

Parallel Programming 2018, Assignment 1-B: Hellerman-Rarick

Deadline: Wednesday, Oct 31 before 23:59 hours.

In the second programming assignment, you will improve your understanding of reordering techniques, which are a crucial component in the parallelization of both sparse matrix computations as well as graph computations.

For this assignment you have to implement the Hellerman-Rarick tearing technique which reorders a sparse (adjacency) matrix into bordered block triangular form. This tearing is basically an unsymmetric reordering and will change the underlying graph properties. An algorithmic description of this technique is given in Lecture 7.

The deadline for the assignment is October 31. The assignment has to be completed individually. You are expected to hand in a tarball containing your source code and a PDF file illustrating the input matrix as well as the output matrix of the three test matrices (a total of 6 pictures). The assignments should be handed in by e-mail to *ppiFall2018 (at) gmail (dot) com*.

1 Implementation

Any implementation platform (language) can be chosen for implementing the algorithm. I/O and visualization has not to be implemented and any tool for this can be taken.

2 Input matrices

You are expected to run Hellerman-Rarick on three input matrices:

- A 10x10 unsymmetric sparse matrix with density 0.5
- A 100x100 unsymmetric sparse matrix with density 0.1
- A 10000x10000 unsymmetric sparse matrix with density of 0.005

3 Output

Both the three input matrices and their reordered bordered block triangular form should be visualized. The reordered matrices should be transposed so that the border is located on the bottom of the matrix and the triangular part is upper triangular.