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On a grid-method solution of the Laplace equation in an infinite rectangular cylinder under periodic boundary conditions

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Review text:

The article deals with a new finite difference scheme to approximate the Laplace equation posed on three dimensional infinite rectangular cylinder with periodic boundary conditions. Under the assumption that the boundary value data is a bounded function and is periodic in the x_3 direction, it is first proved that there exists a unique bounded periodic solution. A special finite difference scheme is suggested. To derive the error estimate, the author proved two results on the exact solution. The first result states that the second derivatives of the exact solution are bounded. The second result states some estimate for the fourth derivatives of the exact solution. Thanks to these two stated results on the exact solution and two other lemmas, the author proved that the convergence order of the finite difference scheme is $h^2 |\log h|$.

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