Assignment 2

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Introduction

The aim of this assignment is to approximate π using the mid-point rule. In particular, a comparison between an OpenMP and an MPI implementation will be presented.

Exercise 3

`omp_pi.c` and `mpi_.pi.c` implement the two approaches. In particular, the OpenMP implementation uses `omp_atomic` to deal with critical sections, because in this particular problem it provides better and more stable results than `omp_critical` and `omp_reduction` (please, refer to Assignment 1 for a comparison between the three methods).

Fig. 1 shows the result of the computation. The message passing approach has been scaled up to two nodes, for a total of 40 processors, while the OpenMP approach stops at 20 processors. The plot shows how the MPI approach offers better performance, consistently running faster than the OpenMP approach. Moreover, a message passing approach offers the possibility to exploit more than one node. Fig. 2 shows the speedup comparison. The dashed line represents a linear speedup: both approaches scale almost linearly.

As required, the I/O time is excluded in the MPI timing. This justifies the similarities between the two approaches: the actual computation time is almost the same, but the

whole execution time might be larger for the MPI approach, if I/O operations were taken into account.

Fig. 1: Strong scaling, $N = 10^9$ quadrature points, OpenMP vs MPI.

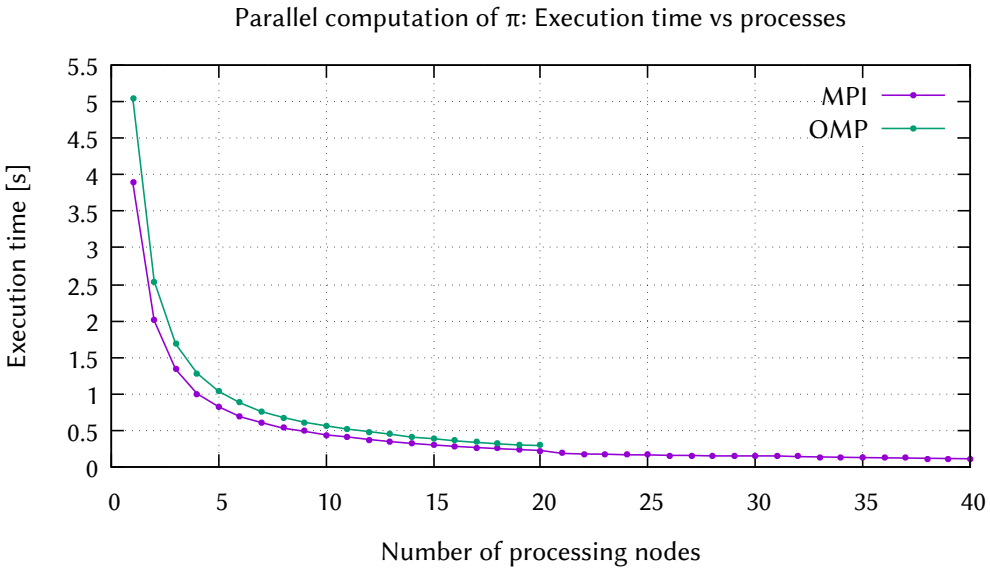

Fig. 2: Speedup, $N = 10^9$, OpenMP vs MPI.