Akhtar, J.

On the optimisation of discretising steps in the space and time domains along with over-relaxation parameter in the finite difference solution of the transient heat-flow equation.

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COMPEL 19, No. 4, 956-973 (2000).

Optimisation of the discretising steps in the space and time domains is studied for the evaluation of the corresponding optimum value of the overrelaxation parameter in the numerical solution of the transient heat flow equation using the successive-overrelaxation method in the finite difference code. No closed form solutions are available for the optimisation of a complete set of the involved parameters in such problems.

The present work deals quantitativly with the need for a more generalised closed form relation involving discretising steps in the space and the time domains for an optimal overrelaxation parameter. The maximum finite difference error and the number of iterations required to achieve a reasonable error tolerance in functional value are the two criteria used to obtain an optimised set of parameters. The effect of deviation from the optimised values of any of the involved parameters is shown by means of a model problem of a one dimensional diamond-IIa medium of 100 micrometer length and for a time duration of 1.24 micro-seconds.

Reviewer: Peter Matus (Minsk)

MSC:

65M06 Finite difference methods for initial value and initial-boundary value problems involving PDEs
35K05 Heat equation
65M50 Mesh generation, refinement, and adaptive methods for the numerical solution of initial value and initial-boundary value problems involving PDEs
65M15 Error bounds for initial value and initial-boundary value problems involving PDEs
80A20 Heat and mass transfer, heat flow (MSC2010)

Keywords:

grid optimization; error bound; transient heat flow equation; successive-overrelaxation method; finite difference; optimal overrelaxation parameter

Full Text: DOI

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