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Description:
A report to assess the calculation time versus number of threads used.

To assess the effect of varying the number of threads while using Open MP multithreading to calculate the electric field at a point due to all point charges in a 2D grid, the following values were kept constant in the experiment:

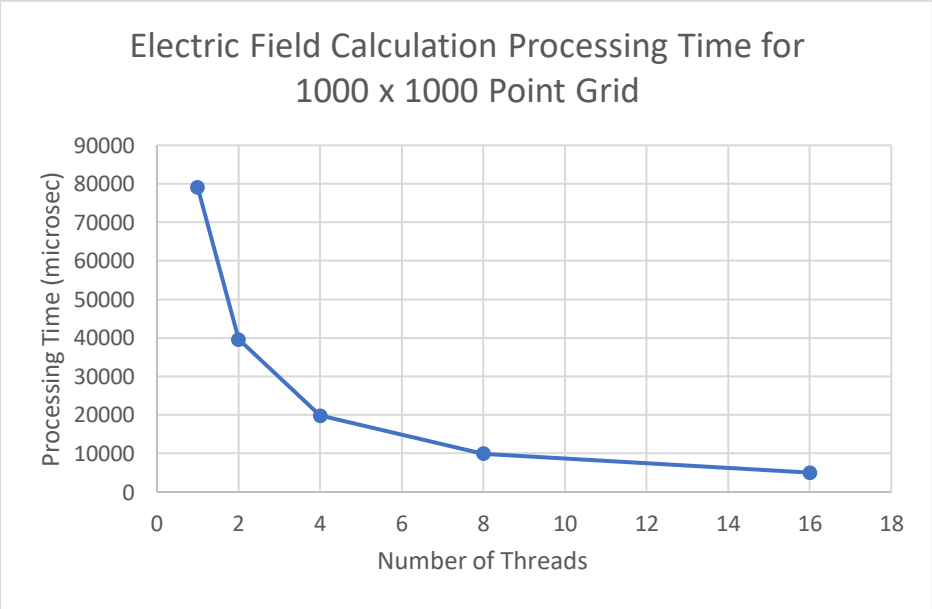
```
Please enter the number of rows and columns in the N x M array: 1000 1000
Please enter the x and y separation distances in meters: .01 .03
Please enter the common charge on the points in micro C: .02

Please enter the location in space to determine the electric field (x y z) in me
ters: 1 2 3
```

The calculation time in microseconds was assessed for the following thread counts: 1, 2, 4, 8, 16. The calculations were done so as NOT to include the thread creation process, but only for the nested for-loop which iterated through the 2D point array to find the contributions to the electric field at a point and sum them up for the result. The electric field values were the same regardless of thread count:

```
The electric field at (1, 2, 3) in V/m is
Ex = 3.277411e+05
Ey = 9.640221e+04
Ez = 2.362227e+06
|E| = 2.386802e+06
```

However, the processing time varied significantly with the number of threads used as shown in this graph:



This shows that the processing time was cut in approximately half each time the number of threads was doubled, showing a significant reduction in calculation time due to Open MP multithreading. Allowing the threads to run concurrently through the nested for-loop with “no wait” allowed the calculations to be split among threads and the whole process to finish much faster. Collapse(2) was used as an open MP directive to account for the nested loop running through the 2D grid.