

OpenMP PI approximation

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Exercise 1

Objective

The objective of this exercise is to approximate the value of PI using the rectangle method in **OpenMp**.

Result

PI can be approximated via the following formula:

$$PI = 4 \int_0^1 1/(1+x^2)dx$$

The **rectangle method** (also called **the midpoint rule**) is the simplest method in Mathematics used to compute an approximation of a definite integral. This method is used to compute the area under the simple curve.

Time taken by different types scheduling:

Time taken by serial PI approximation = **0.185 s**

Time taken by Parallel (guided) PI approximation using OpenMp = **0.189s**

Time taken by Parallel (dynamic) PI approximation using OpenMp:

Chunk Size	Time Taken(s)
1	13.860
10	1.035
100	0.882
1000	0.194
10000	1.44

From the table given above, we can see that the time taken decreases with increase in the chunk size that is accessible to the threads. But, we can see that once the chunk size increases to a certain level we can see the time taken starts to increase, due to the increase in the work load for a given thread. Hence, we need to choose an optimum chunk size according to the operation.

Time taken by Parallel (dynamic) PI approximation using Reduction, Atomic and Critical sections are given below:

No of threads	Reduction(s)	Atomic(s)	Critical(s)
1	0.204	0.202	52.962
2	0.188	0.194	43.839
4	0.186	0.195	48.861
8	0.184	0.193	48.903
16	0.186	0.193	52.053
20	0.200	0.220	48.543

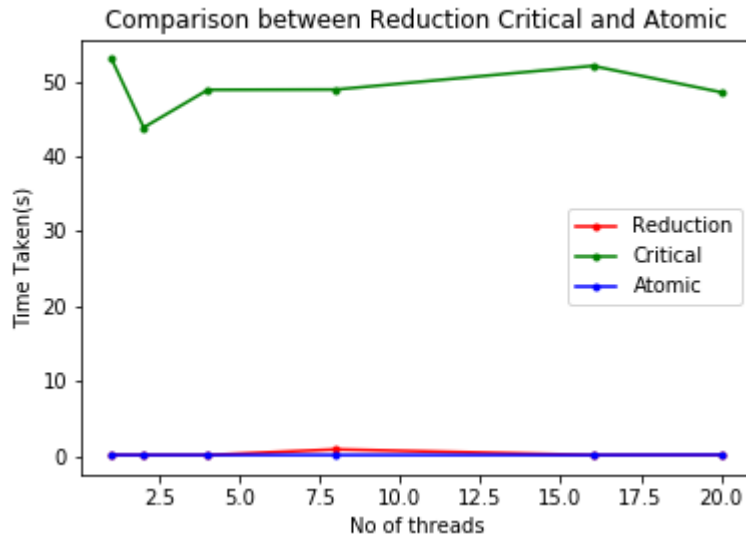


Figure 1: No of threads Vs Time Taken

Conclusion

From the figure we can conclude that the time taken for reduction and atomic clause is almost the same. But, the time taken for the critical clause is higher because it allows the usage of only one thread.