

High Performance Computing Parallel Processing (CS471) - 2021

Assignment 2 -MPI

Deadline & Submission:

- 1. The assignment is individual.
- 2. Code must be in C and MPI & you must run it before sending.
- 3. Cheating could lead to serious consequences.
- 4. Deadline: Wed 26/5/2021 11:59 PM

Assignment Title:

Calculating Standard Deviation

Problem Statement:

Write a parallel c program to calculate standard deviation using MPI_Bcast, MPI_Reduce & MPI Allreduce ONLY. **Don't use MPI Send and MPI Receive**

Given:

An integer **n** (number of elements per each process).

Output:

Standard deviation of randomly generated (n * numberOfProcesses) elements.

How to Calculate Standard Deviation:

- 1. Calculate the Mean.
- 2. For each number, subtract the mean and square the result.
- 3. Calculate the mean of the squared differences.
- 4. Take the square root of step three results.



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Parallelization Scenario:

Master Process:

- ✓ Read **n** from the user.
- ✓ Broadcast **n** to each slave process using MPI Bcast.
- ✓ Calculate the square root of the mean of squared differences.

Slave Process:

- ✓ Get **n** through the MPI Bcast call.
- ✓ Generate n random elements. So each process will generate **n** numbers.
- ✓ Calculate local sum of the generated n elements.
- ✓ Share this local sum with the rest of the processes using MPI_Allreduce.
- ✓ Calculate the global mean. (Total sum of elements / n * numOfProcesses).
- ✓ Calculate local sum of squared differences from the mean. Sum (n mean)2
- ✓ Share this local sum of squared differences with the master process using MPI_Reduce call.

Grading: (100)

Using MPI_Bcast	15
Using MPI_Reduce or MPI_Allreduce	20
Compile code	40
Run and Output correct	25