

MPI PI approximation

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Exercise 3

Objective

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

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.

Here the message is broadcasted to all the other processes from **Process 0**. Then the **approximation of PI** is carried out by the remaining processes using the **MPI_Reduce** function. Then the final result is send back to the **Process 0**.

Comparison between the time taken for PI approximation by OpenMP and MPI:

No of Threads	OpenMP(s)	No of Processes	MPI(s)
1	0.204	1	0.521
2	0.188	2	0.221
4	0.186	4	0.109
8	0.184	8	0.058
16	0.186	16	0.043
20	0.200	20	0.031

Conclusion

From the table given above, we can see that for the **OpenMp** the time taken decreases with increase in the number of threads and for **MPI** the time taken decreases with increases in the number of processes. We know that, a process is basically a collection of threads. Hence, the time taken by **MPI** when the process is increased is less than the time taken by **OpenMp**.