

Discussion

Problem statement: Parallelizing Wave Diffusion with MPI and OpenMP

Here I am listing my analysis of MPI and OpenMP alone and all-together for hybrid programming.

MPI:

Designed for distributed memory

- Runs on Multiple system
- Send/receive messages to communicate between nodes
- MPMD: Multiple program, Multiple data
- Fixed set of processors are used

MPI uses objects called communicators, defines which processes can talk.

MPI_COMM_WORLD predefines all of the processes.

Ranks are integer process identifier

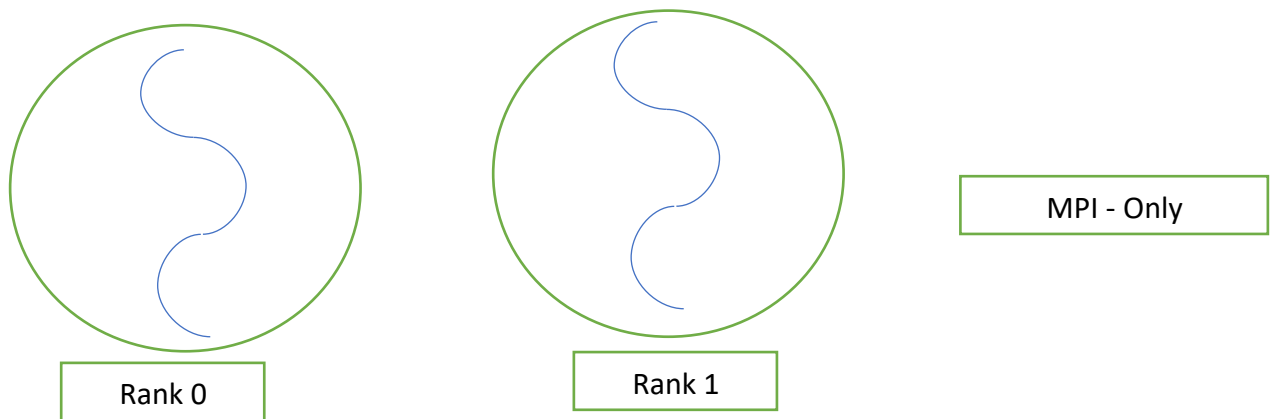
MPI_SIZE is the number of processes

OpenMP: Designed for shared memory

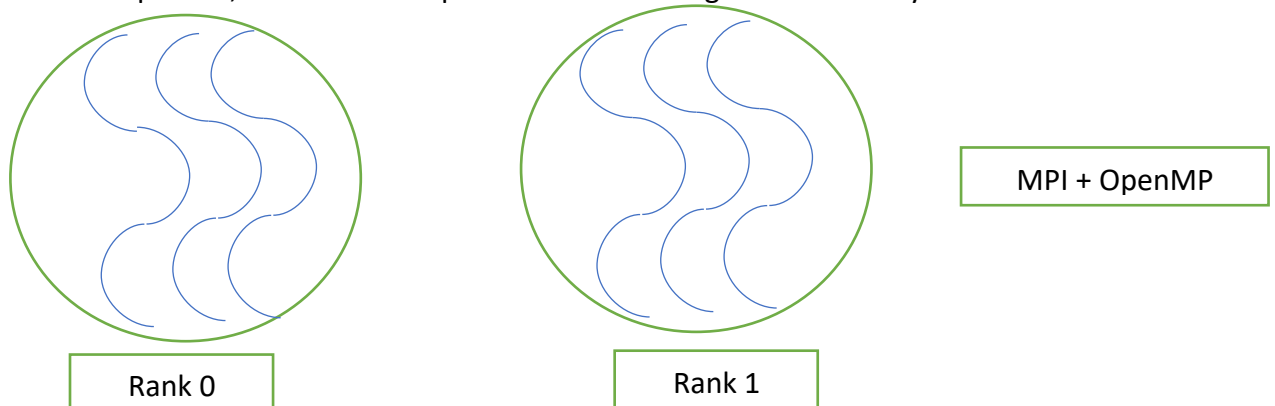
- Single system with multiple core
- SPMD : Single program, Multiple data
- To parallelize used *#pragma omp parallel for*

MPI+OpenMP(Hybrid):

In MPI programming each MPI process has single program counter



With MPI and OpenMP, there are multiple threads executing simultaneously.



Performance improvement scope:

- For $t=0$ and $t=1$, each node is calculating for $z[0][i][j]$ and for $z[1][i][j]$ where instead we can make it parallel by each node will calculate its own $t=0$ and $t1$.
- By making stripe size smaller at start point of wave or origin of wave and making stripe size larger at the boundary of the wave square box.