

Method of Generated Solutions as a Numerical Verification Tool for Ice Code

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Abstract

Method of Manufactured solutions is a well-known method used to verify numerical algorithms. It is used to estimate convergence and order of accuracy of the algorithms. The method involves design of analytical solutions to the set of equations solved by the algorithm and generation of the forcing function, which becomes the input to the solver. The disadvantage of this method is that the solutions it investigates may not reflect physical solutions. Method of Generated Solutions was designed to overcome this limitation. Method of Generated Solutions interpolates or approximates experimental data or data from a solver in order to design analytical solution. These solutions closely resemble physical solutions, which leads to a more accurate baseline for testing and verification of a numerical solver. The method was used to verify ICE (Implicit, Continuous fluid, Eulerian), a semi-implicit finite volume solver, that simulates fluid phenomena. This paper describes the results of numerical experiments, which demonstrate the effectiveness of the method.