Parallel Computing 633: Programming Assignment1b

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In this task, we parallelize the NbodySimulation program using openMP. Using reference from last assignment, we can assure our program produce the same result. Then we test this program with different numbers of processors with different problem sizes. And plot a p vs R(n,p) figure, the figures are shown below. Note, to make the measurement more accuracy, we run the program 5 times.

Now we'd like to show the overall comparasion, which means we draw the performance lines of different problem size for different number of threads.

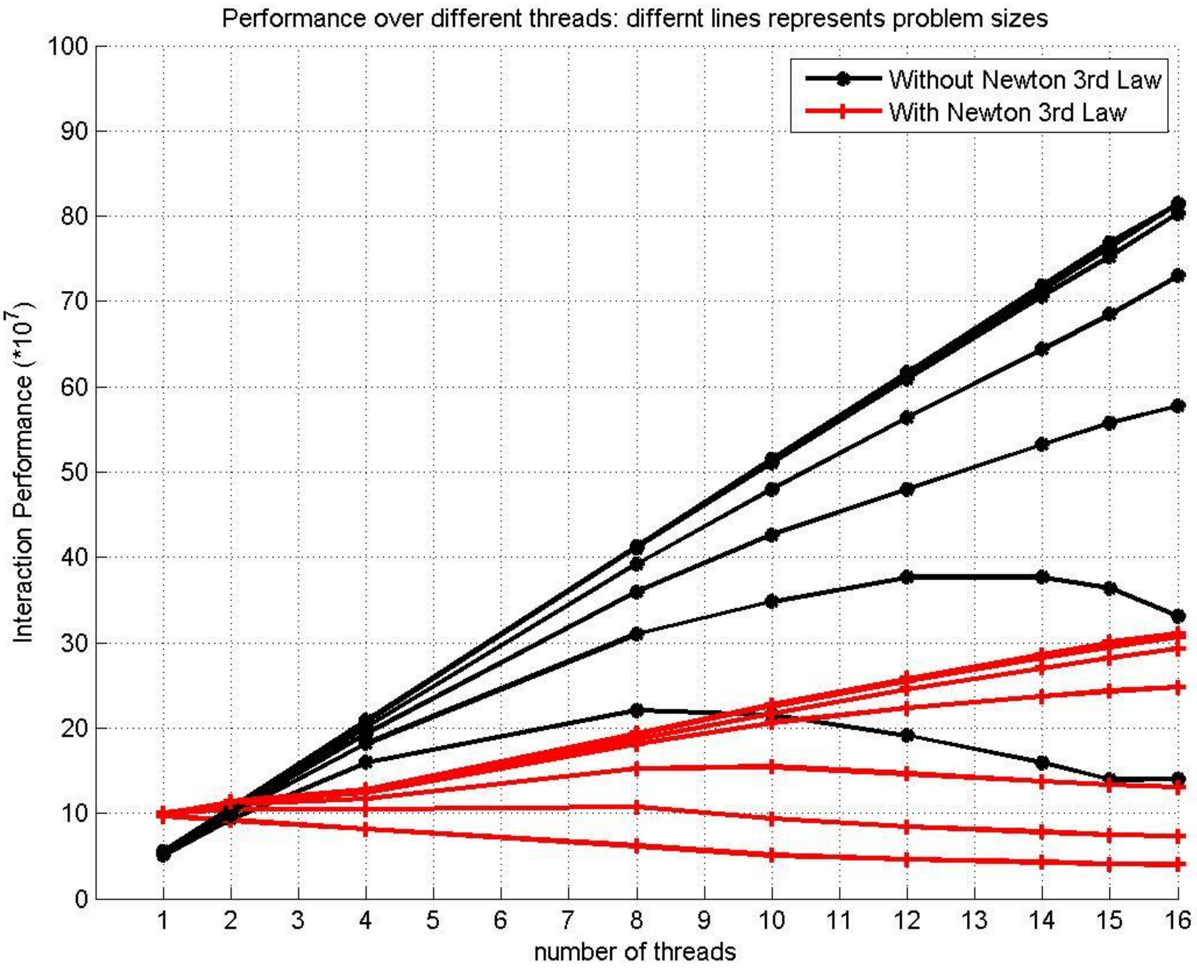


Fig.6 The overall performance comparison (the lines represents different problem size)

