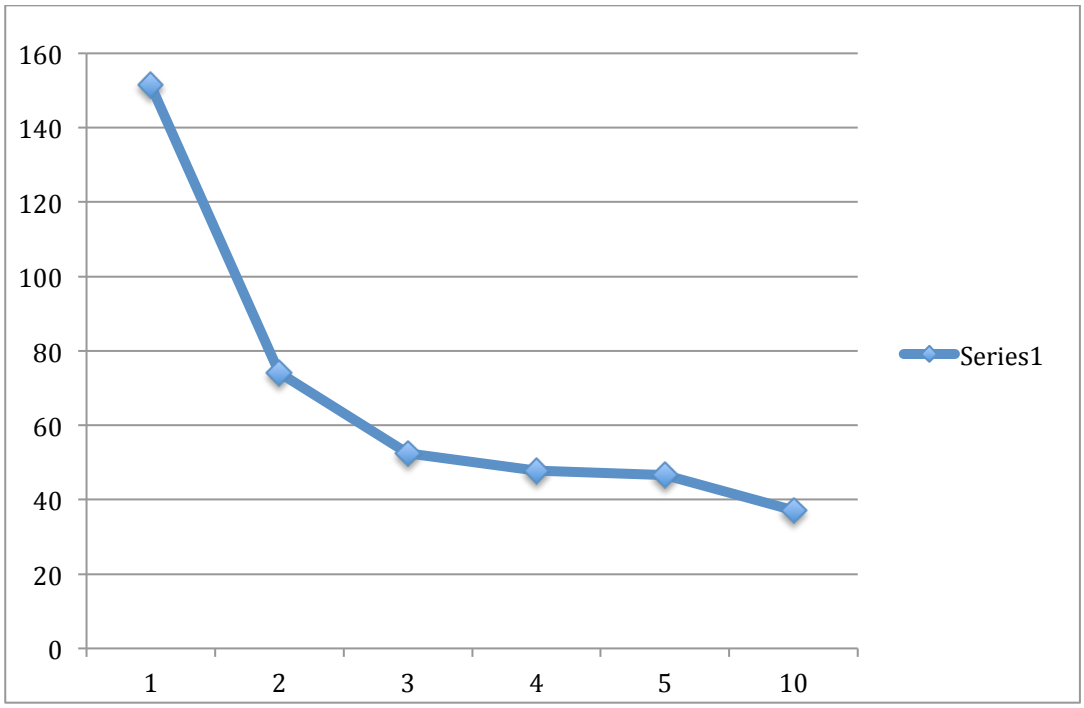
-s 0.00005

-m 5000

Processes graph:

x-axis - number of processes allowed to run concurrently

y-axis - total time for all 50 processes (seconds)



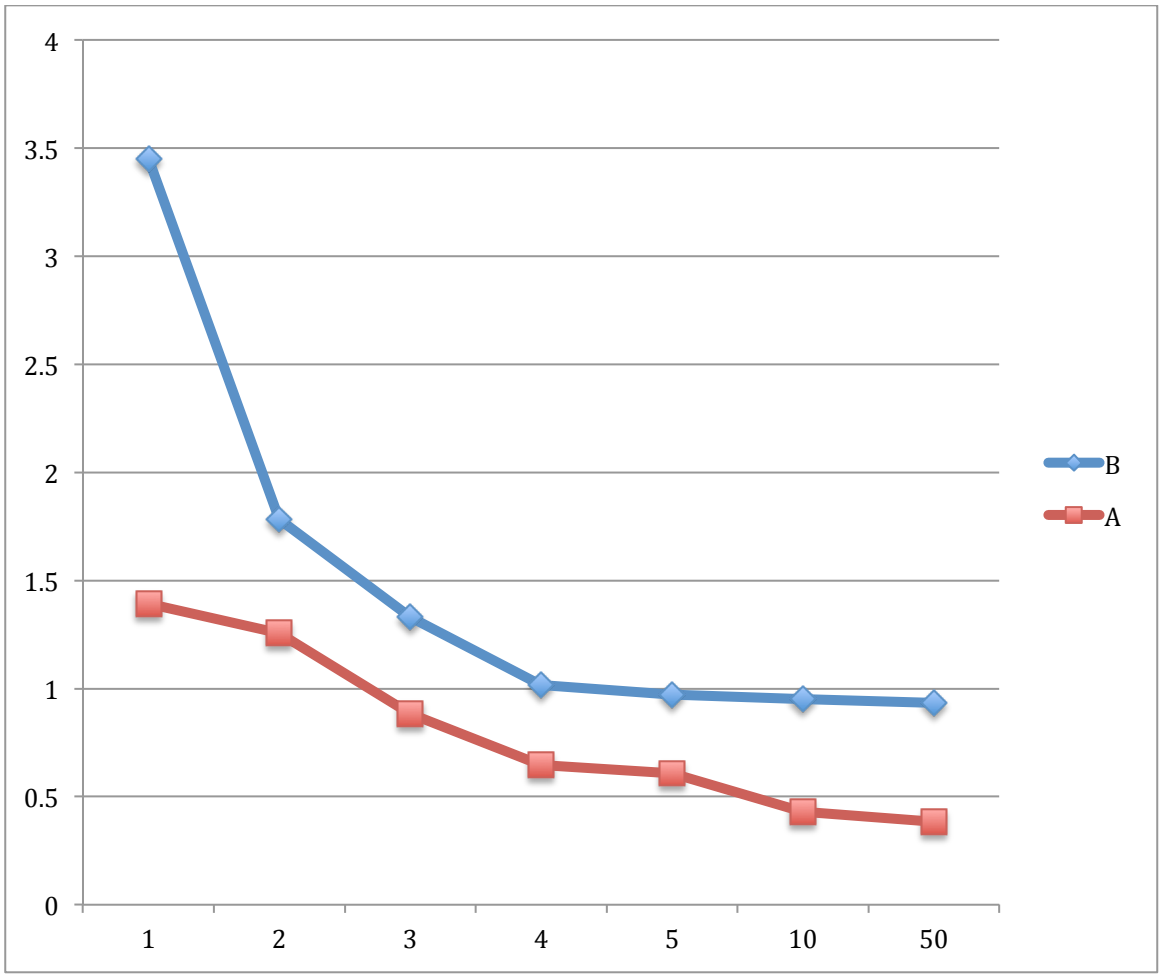
After three processes running simultaneously is when diminishing returns become severely apparent. Therefore, it seems that, for this experiment, three processes is the optimal number. This could just be a result of the type of work or this specific data set.

Of course, it is possible to have too many processes. In this experiment, I produced 50 separate Mandelbrot images, so having over 50 processes running would lead to idle processes being spawned for no purpose.

Threads graph:

x-axis – number of threads

y-axis – time taken to complete the Mandelbrot image (seconds)



For Configuration A, the difference between four and five threads of execution is negligible. I believe that this is due to the number of rows being allocated to each process. For four threads, each thread would receive 125 rows. For five threads, each thread would receive 100 rows. This does not bring any improvement, and results in the slight plateau shown on the graph.

For Configuration B, the time taken reduces drastically from one to two threads. Then the time severely plateaus after reaching four threads. I believe that this may be due to the setup time of starting and stopping each thread. Therefore, the graph is asymptotically approaching the overhead time of our experiment.

After looking at both of these graphs, I believe 4 to be the optimal number of threads for each Configuration. They have different shapes, most likely, due to the different parameters for each Mandelbrot image.