CS 301
High-Performance Computing

Lab 7 : Calculation of pi using random number

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Contents

1 Introduction

1.1 Brief description of the problem.

Problem -> Calculation of pi using random number

In this problem, our task is to calculate the value of pi using random number. We will be using the Monte-Carlo estimation to calculate the value. Serial as well as parallel codes were written for the calculation.

Now our goal is to write an optimal serial as well as parallel algorithm for calculating the upper problem so that we can get optimal use of our processor.

1.2 The complexity of the algorithm (serial).

As you can see in the uploaded code, We are doing calculation for pi by just using 1 for loop.

So The time complexity of the algorithm is:

$$O(N)$$

and The space complexity of the algorithm is:

$$O(1)$$

2 Hardware Details

2.1 Hardware Details of LAB207 Computer

- CPU - 4
- Socket - 1
- Cores per Socket - 4
- Size of L1 cache - 64KB
- Size of L2 cache - 256KB
- Size of L3 cache - 6MB

2.2 Hardware Details of Cluster

- CPU - 16
- Socket - 2
- Cores per Socket - 8
- Size of L1 cache - 64KB
- Size of L2 cache - 256KB
- Size of L3 cache - 20MB

3 PART 1: LAB207 Computer

3.1 Graph

Below we have depicted the Mean execution time vs problem size for Lab207 computer.

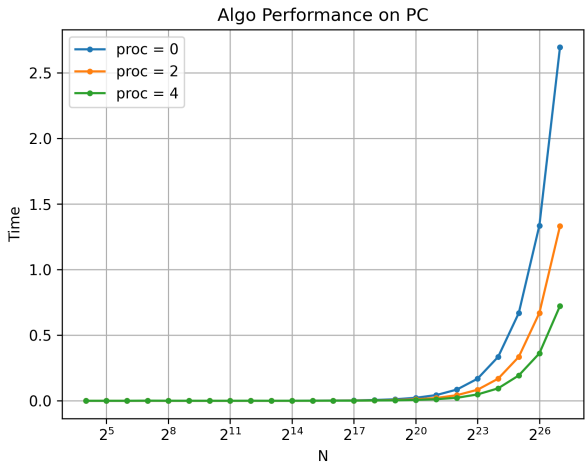

Figure 1: Algorithm time vs Problem size - PC

3.2 Speed-Up with problem size

Here is the plot of speedup vs problem size for Lab207 computer.

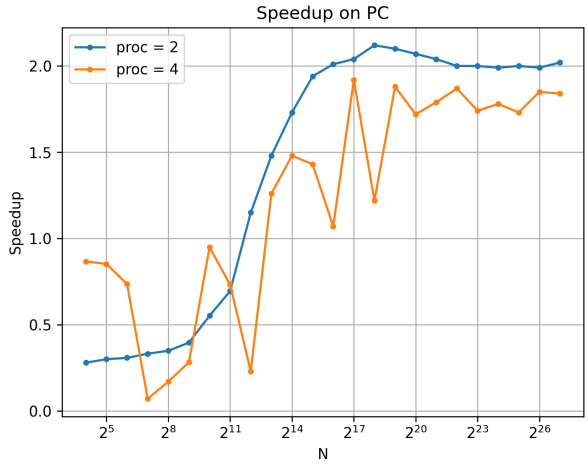

Figure 2: Speedup vs Problem size - PC

3.3 Speed-Up with processor

Here is the plot of speedup vs processor for the Lab207 computer.

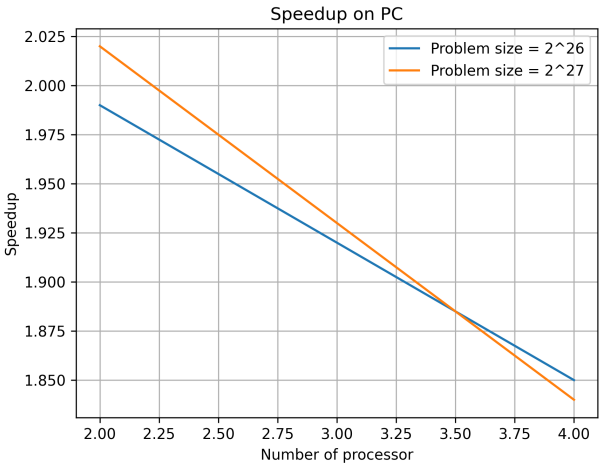

Figure 3: Speedup vs Processor - PC

4 PART 2: Cluster

4.1 Graph

Below we have depicted the Mean execution time vs problem size for Cluster.

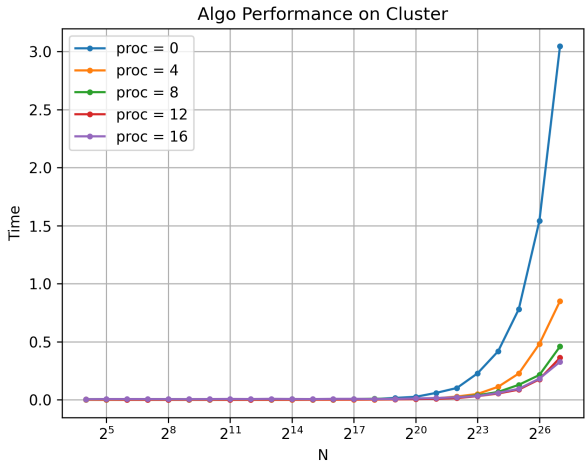

Figure 4: Algorithm time vs Problem size - Cluster

4.2 Speed-Up with problem size

Here is the plot of speedup vs problem size for Cluster.

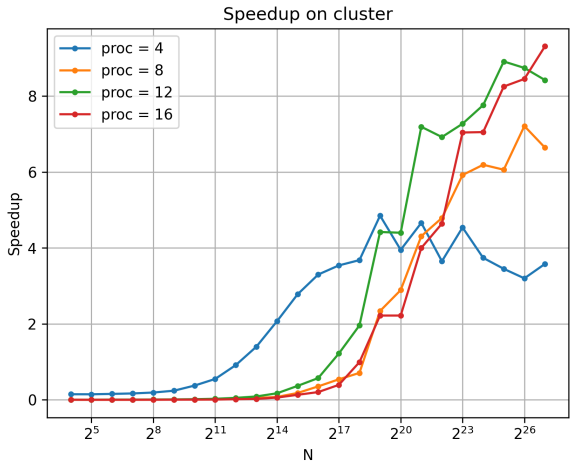

Figure 5: Speedup vs Problem size - Cluster

4.3 Speed-Up with processor

Here is the plot of speedup vs processor for Cluster.

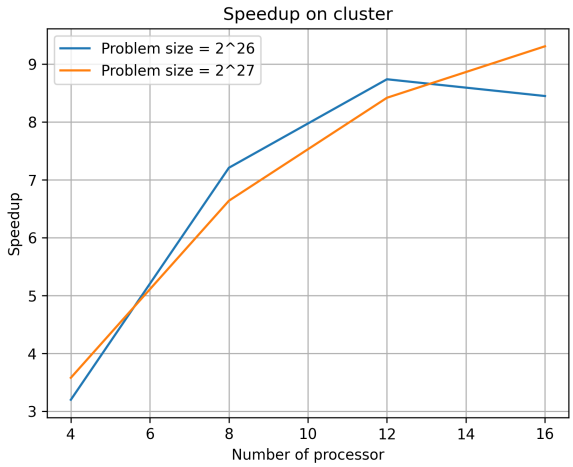

Figure 6: Speedup vs Processor - Cluster