Parallel Programming Exercise 6–8

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(If you and your team member contribute equally, you can use (co-first author), after each name.)

1 Problem and Proposed Approach

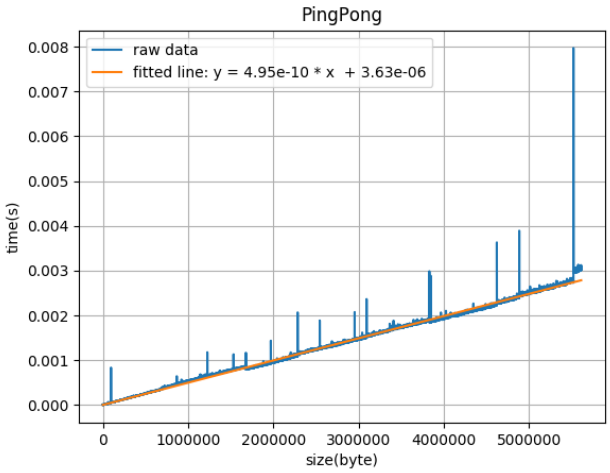
By changing the size of package, we can find an equation $time = \lambda + \frac{n}{\beta}$

(Brief your problem, and give your idea or concept of how you design your program.)

I use for loop to change the size of package and record the time each time and export to a csv file

```
for(int i = 100; i <= 10000000; i += 100){
    char message[i];
    int size = i;
    MPI_Barrier (MPI_COMM_WORLD);
    if (myrank == 0){
        elapsed_time = - MPI_Wtime();
        MPI_Send(message, size, MPI_CHAR, 1, 99, MPI_COMM_WORLD);
        MPI_Recv(message, size, MPI_CHAR, 1, 99, MPI_COMM_WORLD, &status);
        elapsed_time += MPI_Wtime();
        printf("%d, %8.6f\n", size, elapsed_time);
        fflush(stdout);
    }else if (myrank == 1){
        MPI_Recv(message, size, MPI_CHAR, 0, 99, MPI_COMM_WORLD, &status);
        MPI_Send(message, size, MPI_CHAR, 0, 99, MPI_COMM_WORLD);
    }
}
```

And then I use matplotlib to plot the line.



The estimated equation parameters are: $\lambda = 3.63 * 10^{-6}$, $\beta = 2.02 * 10^{9}$

2 Theoretical Analysis Model

(Try to give the time complexity of the algorithm, and analyze your program with iso-efficiency metrics)

3 Performance Benchmark

(Give your idea or concept of how you design your program.)

4 Conclusion and Discussion

(Discuss the following issues of your program

1. What is the speedup respect to the number of processors used?
2. How can you improve your program further more
3. How does the communication and cache affect the performance of your program?
4. How does the Karp-Flatt metrics and Iso-efficiency metrics reveal?

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Appendix(optional):

(If something else you want to append in this file, like picture of life game)