Non-overlapping discretization methods

Ismael Herrera
Universidad Nacional Autónoma de México (UNAM)
Apdo. Postal 22-220, México, D.F.14000
Email: iherrerarevilla@gmail.com

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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.

REFERENCES