Exercises part.3

2 March 2016

Parallelization

The target of this exercise is to solve the **Laplace Equation** in parallel

1) Distributed vectors

1. Initialize MPI
2. Find a convenient way of distributing vectors to the different N^{ranks} processors and store info on local sizes
3. Generate a random Laplace problem paying attention to distributed random generator issues: the generated problem should not depend on the number of processors

2) Implement gathering of non-local data

Choose one of (or optionally both) the two efficient approaches illustrated in the lecture:

1. Shifting the vector back/forward (you can optionally avoid creation of buffer)
2. Caching non-local data

to apply the discrete Laplace matrix to a vector. For this part is convenient to focus on the application of the matrix itself and avoid thinking on the solver. It is also convenient at this stage to compare the result of the application with that obtained with the scalar code

3) Run the full solver

1. Perform global reduction of the scalar products
2. Run the solver and compare the results with those obtained in the scalar code
3. Take a large problem and perform benchmarks: produce plots of the weak/strong scaling of your implementation(s)