Also, the separate figures to compare for different problem size is listed below:

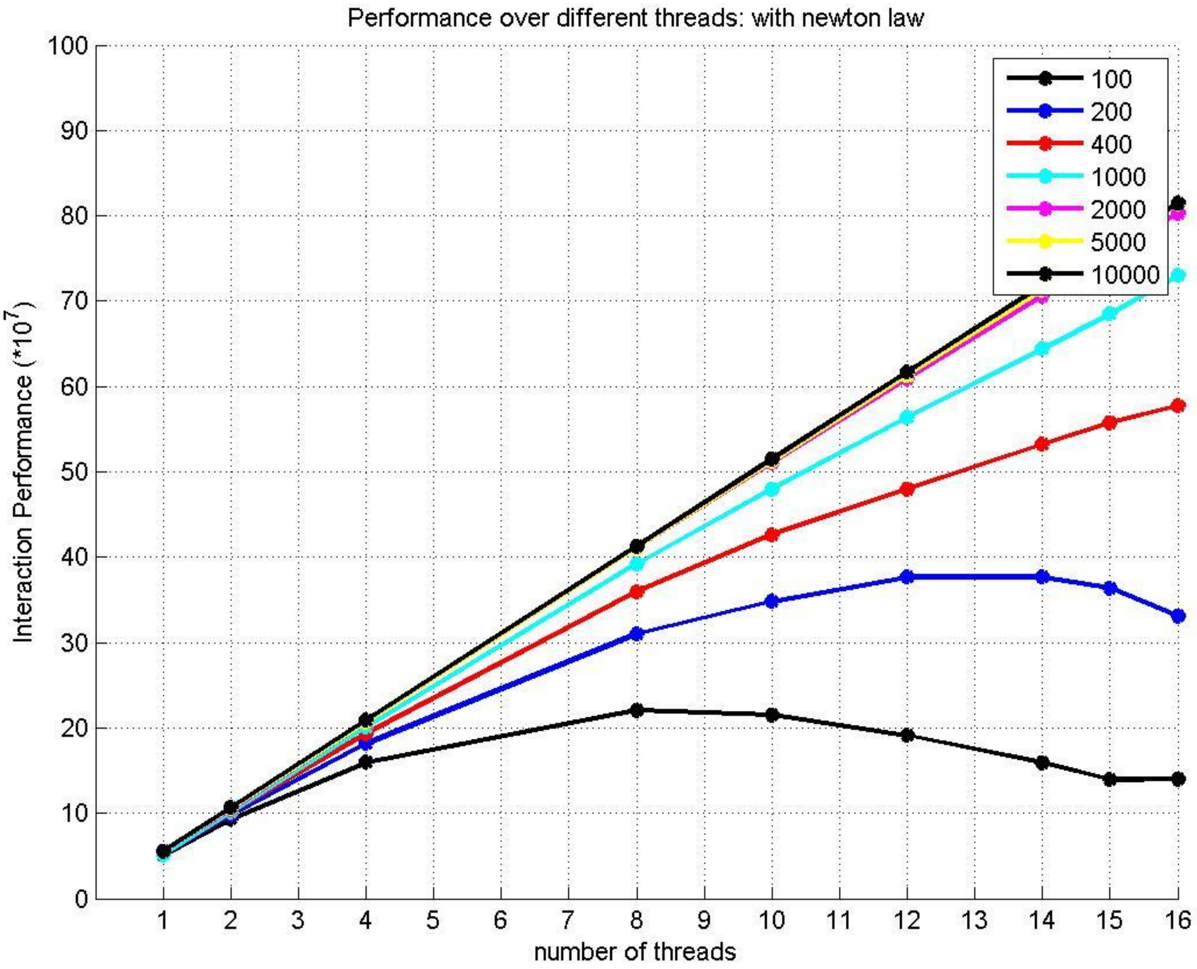


Fig.2 Computational performance over number of threads for different problem size without Newton’s law

