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Parallelization of a finite difference scheme for solving systems of 2D Sine-Gordon equations

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The numerical solving of systems of 2D Sine-Gordon equations is important both for pure mathematical theory and for applications. A second-order finite difference scheme is proposed for solving particular systems of 2D perturbed Sine-Gordon equations coupled via a cyclic tridiagonal matrix. The systems are considered on rectangular domains. In some cases the computational domain size and the number of time steps may be very large, which motivates a parallelization of the difference scheme. The difference scheme is parallelized by using MPI and OpenMP technologies. For different performance tests we use the computational resources of the HybriLIT cluster and the IICT-BAS cluster. Very good performance scalability is achieved.

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