Automatic Domain Decomposition for a Black-Box PDE solver

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Abstract. We want to develop a tool to distribute automatically a given arbitrary 2-D or 3-D mesh equally among a given number of processors. First we sort the nodes by their x-coordinate locally on each processor, afterwards globally by a sophisticated algorithm where we make use of the message passing paradigm. This results in a one-dimensional domain decomposition that may also run over dividing lines. The elements are sent around in a ring shift afterwards, where each processor takes the necessary element information out of the current basket in each tact. To be able to execute the following solution of the system of PDEs purely local without communication, we also create an overlap, i.e. we also store on each processor the necessary nodes and elements of neighbouring processors. The re-sorting of refined meshes serves the purpose of load-balancing, and for the resulting matrix it serves as a kind of bandwidth optimizer.