

Multilevel adaptive methods for partial differential equations

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Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=20450611&lokasi=lokal>

Abstrak

A practical handbook for understanding and using fast adaptive composite grid (FAC) methods for discretization and solution of partial differential equations (PDEs). Contains fundamental concepts. These so-called FAC are characterized by their use of a composite grid, which is nominally the union of various uniform grids. FAC is capable of producing a composite grid with tailored resolution, and a corresponding solution with commensurate accuracy, at a cost proportional to the number of composite grid points. Moreover, special asynchronous versions of the fast adaptive composite grid methods (AFAC) studied here have seemingly optimal complexity in a parallel computing environment. Most of the methods treated in this book were discovered only within the last decade, and in many cases their development is still in its infancy. While this is not meant to be comprehensive, it does provide a theoretical and practical guide to multilevel adaptive methods and relevant discretization techniques. It also contains new material, which is included to fill in certain gaps and to expose new avenues of research. Also, because adaptive refinement seems to demand a lot of attention to philosophical issues, personal perspectives are often brought freely into the discussion.