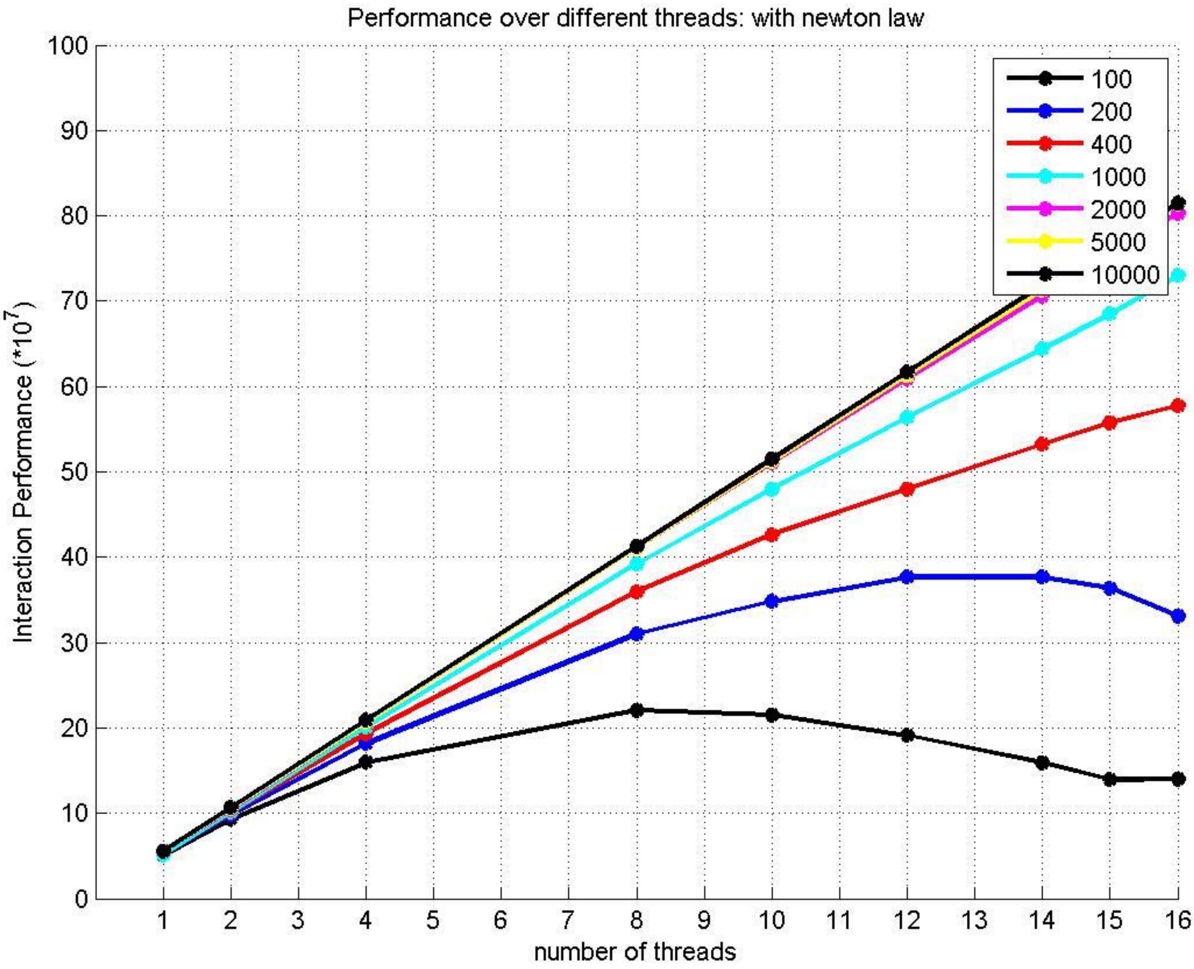


Fig.3 Computational performance over number of threads for different problem size with Newton's law

