CS420 MP2

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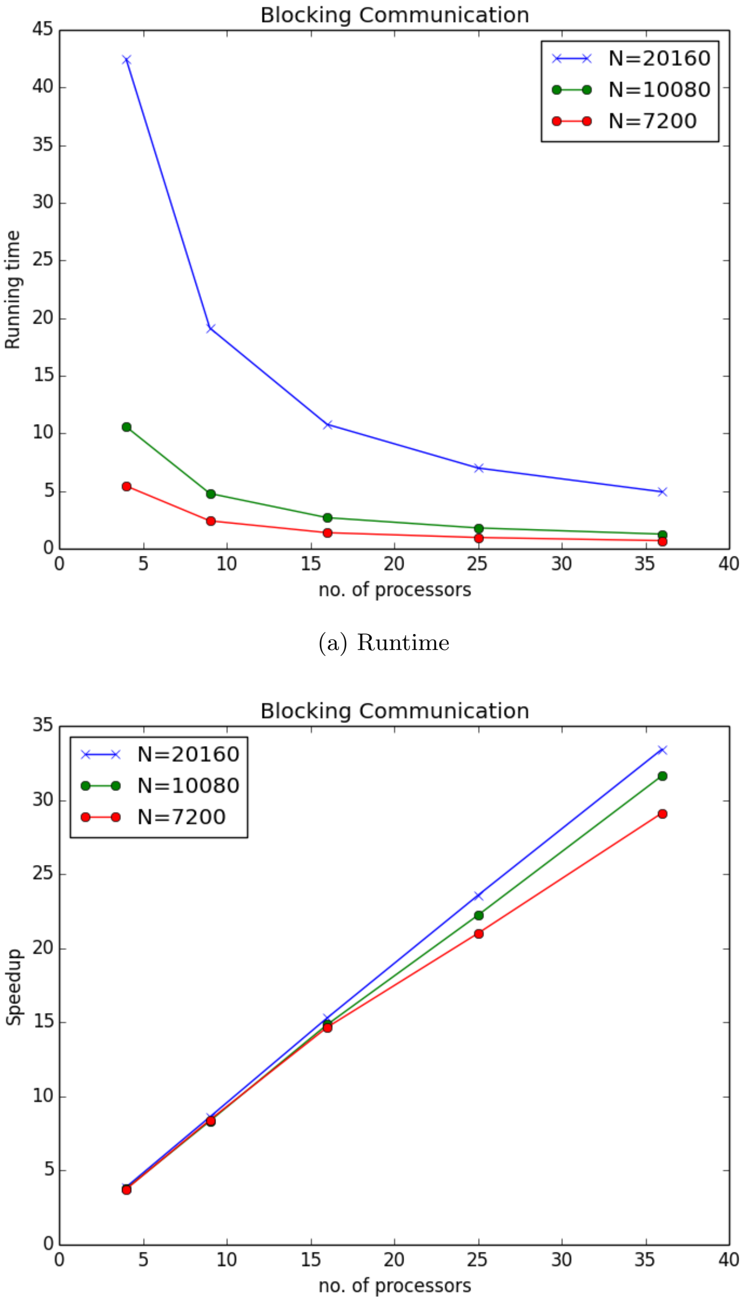
Blocking Communication(jacobi1.c)

Parallel implementation with blocking send and recieve, final tolerance for all grid sizes and with different no. of processors was equal to 0.0072111531. Values of $a[R][C]$ were also equal with different no. of processors. So they are as follows:

- $N = 7200$, $a[7189][7190] = 0.5005487037$.
- $N = 10080$, $a[4][3589] = 0.5585149305$.
- $N = 20160$, $a[20150][2] = 0.6731813218$.

Figure 1(a) and 1(b) show the running time and speedup vs no. of processors. Almost Linear speedup is obtained, due to following reasons:

- There is no serial optimization of Cache reuse within a single core, so there is no gain in speed.
- No. of computations in the problem is linear function of size of grid, so work is evenly distributed between processors, therefore there is no loss in speedup.
- Communication overhead is small for given array sizes compared to no. of computations, so there is no loss in speedup.



