Lab 5. MPI – matrix operations and performance studies

Main goals of the assignment

- Understand the principles of collective communication.

- Learn about perfformance through experiments.

The problem to solve

General overview

A MPI-based parallel version of matrix to matrix multiplication is requested.

Background

See the description from Lab 2.

How to paralelize

Similar with the solution from Lab 2.

To do

1. Recall the sequential code and OpenMP code from Lab 2 for multiplying two matrices.

2. Write the parallel code that uses MPI (hint: see the code from the text book from page 316 - bottom; note that bands of all three matrices are split and distributed to the active processes, not only two matrices as in the case of Lab 2).

3. Introduce time records (hint: `MPI_Wtime`) at the start and the end of the code (without including the final displaying of checked values).

4. Record the times for 1 to maximum number of processors that are available for the dimension of the matrices of 1600, 2000, respectively 2400, compute the speedups and display them in a graphic (similar with lab 2).

5. Compare the speedups obtained with MPI and the ones obtained with OpenMP when running on one computer. Which one provides a faster response? Explain! (but Remember that MPI is to be used for multiple servers, while OpenMP is a single multi-core system.

6. Investigate if another communication schema is more efficient. Eg. allocate both matrices in one process and then distribute the parts necessary to be used in computation to other processes. Is this schema providing a faster response of the code?