Derived Vector Space method applied to a subsurface flow simulator

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Abstract

With performance efficiencies around the 90% values, at present DVS algorithms are top for applying highly parallelized software to the solution of partial differential equations (PDE), or systems of such equations [1]-[2]. Furthermore, due to their axiomatic foundations, DVS-algorithms possess a range an applicability of outstanding wideness. To make effective such a range of applicability, DVS-software has been organized as follows: a central code of general applicability, based on optimized sequences that use the DVS-algorithms, has been developed; then, in specific applications, this code is preceded by interphases that are case-specific. As an illustration of the procedure, in this talk we present its application to a well-known and extensively used software: MODFLOW [3]. This is a simulator that models groundwater flow using the finite difference method; it was developed by the U.S. Geological Survey. MODFLOW has been widely used for decades but when applied to solve large-scale problems the computational time can be excessive. For such applications, in recent years, MODFLOW has been parallelized by a few authors using different strategies. However, since DVS is at present the most effective procedure for solving elliptic systems in parallel, this talk will probably be relevant for improving the parallelization of MODFLOW.

Keywords: DVS, Derived Vector Space, Parallel software for PDEs, domain decomposition methods, DDM, MODFLOW

References

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