(a) Runtime

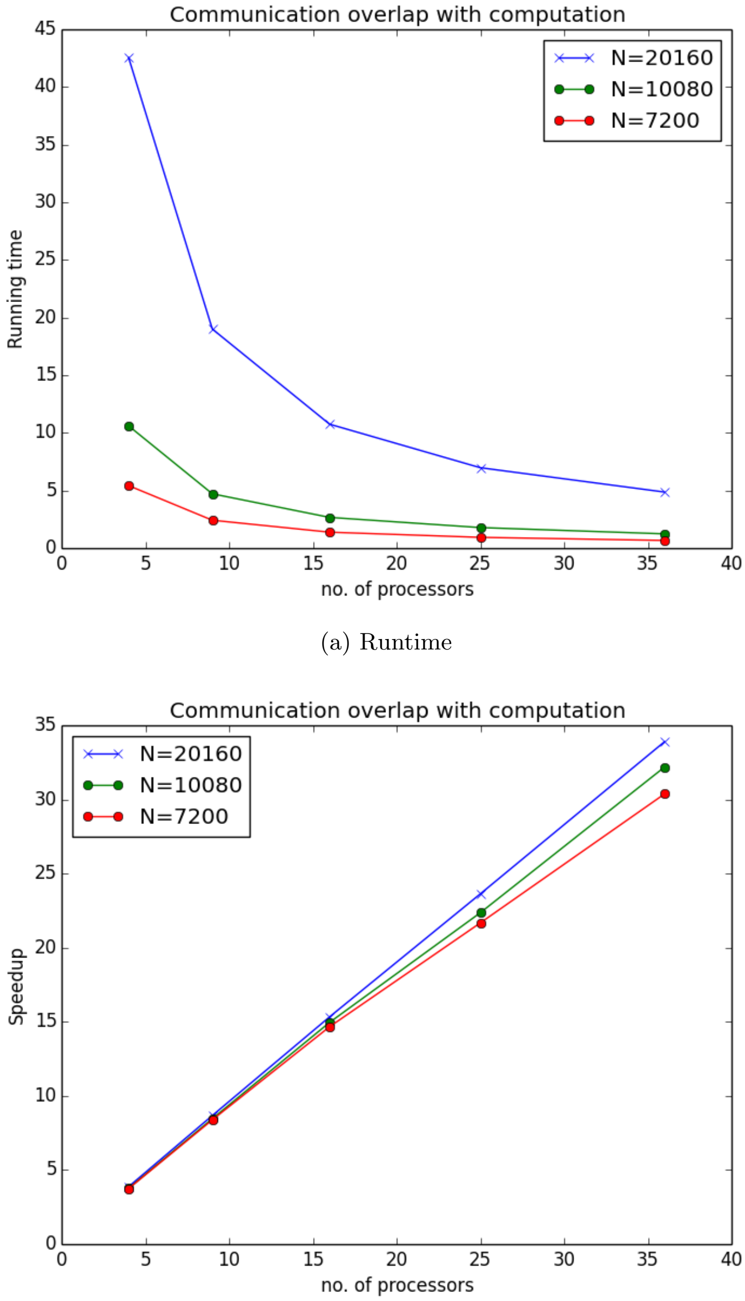
(b) Speedup

Figure 1: Blocking Communication

Non-Blocking Communication(jacobi2.c)

For Parallel implementation with non-blocking send and recieve, i.e. with overlap of computations with communication, same values of tolerances and a[R][C] were obtained as for blocking communication.

Figure 2(a) and 2(b) show the running time and speedup. Linear speedup is obtained, as there is no optimization of cache reuse within a core. There is little difference in running time as compared to blocking communication. For $N = 7200$ and 36 processors the nonblocking is about 4% faster. Whereas for $N = 10080, 20160$, with 36 processors, the gain is only about 2% and 1% respectively. This is because the communication overhead is really low (as we are just transferring boundaries) and computations increase with increasing N.



(a) Runtime

(b) Speedup

Figure 2: Non-blocking Communication

Note: I didn't make a table as the values were exactly equal in given decimal precision. To check please use Makefile and batch scripts given with code. Also the output results are given in .txt files.