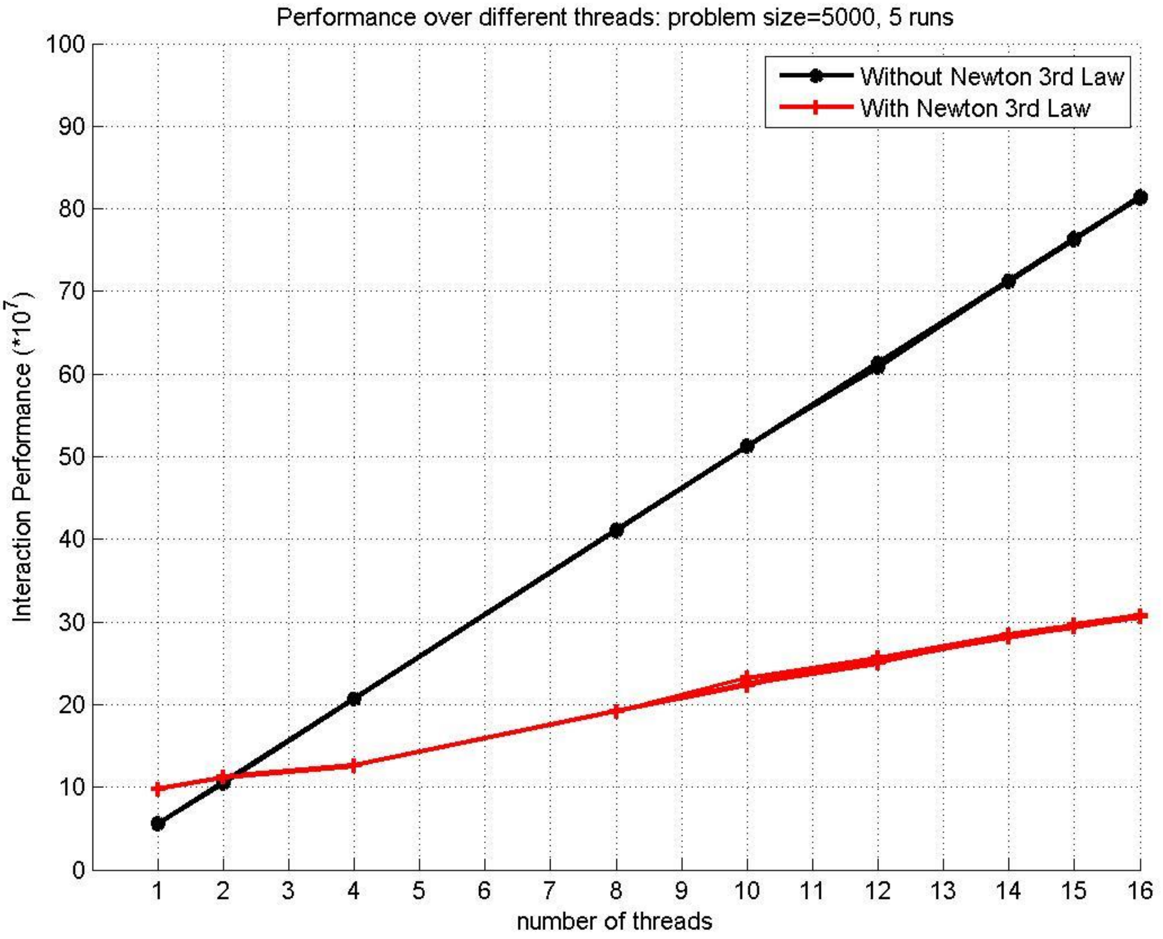


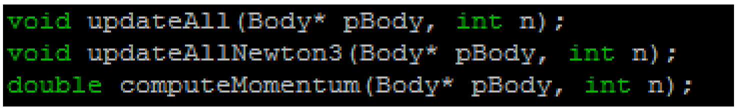
Fig.4 Variation for running 5 times

From the above performance comparisons, we can make the following conclusion:

1. Generally speaking, when the problem size is not too small, the larger number of threads means the better computational performance, this is true especially for larger problem sizes.
2. For the same number of threads (more than 1), the larger problem size is, the better computational performance is. But when the problem size is larger than some value, the computational performance cannot improve much.
3. For some small problem size, with the increase of number of threads, the computational performances may increase first, but decrease later.
4. When the number of threads are very small (e.g., 1 or 2), to use newton's law will improve the computational performance (mainly double the computational performance). However, when the number of threads are large (e.g., more than 3), algorithm with newton's law gives a worse computational performance.
5. From Fig.4, we can know the variation for multiple running is very limited.

Code List:

Here is my writing methods, and they are in NbodySimulation.c.



```
void updateAll(Body* pBody, int n);
void updateAllNewton3(Body* pBody, int n);
double computeMomentum(Body* pBody, int n);
```

Auther list:

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The code is uploaded by Dong Nie, so the login is: dongnie