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Meshless collocation methods with barycentric interpolation for solving the Helmholtz equation. (Chinese. English summary) [Zbl 07404359]
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Summary: In this paper, Chebyshev interpolation nodes, barycentric Lagrange interpolation basis function and barycentric rational interpolation basis function are used to deduce two types of meshless collocation methods for solving the Helmholtz equation. First of all, the two kinds of interpolation basis functions are applied to treat the spatial variables and their partial derivatives, and the collocation methods for solving the second order differential equations are established. Secondly, the differential matrices are used to simplify the given differential equations on a given interpolation node. Finally, based on three kinds of test nodes, numerical experiments show that the presented methods can calculate not only large wave number problems, but also variable wave number problems. In addition, the algorithms have the advantages of high accuracy, good numerical stability, cost-effective and high efficiency.

MSC:
65M70 Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs

Keywords:
Helmholtz equation; barycentric Lagrange interpolation; barycentric rational interpolation; meshless collocation method; high wave number; variable wave number