Concurrency and Parallelism. Block II Parallelism

Assignment 2: MPI collectives in the estimation of PI

Spring 2024

MPI collectives in the estimation of PI

Parallelization performed in assignment 1 + improvements assignment 2!

- SPMD implementation
- I/O (scanf/printf) is made by process 0
- Distribute *n* to all the processes (with Send/Recv) Now with MPI collective operation!
- Divide the workload of the for loop with "step" i+=numprocs instead of i++
- Gather the estimation of PI in each process (with Send/Recv) Now with MPI collective operation!

MPI collectives in the estimation of PI

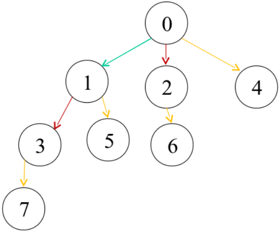
Usage of MPI collectives

- Initially use standard MPI collective operations
- Later introduce own implementation of the collective (with same header as the standard collective) ONLY for the recollection of *sum*, initially using the same Send/Recv operations as in the implementation without collectives (for loop with Sends), implementation that we will call MPI_FlattreeColective. Assume that the operation to perform is an addition. The remaining parameters of the function must be the same ones as in the standard MPI collective (including checking errors)
- Implement the collective following a binomial tree approach. We will call MPI_BinomialColective to this implementation to use in the distribution of *n*

MPI collectives in the estimation of PI

Implementation of Bcast with binomial tree (MPI_BinomialBcast):

- Same parameters as MPI_Bcast (see man page of MPI_Bcast to obtain the header), assuming for simplicity that the root is 0. Not necessary to correctly return the "error" integer.
- In step "i" the processes with $myrank < 2^{i-1}$ communicate with the process $myrank + 2^{i-1}$



Paso 1: 0→1
Paso 2: 0→2, 1→3
Paso 3: 0→4, 1→5, 2→6, 3→7

Conditions of the assignment

- Assigned points: 0.5
- Deadline: April 22nd
- Must be done in couples
- Defended in the laboratory class