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Non-overlapping discretization methods

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The main difficulties of parallel computing are the coordination of the many processors that carry out the different tasks and the information-transmission between them. These difficulties disappear when such *'a task can be carried out with the processors working independently of each other'*. We refer to this latter condition as the *'paradigm of parallel-computing software'*. The *DDM-paradigm*, which is concomitant to the *paradigm of parallel-computing,* is: *'obtaining the global solution by solving local problems exclusively'*. DDMs algorithms that fulfill this paradigm are said to be *'optimal'*. Stated in a simplistic manner, the basic idea is that, using *optimal* DDM-algorithms, a parallelization very close to 100% can be achieved by assigning each subdomain to a different processor. In the past, to develop *optimal* algorithms, efforts were made to uncouple the local problems by means of *substructuring*, which led to the most effective methods of today: *non-overlapping DDMs*. However, significant difficulties still present in *non-overlapping DDMs* stem from the interface-nodes, which are shared by two or more subdomains of the coarse-mesh and, therefore, even non-overlapping DDMs are actually overlapping when seen from this perspective. In this talk, a new discretization methodology of partial differential equations, the *'non-overlapping discretization methods'* in which the sets of nodes used are non-overlapping, is presented. Such procedures are very general and can be applied to any well-posed boundary-value problem derived from a single equation, or systems of equations, independently of whether it is symmetric, non-symmetric or indefinite.

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